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Review for Population Research

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DEAR READERS,

Pavel Čtrnáct

The Czech Statistical Office and the editorial team of *Demografie* is fulfilling its promise of last year and publishing now the second issue of the journal fully in English. With this move we hope to provide greater access to our work, greater international publicity for the journal, and a higher standard of published articles by Czech and foreign authors. The aim is to acquaint the larger scholarly community with the main problems studied by Czech demographers, who are often working within the framework of international projects and grants. We are pleased that in this issue we have been able to select for publication a number of articles and to present news, interesting information, summary articles, and data tables, including an analysis of population development in the Czech Republic in 2011 and the first final results of the Population and Housing Census conducted on 26 March 2011. The editorial team is also adhering to its promise to publish important articles written in English in the Czech issues of the journal.

The editorial team has also taken the step of calling on some prominent personalities in world demography with the offer to cooperate on developing the scope of specializations and the publishing plan of the journal *Demografie* by inviting them to join our Editorial Board. We are very pleased that pledges of cooperation have already been received from Natalia S. Gavrilova, Richard Gisser, Nico Keilman, Juris Krumins, Michel Poulain, Mirjana Rašević and Leo van Wissen, who have already been appointed as members of the Editorial Board by the President of the Czech Statistical Office. The first task that the newly appointed members will participate in is finalising the journal's publishing plan for 2013. We also expect that they will be instrumental in helping the journal to obtain quality submissions from authors abroad and providing us with information about important conferences, research projects, publications, and so forth.

I would also like to draw your attention to the fact that current and archive issues of *Demografie* are accessible online at: http://www.czso.cz/eng/redakce.nsf/i/demografie_review_for_population_research. Readers will also find there back issues of the electronic journal *Czech Demography*, which was published from 2007 to 2010. On behalf of the publisher and the Editorial Board allow me to wish you much success in the coming year and to wish our *Demografie* another good year in 2013, which will be our 55th continuous volume. We welcome all comments and suggestions from readers.

POPULATION DEVELOPMENT IN THE CZECH REPUBLIC IN 2011

Eva Kačerová – Michaela Němečková

ABSTRACT

This article describes the demographic situation in the Czech Republic in 2011 and evaluates it in the context of development since 2001. The study focuses on the decrease in fertility, nuptiality, divorce and migration and the stagnation of abortion. Changes in the mortality and in mortality statistics by causes of death are also discussed.

Keywords: population development, Czech Republic, age structure, nuptiality, divorce, fertility, abortion, mortality, migration

Demografie, 2012, **54: 336–355**

INTRODUCTION

The year 2011 is very important for Czech demography, as in this year the population census took place again after ten years. The complete results of the census are awaited with great expectations, not only by demographers. The published conclusive results of the census[1)] indicate that the Czech Republic had a total usually resident population of 10,436,560 as of the census date 26 March 2011.

Based on the conclusive results of the census the number of inhabitants of the Czech Republic as of 1 January 2011 and 31 December 2011 was derived from the population balance. Unfortunately, as of July 2012 very important data, e.g. the number of inhabitants by marital status or the numbers of children by age and by the date of birth of the mother, are not yet available. That is why these data are absent (or end by 2010) from the present paper; for example the nuptiality tables for singles or fertility rates by marital status could not be calculated.

Based on the records of demographic events, in 2011 there was a significant decrease in both the number of live-born children (by 8.5 thousand to 108.7 thousand) and the total fertility rate (to 1.43 children per woman). The number of deaths (106.8 thousand) stagnated and the life expectancy at birth continued to rise among both men and women (to 74.7 years and 80.7 years, respectively). There were year-on-year decrements of weddings (by 1.6 thousand to 45.1 thousand), divorces (by 2.7 thousand to 28.1 thousand) and abortions (by 0.4 thousand to 38.9 thousand).

Because of the significantly lower number of newborns the natural increase dropped year-on-year by 8.5 thousand, nevertheless it remained positive (1.8 thousand). Foreign migration caused an increment of 16.9 thousand people during 2011 and thus resulted in a gain of 18.7 thousand inhabitants overall. According to the balance derived from the census, the Czech Republic had 10,505,445 inhabitants as of 31 December 2011.

1) www.scitani.cz.

Table 1 **Population and vital statistics, 2001–2011**

Indicator	2001	2003	2005	2007	2008	2009	2010	2011
	Absolute number							
Live births	90,715	93,685	102,211	114,632	119,570	118,348	117,153	108,673
Deaths	107,755	111,288	107,938	104,636	104,948	107,421	106,844	106,848
under 1 year of age	360	365	347	360	338	341	313	298
Marriages	52,374	48,943	51,829	57,157	52,457	47,862	46,746	45,137
Divorces	31,586	32,824	31,288	31,129	31,300	29,133	30,783	28,113
Abortions	45,057	42,304	40,023	40,917	41,446	40,528	39,273	38,864
induced abortions	32,528	29,298	26,453	25,414	25,760	24,636	23,998	24,055
Immigrants	12,918	60,015	60,294	104,445	77,817	39,973	30,515	22,590
Emigrants	21,469	34,226	24,065	20,500	6,027	11,629	14,867	5,701
Natural increase	–17,040	–17,603	–5,727	9,996	14,622	10,927	10,309	1,825
Net migration	–8,551	25,789	36,229	83,945	71,790	28,344	15,648	16,889
Total increase	–25,591	8,186	30,502	93,941	86,412	39,271	25,957	18,714
Mid-year population (thousands)	10,224	10,202	10,234	10,323	10,430	10,492	10,517	10,497
	Per 1,000 inhabitants							
Live births	8.9	9.2	10.0	11.1	11.5	11.3	11.1	10.4
Deaths	10.5	10.9	10.5	10.1	10.1	10.2	10.2	10.2
Marriages	5.1	4.8	5.1	5.5	5.0	4.6	4.4	4.3
Divorces	3.1	3.2	3.1	3.0	3.0	2.8	2.9	2.7
Abortions	4.4	4.1	3.9	4.0	4.0	3.9	3.7	3.7
induced abortions	3.2	2.9	2.6	2.5	2.5	2.3	2.3	2.3
Immigrants	1.3	5.9	5.9	10.1	7.5	3.8	2.9	2.2
Emigrants	2.1	3.4	2.4	2.0	0.6	1.1	1.4	0.5
Natural increase	–1.7	–1.7	–0.6	1.0	1.4	1.0	1.0	0.2
Net migration	–0.8	2.5	3.5	8.1	6.9	2.7	1.5	1.6
Total increase	–2.5	0.8	3.0	9.1	8.3	3.7	2.5	1.8

Table 2 **Main analytical characteristics of population development, 2001–2011**

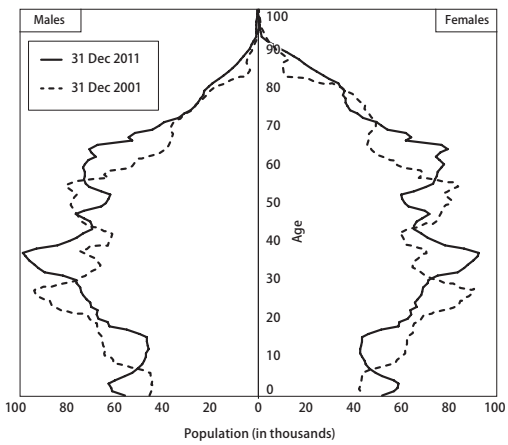
Indicator	2001	2003	2005	2007	2008	2009	2010	2011
Total first marriage rate – males (%)	66.0	62.5	62.8	64.5	59.6	56.1	54.9	.
– females (%)	72.5	68.7	69.1	71.1	66.1	62.7	61.6	.
Mean age at first marriage – males	29.3	30.3	30.8	31.2	31.4	32.0	32.2	.
– females	26.9	27.7	28.1	28.6	28.8	29.2	29.4	.
Total divorce rate	0.45	0.48	0.47	0.49	0.50	0.47	0.50	0.46
Total fertility rate	1.15	1.18	1.28	1.44	1.50	1.49	1.49	1.43
Mean age of mothers at 1st birth	25.3	25.9	26.6	27.1	27.3	27.4	27.6	27.8
Share of live births outside marriage (%)	23.5	28.5	31.7	34.5	36.3	38.8	40.3	41.8
Net reproduction rate	0.55	0.57	0.62	0.70	0.72	0.73	0.72	0.69
Total abortion rate	0.60	0.56	0.53	0.54	0.54	0.53	0.51	0.52
Total induced abortion rate	0.44	0.39	0.35	0.34	0.34	0.33	0.32	0.32
Life expectancy at birth – males	72.1	72.0	72.9	73.7	74.0	74.2	74.4	74.7
– females	78.4	78.5	79.1	79.9	80.1	80.1	80.6	80.7
Infant mortality rate (‰)	4.0	3.9	3.4	3.1	2.8	2.9	2.7	2.7

Note: Data on nuptiality based on nuptiality tables for single people.

POPULATION SIZE AND STRUCTURE BY AGE AND MARITAL STATUS

Since 2003 the size of the population of the Czech Republic has been continuously increasing; initially only by international migration, since 2006 also by natural increase. During the last ten-year period the population increased from 10,206.4 thousand (as of 31 December 2001) to 10,505.4 thousand (as of 31 December 2011), that is, by 299.0 thousand. During 2011 the population increase was 18.7 thousand.

Figure 1 **Age distribution of the population as of 31 December 2001 and 2011**



Changes in the age composition of the Czech population between 2001 and 2011 can be seen in the population pyramid (Figure 1): the share of the oldest population grew (especially people over 80 years old), and so did the youngest children within the population up to 15; conversely, the younger age groups decreased in share within the productive population. People born in 1974 remain the largest generation in the Czech Republic: 187.3 thousand at the end of 2001 and 193.3 thousand at the end of 2011.

Out of the three main age groups the number and share of seniors aged 65 years and over grew most quickly in the last seven-year period; it gained 65.6 thousand people (by 4%) to reach 1,701 thousand during 2011. This age group made up 16.2% of the Czech population at the end of 2011. Since 2008 the number of children up to the age of 15 has grown too; it rose by 23.1 thousand (2%) to 1,541 thousand in 2011. The share of children went up from 14.4% to 14.7%.

By contrast, since 2009 the size of the population in productive age has gone down. The number of 15–64 year-olds decreased by 116.0 thousand to 7,264 thou-

Table 3 **Age distribution of the population, 2001–2011 (31 December)**

Age group/Indicator	2001	2003	2005	2007	2008	2009	2010	2011
	Population (thousands)							
Total	10,206	10,211	10,251	10,381	10,468	10,507	10,533	10,505
0–14	1,622	1,554	1,501	1,477	1,480	1,494	1,518	1,541
15–64	7,170	7,234	7,293	7,391	7,431	7,414	7,379	7,263
65+	1,415	1,423	1,456	1,513	1,556	1,599	1,636	1,701
	Share of the total population (%)							
0–14	15.9	15.2	14.6	14.2	14.1	14.2	14.4	14.7
15–64	70.2	70.8	71.1	71.2	71.0	70.6	70.1	69.1
65+	13.9	13.9	14.2	14.6	14.9	15.2	15.5	16.2
	Share of the total population (%)							
Index of ageing*)	87.2	91.6	97.0	102.4	105.1	107.0	107.8	110.4
Total dependency ratio**)	42.3	41.2	40.6	40.4	40.9	41.7	42.7	44.6
Average age	39.0	39.5	40.0	40.3	40.5	40.6	40.8	41.1
Median age	37.9	38.5	38.9	39.1	39.2	39.4	39.6	40.1

Note: Population as of 31 December 2010 and earlier is based on 2001 census data on 2011 is based on 2011 census.
*) The number of people aged 65 or more per 100 children aged 0–14.
**) The number of children aged 0–14 and people aged 65 and over per 100 people aged 15–64.

sand during 2011. In relative figures, their share was lower almost by 2 percentage points and was 69.1% as of 31 December 2011.

The development of the distribution of the age groups was reflected in the age-composition characteristics of the Czech population: the average age of the population was greater than 41 years (it went up by 0.3 years to 41.1 years) and the median age was higher than 40 years for the first time (it increased from 39.6 years to 40.1 years). At the end of 2001 the Czech population was younger by more than two years (the mean age was 39.0, the median age was 37.9). The index of ageing that has been increasing since the mid-1980s went up further in 2011, and more markedly. There were 110 people aged 65 years and over per 100 children at the end of 2011. Since 2008 the dependency ratio (persons aged 0–14 and 65+ per 100 persons aged 15–64) has been increasing too; it was 44.6% as of 31 December 2011.

The population structure by marital status has also been changing very significantly in recent decades.[2)] As a consequence of low nuptiality the share of the married population has been going down (49.9% of all people over the age 14 in 2010, 55.4% in 2001); by contrast, the number and share of single people has risen from 25.8% to 29.9%). Forms of partnerships have diversified and many single persons live with a partner in a shared household or live apart together. Due to the high divorce the proportion of divorced people in population also increased from 9.7% in 2001 to 11.9% in 2010, but the share of widowed people has slowly shrunk thanks to decreasing mortality (8.3% in 2010 compared to 9.1% in 2001).

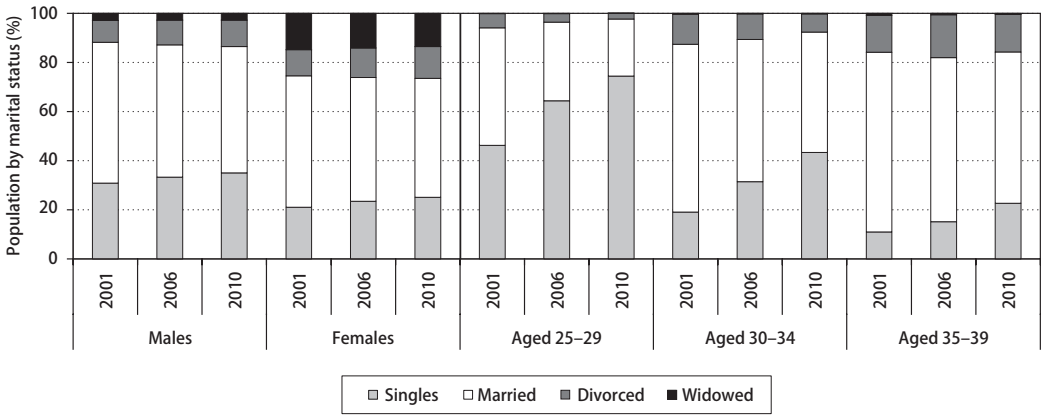
NUPTIALITY

In 2011 there were 45.1 thousand marriages, which is 1.6 thousand less than in the previous year. This was the fourth time that the number of marriages decreased year-on-year and brought the historical minimum (in the period since 1918; compared to the high of 135.7 thousand marriages in 1920) even lower. Nuptiality intensity has been markedly decreasing in the last ten-year period; there have also been significant changes in the timing of marriage.

Almost 80% of newly married couples are made up of two people of the same marital status, with

2) According to the last available data as of 31 December 2010.

Figure 2 **Population over the age 14 by marital status (%), 2001–2010 (31 December)**



the majority of couples being two single people. In 2011, 29.0 thousand protogamous marriages were registered (accounting for 64% of the total). Almost one-fifth of unions were between one single and one divorced man/woman (8.5 thousand in 2011). Another 15% of the total number of marriages were between couples of two divorcees (6.7 thousand). Widows and widowers rarely remarry (0.5 thousand men and 0.5 thousand women in 2011). In comparison with the previous year 2010, there were fewer marriages of all orders in 2011, among men as well as women. In case of first marriage, the decrease was relative higher among women (by 4% to 33.4 thousand in 2011), and in the case of the second marriages among men (by 5% to 9.9 thousand).

The homogeneity of the bride and the groom is evident also in terms of education: 55% of couples which gave information about their highest completed level of education[3] had the same level of education and the level was different only by one level in 39% of marriages.

Table 4 **Marriages by order, 2001–2011**

Indicator		2001	2003	2005	2007	2008	2009	2010	2011
Total marriages		52,374	48,943	51,829	57,157	52,457	47,862	46,746	45,137
Protogamous marriages		33,918	31,471	33,446	36,247	32,830	30,315	30,095	29,045
– share of total (%)		64.8	64.3	64.5	63.4	62.6	63.3	64.4	64.3
First order of marriage	– males	38,841	36,016	38,347	41,752	38,038	34,865	34,414	33,371
	– females	39,218	36,371	38,605	42,032	38,117	35,203	34,734	33,443
First marriages (%)	– males	74.2	73.6	74.0	73.0	72.5	72.8	73.6	73.9
	– females	74.9	74.3	74.5	73.5	72.7	73.6	74.3	74.1
Second and higher order of marriage									
	– males	13,533	12,927	13,482	15,405	14,419	12,997	12,332	11,766
	– females	13,156	12,572	13,224	15,125	14,340	12,659	12,012	11,694

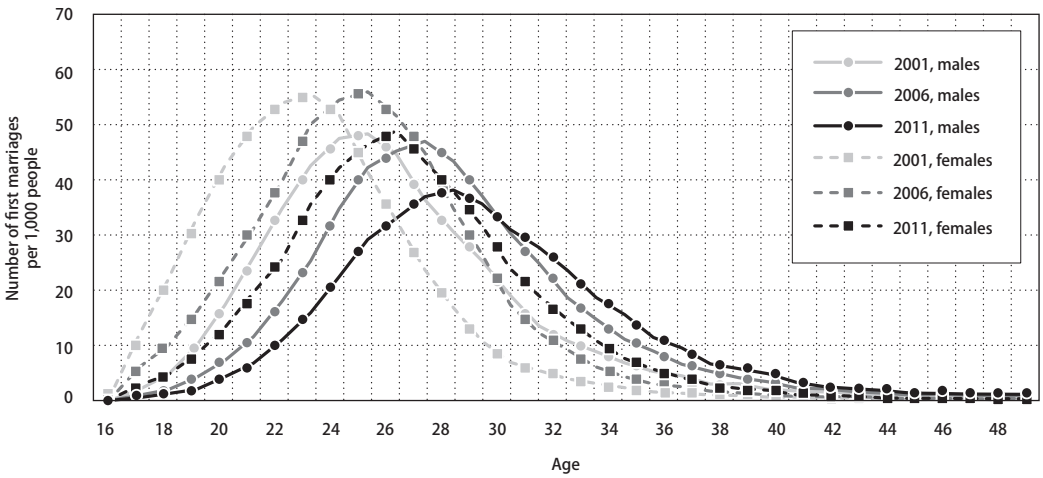
3) Since 2005 data on education are voluntary. In 2011, 3.7 thousand brides and 3.6 thousand grooms chose not to fill in information about their educational level, so educational homogamy could not be examined in 8.5% of marriages.

In the Czech Republic most weddings take place in the summer (almost one half). The situation was no different in 2011. The highest number of marriages was in June (8.1 thousand), the second highest was in July (7.3 thousand), and the third most popular month for marriage was September (6.8 thousand), which has long been a very common wedding month. In comparison with previous years there were more weddings in November,[4] because of the occurrence of the dates Friday 11 November 2011 (42% of all November weddings) and Sunday 20 November 2011. Traditionally, the fewest weddings take place in January, February and December.

The significant decrease in the probability of marriage for single people, which has been witnessed since the beginning of the 1990s, was connected mostly with the youngest age groups up to the age of highest nuptiality. The highest probability of first marriage in 2010[5] and in 2001 was at the age of 29 among men, but the probabilities in these two years were different: 79‰ men got married in 2001 and only 56‰ in 2010. Among women the maximum decreased similarly (from 99 to 76‰) and in addition the age of highest nuptiality shifted to a later age (from 25 years to 28 years). The nuptiality of singles at later ages has been increasing slowly; no noticeable recuperation has been observed. The average age of people who married increased between 2001 and 2010 by almost three years: among grooms by 2.9 years to 32.2 years, among brides by 2.5 years to 29.4 years. Based on the nuptiality table for single people, in 2010, up to the age of 50 a total of 55% of men and 62% of women would get married, whereas in 2001 the relevant figures were 66% of men and almost 73% of women.

According to a rougher indicator, marriage frequencies, which compare the number of weddings per the total population (mid-year population) of all marital statuses, a similar development is evident.

Figure 3 **First marriage frequencies*) by age and sex, 2001–2011**



Note: *) The number of first marriages per 1,000 people at given age of mid-year population.

4) The monthly marriage rate index (the ratio between the monthly number and average monthly number of weddings) for November 2011 was 0.63, whereas it was 0.37 in 2010. Generally, the maximum used to be above 2.0 (2.8 for June 2011) and the minimum under one-third (0.24 for January 2011).

5) Because the population structure by marital status based on the 2011 census (and consequently as of 31 December) is not available the nuptiality tables for 2011 have not yet been prepared (July 2012). For an update see the Demographic Yearbook of the Czech Republic 2011, tab. I.08 and I.09.

Table 5 **Nuptiality indicators, 2001–2011**

Indicator	2001	2003	2005	2007	2008	2009	2010	2011
	Characteristics from the nuptiality table for single persons							
Total first marriage rate (%) – males	66.0	62.5	62.8	64.5	59.6	56.1	54.9	.
– females	72.5	68.7	69.1	71.1	66.1	62.7	61.6	.
Mean age at first marriage – males	29.3	30.3	30.8	31.2	31.4	32.0	32.2	.
– females	26.9	27.7	28.1	28.6	28.8	29.2	29.4	.
	Marriage rates of divorced people							
Total marriage rate of divorcees (%)								
– males	43.2	40.4	41.7	47.9	44.5	40.4	38.4	36.9
– females	41.8	39.1	40.7	46.6	44.0	38.9	37.2	36.6
Average elapsed time from divorce								
– males	6.0	6.5	7.0	7.3	7.5	7.5	7.5	7.5
– females	6.2	6.7	7.3	7.5	7.8	7.9	7.8	7.8

In the youngest age groups nuptiality decreased. But at later ages an increase appears, partly as a consequence of the changed proportion of single people.

The remarriage rate has continued to decrease in 2011. Because widowed people very rarely remarry, the re-marriage rate can be interpreted as the marriage rate of divorced people. Based on the 2011 marriage intensity among divorced people, 37 men and 37 women out of 1,000 divorced people would remarry. The relevant figures based on 2001 data were 43 men and 42 women. A significant change occurred in the data on how quickly divorcees remarry after their divorce: in 2001 it was 6 year after a divorce, since 2008 the figure is almost 8 years. This is connected with the decrease in the intensity during the first years after divorce when the remarriage rate is the highest.

DIVORCE

According to data from the Information System of the Ministry of the Justice of the Czech Republic there were 28.1 thousand divorces in 2011, which is 2.7 thousand fewer than in 2010. Since 1991 this is the biggest year-on-year decrease in the number of divorces (except for the years 1998–1999 when the new Family Act was passed, which made the divorce application procedure more stringent for families). The total divorce rate was lower too; it decreased from a record high of 50% in 2010 to 46% in 2011. This share of marriages that would end in divorce is based on actual divorce rates. Women file for divorce in two-thirds of all cases.

The share of second- or higher-order divorces out of the total number has also been unchanged in recent decades at a level slightly under 20%. This means that four-fifths of men and women are divorcing for the first time.

The share of divorces of couples without minor children has been increasing year by year. This is due to the growing share of divorces of marriages of long duration (20 or more years after the wedding, when minor children are already adult) and to the low fertility in the 1990s. There were a total of 12.3 thousand divorces of couples without minor children in 2011 (44%). The relevant figure was 35% in 2001. In 2011 a total of 23.7 thousand minor children lost one parent through 15.8 thousand divorces.

Since the 1990s a significant feature has been the increasing share of marriages of long duration ending in divorce. Divorces of marriages that had lasted more than 20 years made up 19% of all divorces in 2001, but 30% in 2011. This structural change reflects not only the higher number of weddings in the 20th century than today, but also the increasing divorce intensity of marriages of long duration (marriages more than 20 and 15–19 years in duration).

The highest divorce intensity has not changed much in the long term and occurs between the third and sixth year of marriage. The maximum rate (27‰) was recorded in the fourth year of marriage in 2011, while it was 31‰ in 2001 (in the same duration

Table 6 **Divorce rate indicators, 2001–2011**

Indicator	2001	2003	2005	2007	2008	2009	2010	2011
Divorces	31,586	32,824	31,288	31,129	31,300	29,133	30,783	28,113
Share of repeat divorces (%) – males	19.4	19.1	19.9	20.0	19.3	19.4	19.5	19.4
– females	18.5	19.0	19.1	19.4	18.9	19.0	18.8	19.1
Divorces without minor children	11,037	12,119	12,078	12,721	13,104	12,282	13,143	12,282
Divorces with minor children	20,549	20,705	19,210	18,408	18,196	16,851	17,640	15,831
– share of total (%)	65.1	63.1	61.4	59.1	58.1	57.8	57.3	56.3
Number of minors in divorced marriages	30,385	30,927	28,732	27,546	27,034	25,094	26,483	23,716
Total divorce rate (%)	44.7	48.0	47.3	48.7	49.6	46.8	50.0	46.2
Mean marriage duration at divorce	11.3	11.8	12.2	12.3	12.3	12.5	12.7	12.9
Divorce rates by duration of marriage*):								
0–4	2.3	2.3	2.1	2.2	2.3	2.2	2.3	2.1
5–9	2.5	2.6	2.5	2.5	2.5	2.3	2.4	2.2
10–14	1.7	1.8	1.8	1.8	1.8	1.7	1.8	1.6
15–19	1.1	1.3	1.3	1.4	1.4	1.3	1.5	1.3
20–24	0.7	0.9	0.9	1.0	1.0	1.0	1.0	1.0
25+	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.5

Note: *) Number of divorces after given years of marriage per 100 marriages.

of marriage). But the total divorce rate (the sum of divorce rates by duration of marriage) was slightly higher in 2011 that in 2001 (46% compared to 45%). The average duration of marriage at divorce increased by 1.6 years from 11.3 to 12.9 years in the given period.

FERTILITY

A total of 108.7 thousand new inhabitants of the Czech Republic were born in 2011, which is 8.5 thousand less than in the year before. The number of newborn children has been decreasing since 2008, when the period of higher fertility peaked with 119.6 thousand births. But, the year-on-year decrease in 2011 was markedly deeper than in the previous two years together. Fertility intensity was also lower; it decreased to 1.43 children per woman after a three-year stagnation at a level slightly under 1.50.

In comparison with 2010 there were fewer children of every birth order. The deepest decrease was observed

Figure 4 **Divorce rates by duration of marriage, 2001–2011**

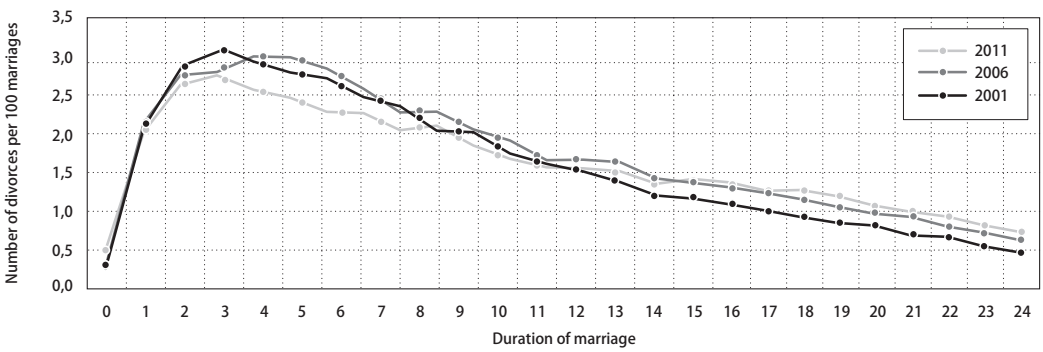


Table 7 **Live births by birth order and by marital status of the mother, 2001–2011**

Indicator	2001	2003	2005	2007	2008	2009	2010	2011
Live births	90,715	93,685	102,211	114,632	119,570	118,348	117,153	108,673
– first order	43,337	45,363	49,930	54,050	56,941	56,039	54,331	50,989
– second order	34,216	34,823	37,993	43,400	45,291	45,206	45,514	42,156
– third and higher order	13,162	13,499	14,288	17,182	17,338	17,103	17,308	15,528
Marital status of mother:								
Single	23.5	28.5	31.7	34.5	36.3	38.8	40.3	41.8
Married	28.8	35.4	40.0	43.9	46.2	49.5	51.1	53.1
Divorced	15.2	18.8	20.8	24.0	25.2	26.9	28.8	29.9
Widowed	27.5	30.2	31.7	31.5	33.1	35.2	36.5	37.0
Share of live births outside marriage (%)	23.5	28.5	31.7	34.5	36.3	38.8	40.3	41.8
– first order	28.8	35.4	40.0	43.9	46.2	49.5	51.1	53.1
– second order	15.2	18.8	20.8	24.0	25.2	26.9	28.8	29.9
– third and higher order	27.5	30.2	31.7	31.5	33.1	35.2	36.5	37.0

for third- and higher-order births; the figure was 10% lower at 15.5 thousand. The number of second-order births decreased by 7% to 42.2 thousand, and first-order births decreased by 6% to 51.0 thousand.

For the first time, the number of live-born children decreased among all marital statuses of women. The number of children born to single women decreased for the first time (it increased in 2009 and 2010); the number of children born to married, divorced or widowed women has been decreasing since 2009 (like the total number). In 2011, a total of 38.7 thousand live-born children were born to single women (2% less than the year before), a total of 63.3 thousand (10% less) to married women and 6.5 thousand to divorced women. Widowed women rarely become mothers (241 live-born children in 2011).

Although the majority of children are still born within marriage, the unequal development of fertility by the marital status of women has brought important changes in the fertility structure by marital status. Since the beginning of the 1990s the share of children born outside marriage has been markedly increasing. For the first time, in 2010, the share of children born within marriage was lower than 60% and even less than 50% among first-order births. In 2011 the share of children born outside marriage further increased. Married women delivered 63.3 thousand children whereas single, divorced and widowed women together delivered 45.4 thousand children; the share of children born outside marriage was 41.8% in total and 53.1% among first-order births. In comparison, in 2001 only 23.5% (18 percentage points less) of live births were born to unmarried women; the relative figure for first-order births was 28.8%. The share of children born within marriage is decreasing for all birth orders: between 2001 and 2011 it reduced from 85% to 70% for second-order births, and from 72% to 63% for third- and higher-order births. Most extramarital fertility is among single women.

Without more detailed research on reproductive and family behaviour it cannot be determined to what extent mothers of single marital status are real single parents or are part of a household with a partner, but still unmarried. Czech society is generally tolerant of parents of children not being married. The opinion that despite the increasing proportion of children born outside marriage the majority of children grow up within a two-parent family (although without legal footing) is supported by the statistics of data on the children's father. The data on father's characteristics are voluntary in the case of unmarried women,[6] but

6) Until 2006 the Czech Statistical Office kept on file the characteristics of fathers only in the case of marital births. Since 2007 it has recorded all available data on fathers (regardless of the marital status of mothers).

only one-tenth of this information is missing from the Report on Birth (Obyv 2-12). This proportion used to be markedly higher at some specific groups like the youngest mothers (49% among women up to 20 years of age) or women with basic education (37%).

The period of the last twenty years was one of deep, quite quick and important changes in the reproductive and fertility behaviour of the Czech population. These changes were reflected in a shift of motherhood to a later age and a decrease in the transversal characteristics of the fertility level to one of the lowest in the world. The total fertility rate reached a low of 1.13 children per woman in 1999. From 2000 the total fertility rate (TFR) began to increase, and from 2004 did so more quickly. In 2006 the total fertility rate in the Czech Republic exceeded 1.3, which delimits the population with lowest-low fertility. Fertility stopped rising in 2008 at a level slightly under 1.5 children per woman (1.497). In the next two years the TFR stagnated at 1.49, and in 2011 it dropped further to 1.43.

Similarly, the TFR for first-order births has not been increasing since 2008. In 2011 it was 0.70 for first-order births per woman (0.73 in 2008). The increasing trend of the TFR for second-order births broke in 2011 when the total fertility rate for second-order births dropped by 0.02 to 0.54. The total fertility rate for third- and higher-order births, which stagnated after 2008 at 0.21, decreased to 0.19 children per woman.

In 2011 the highest number of live births per woman (ASFR) was observed among 30 year-old women, with 117 live births per 1,000 women. The first-order fertility rate still culminates before the 30 year-old limit at the age of 28 and a level of 63‰. The second-order fertility rate culminates at the age of 31 and a level of 52‰, and the higher-order fertility rate at the age of 35 and a level of 15‰. Between 2010 and 2011 the age of the highest fertility did not change, but all the maximum levels decreased. The year-on-year decrease was caused by the lower fertility of women up to the age of maximum fertility; the fertility of older women did not change.

Between 2001 and 2011 the highest fertility age shifted very markedly to a later age. The shift in the timing of motherhood is evident from the average age of women at childbirth too; the increasing trend did not cease in 2008–2010, despite the stagnation of the total fertility rate.

Table 8 **Fertility indicators, 2001–2011**

Indicator/Age group	2001	2003	2005	2007	2008	2009	2010	2011
Total fertility rate – total	1.15	1.18	1.28	1.44	1.50	1.49	1.49	1.43
– first order	0.54	0.57	0.63	0.69	0.73	0.73	0.72	0.70
– second order	0.43	0.43	0.46	0.53	0.55	0.55	0.56	0.54
– third and higher order	0.18	0.18	0.19	0.22	0.21	0.21	0.21	0.19
Mean age of mother at childbirth – total	27.5	28.1	28.6	29.1	29.3	29.4	29.6	29.7
– first order	25.3	25.9	26.6	27.1	27.3	27.4	27.6	27.8
– second order	28.4	29.0	29.6	30.1	30.5	30.6	30.7	30.9
– third and higher order	32.0	32.4	32.8	33.1	33.3	33.3	33.2	33.3
Age group:	**Fertility rates (per 1,000 women)**							
15–19	11.5	11.5	10.9	11.2	11.5	11.8	11.5	11.3
20–24	61.4	53.8	48.7	48.0	47.9	46.8	45.7	42.4
25–29	92.4	94.5	100.9	105.8	106.0	102.8	99.7	93.6
30–34	48.3	57.4	72.1	89.8	96.3	97.1	99.0	95.7
35–39	15.3	17.6	22.8	30.6	34.5	36.2	38.4	37.2
40–44	2.5	3.1	3.7	4.6	5.3	5.6	5.9	6.1
45–49	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3

Figure 5 **Age-specific fertility rates by age of woman and by birth order, 2010 and 2011**

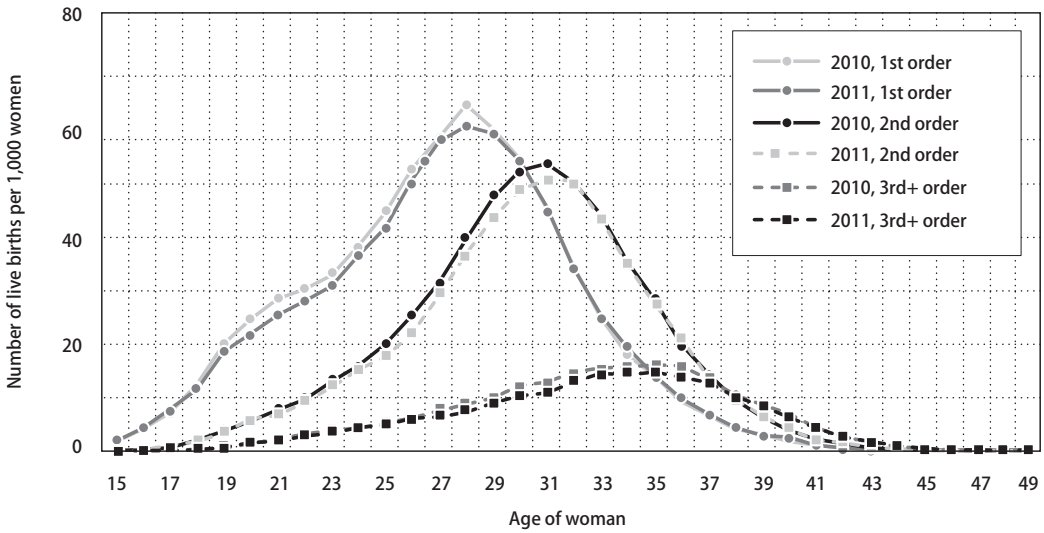


Figure 6 **Age-specific fertility rates by age of woman, 2001–2011**

ABORTION

In 2011 the slight decline in the numbers of recorded abortions continued,[7] but compared to 2010 the total abortion rate moderately increased to 0.52 abortions per woman of reproductive age. The trend of decreasing abortion rates was one of the dominant features of population development in the last (and preceding) decade.

In 2011 there were 38.9 thousand abortions recorded, 409 fewer than in 2010. The number of spontaneous abortions decreased to 13.6 thousand, as did the number of terminated ectopic pregnancies, to 1.2 thousand. On the other hand, the number of induced abortions increased by several dozen. The total of 24.1 thousand induced abortions accounted for 62% of the total number of abortions.

7) The data on abortions are provided by Institute of Health Information and Statistics of the Czech Republic (IHIS CR).

Induced abortions represent the majority group, but their share of the total substantially decreased in the last decade (in 2001 it was 72%). By contrast, between 2001 and 2011 the share of spontaneous abortions increased by more than 10 percentage points (25% in 2001 and 35% in 2011).

Among induced abortions, the share of women who have never had an induced abortion decreased (by 8 percentage points to 63% in the period 2001–2011); that can be regarded as a positive development. The long-term level of abortions for medical reasons is less than one-fifth of all abortions (18%) in 2011.

In connection with the changes in the marital status of inhabitants, the number of abortions of single women increased in recent years and conversely the number of abortions of married women decreased. Starting in 2007, single women account for the largest share of women who have induced abortions (49% in 2011) and in 2011 for the first time the predominance of single women was noted also in the range of all abortions. The share of abortions among single women was 44% (17.3 thousand), whereas the share among married women was only 42% (16.3 thousand). The remaining 14% were among divorced women, widows, cohabiting women and unknown.[8)]

Most single women who undergo an induced abortion are childless. The share of women without any previous delivery is steadily decreasing (50% in 2011 compared to 64% in 2001) and becoming comparable to women with childbirth experience. The reproductive behaviour of single (i.e. unmarried) women more and more resembles that of married women. Among married women the majority is stably represented by women with two live-born children (52% in 2011 and 53% in 2001). The second largest group, both among married and single women, is made up of women with one live-born child, in the long term a one-fourth of married so as single women.

In 2011, the abortion rate did not show nearly any year-on-year changes; its level in 2010 was the lowest to date. Based on abortion rates in 2011, there would have been 52 abortions per 100 women of reproductive age (51 in the case of 2010 abortion rates), including 18 spontaneous ones and 32 induced ones. Compared to 2001, there has been a decrease in the average number of abortions per 100 women (from 60 to 52), an increase in the number of spontaneous abortions (from 14 to 18) and a decrease in the number of induced abortions (from 44 to 32). Based on present conditions, an abortion would be undergone by a woman at the average age of 30.1 years, a spontaneous abortion at the average age of 30.9 years and an induced abortion at the average age of 29.7 years. The average age of women who underwent an induced abortion has shown weak oscillations only in the last decade. The average age of women who suffered a spontaneous abortion has been increasing in the long term – in the decade 2001–2010 there was an increase from 29.1 years to 31.0 years (there was a year-on-year decrease by one-tenth in 2011) in accordance with the rise of the average age at childbirth and this increase influences also by the progression in the average age of women at the time of any abortion.

Table 9 **Abortions, 2001–2011**

Indicator		2001	2003	2005	2007	2008	2009	2010	2011
Abortions		45,057	42,304	40,023	40,917	41,446	40,528	39,273	38,864
– induced abortions		32,528	29,298	26,453	25,414	25,760	24,636	23,998	24,055
– spontaneous abortions		11,116	11,660	12,245	14,102	14,273	14,629	13,981	13,637
– ectopic pregnancy		1,411	1,288	1,324	1,401	1,413	1,263	1,287	1,172
Abortions	– single women	14,563	14,662	14,942	16,022	16,849	16,822	16,706	17,269
	– married women	24,924	22,233	19,548	19,428	19,081	18,297	17,274	16,347
Induced abortions	– single women	11,016	10,852	10,646	11,016	11,562	11,271	11,283	11,693
	– married women	17,130	14,404	11,901	10,716	10,556	9,873	9,296	8,993

8) IHIS CR uses its own code list of marital status categories.

Figure 7 **Induced abortions by marital status of the woman and the number of preceding live births (%), 2001–2011**

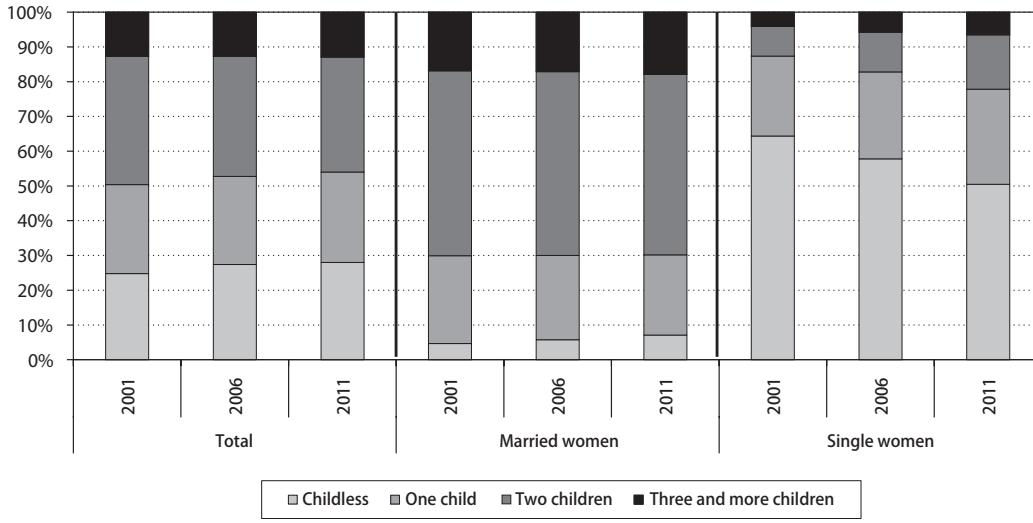
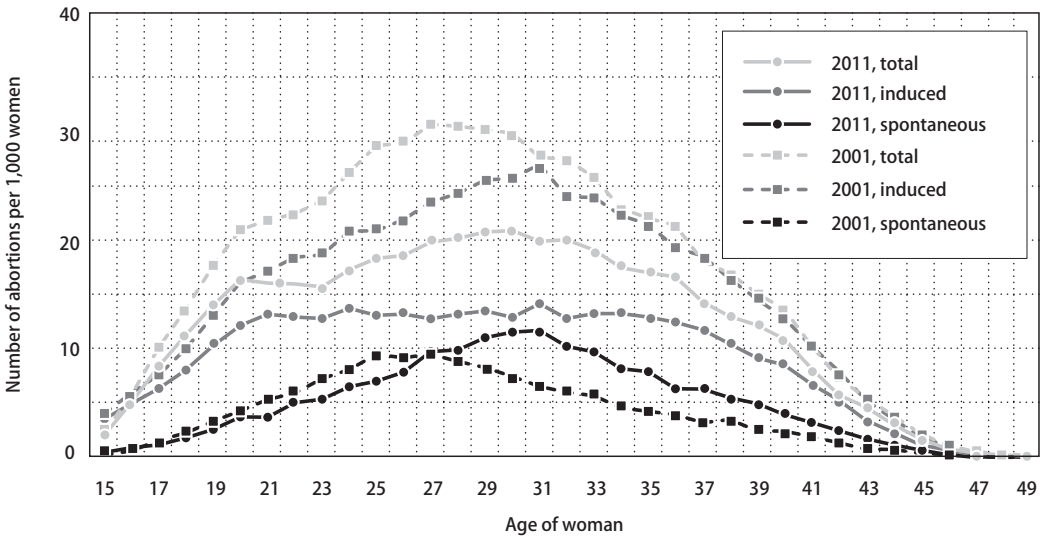


Table 10 **Abortion indicators, 2001–2011**

Indicator/Age group	2001	2003	2005	2007	2008	2009	2010	2011
Total abortion rate	0.60	0.56	0.53	0.54	0.54	0.53	0.51	0.52
Total induced abortion rate	0.44	0.39	0.35	0.34	0.34	0.33	0.32	0.32
Total spontaneous abortion rate	0.14	0.15	0.16	0.18	0.18	0.19	0.18	0.18
Mean age at abortion	29.6	29.7	29.8	29.9	29.9	30.1	30.2	30.1
Mean age at induced abortion	29.7	29.7	29.6	29.6	29.5	29.7	29.7	29.7
Mean age at spontaneous abortion	29.1	29.7	30.0	30.4	30.6	30.7	31.0	30.9
Age group:	**Induced abortion rates (per 1,000 women)**							
15–19	8.5	8.3	7.7	7.6	7.9	7.5	7.0	7.1
20–24	16.7	15.4	14.2	13.9	14.1	13.0	12.7	13.3
25–29	20.0	16.8	14.5	13.7	13.8	13.3	13.1	13.5
30–34	20.0	17.8	15.8	14.5	14.3	13.6	13.2	13.6
35–39	15.1	13.7	12.8	12.3	12.4	12.0	12.0	11.8
40–49	3.4	3.2	3.1	3.1	3.0	3.0	2.9	3.0

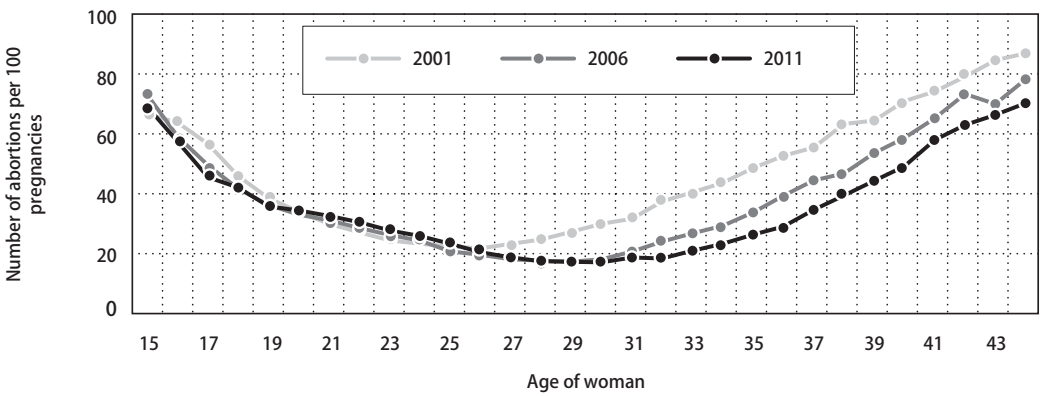
The decrease in abortion rates has been influenced especially by the lower abortion rate among women up to the age of 35. The trend in the induced abortion rate had a pivotal influence. It has been decreasing in every age group, especially ages 27–33. In the early 1990s the highest number of induced abortions per 1,000 women (up to 80‰) was around the age of 25; now this abortion rate does not exceed 15‰ in any age group. The highest values are under this level in the wide age interval of roughly 20 to 35 years of age. The age-specific abortion rates for all abortions and spontaneous abortions have more distinctive peak. Both curves peak around 30 years of age. In 2011 the most abortions (28 including 12 spontaneous) per 1,000 women were at the age of 31.

Figure 8 **Abortion rates by type of abortion, 2001–2011**



The trend in abortion rates is illustrated by the index of pregnancy by abortion per a woman's age. This indicator shows that the decrease in the abortion rate among younger women mirrors the lower rate of entering into reproduction, as the proportion of pregnancies ending in abortion did not change. The decreasing abortion rates among later age groups is a positive trend.

Figure 9 **Share of pregnancies ending in abortion (%), 2001–2011**



MORTALITY

The number of deaths in 2011 remained at the same level as in 2010 (106.8 thousand). Male life expectancy at birth increased by three-tenths of a year to 74.7, female life expectancy at birth increased by one-tenth of a year to 80.7. The number of infant deaths (298) was at a historical minimum. Infant mortality still remained below 3‰ at the same level as in the previous year – 2.7 infant deaths per 1,000 live births. This level is one of the lowest in the world. Both neonatal

(1.7‰) and post-neonatal (1.0‰) mortality were at the same level as in the previous year.

Life expectancy at birth in the Czech Republic is increasing in the long term, both for men and women. In the 2001–2011 period the average annual increase of life expectancy at birth was roughly quarter of a year, and this indicator increased more quickly for men than for women. Life expectancy at birth among men increased by 2.6 years to 74.7 years with a year-on-year increase of 0.3 years in 2011. Life expectancy at birth among women increased in the last decade by 2.3 years to 80.7 with the last year-on-year increase of 0.1 of a year. The uneven development of life expectancy at birth in 2011 was evident in a decrease in the difference between the values of this indicator for men and women to 6.0 years (this difference in 2001 was 6.3 years, in 2010 it was 6.2 years).

The decrease in mortality intensity among elder age groups was important for the ten-year increase in life expectancy at birth. The biggest contribution was caused by a decrease in mortality intensity over the age of 69; among women by 1.3 years (57%), among men by 0.9 years (35%). The increase in male life expectancy was significantly influenced by the 45–69 age group, which caused an increase of 1.1 years. The decrease in infant mortality contributed 4% to the rise in life expectancy at birth. The difference between male and female life expectancy was caused by the distinct level of mortality at ages 55–74, especially in the 60–69 age group.

Table 11 **Deaths, 2001–2011**

Indicator	2001	2003	2005	2007	2008	2009	2010	2011
Deaths	107,755	111,288	107,938	104,636	104,948	107,421	106,844	106,848
– males	53,772	55,880	54,072	52,719	53,076	54,080	54,150	54,141
– females	53,983	55,408	53,866	51,917	51,872	53,341	52,694	52,707
– under 1 year of age	360	365	347	360	338	341	313	298
Infant mortality rate (‰)	4.0	3.9	3.4	3.1	2.8	2.9	2.7	2.7
Cause of death:								
Diseases of the circulatory system	57,404	58,065	55,155	52,464	52,280	54,100	53,590	52,725
Neoplasms	28,455	29,364	28,255	27,709	27,981	28,064	28,222	27,539
Diseases of the respiratory system	4,653	5,286	6,040	5,715	5,736	6,393	6,151	5,690
Diseases of the digestive system	4,418	4,607	4,823	4,747	4,743	4,809	4,664	4,531
External causes	6,910	7,295	6,376	6,080	6,087	5,946	6,009	5,973

Table 12 **Life expectancy, 2001–2011**

Indicator		2001	2003	2005	2007	2008	2009	2010	2011
Life expectancy at birth	– males	72.1	72.0	72.9	73.7	74.0	74.2	74.4	74.7
	– females	78.4	78.5	79.1	79.9	80.1	80.1	80.6	80.7
Life expectancy at the age of 65	– males	13.9	13.8	14.4	15.0	15.1	15.2	15.3	15.5
	– females	17.1	17.1	17.6	18.2	18.4	18.3	18.7	18.8

The cause-of-death structure is dominated by diseases of the circulatory system, which cause one half of all deaths (52.7 thousand in 2011). Among the diseases of the circulatory system ischemic heart disease is the predominant cause, along with, especially among women, cerebrovascular diseases. Neoplasms are in the long term the second most frequent cause of death, they cause roughly one-fourth of deaths (27.5 thousand in 2011). Malignant neoplasm is most often localised in the bronchi and the lung (among men) and in the breast (among women). The third most frequent cause-of-death group in 2011 were external causes of death (6.0 thousand). These causes are relatively more frequent among men than among women,

who die more often not only of respiratory diseases, but also of digestive diseases.

The underlying cause of death used for statistics is derived at the Czech Statistical Office from the specifications listed in the form Death Report filled out by the doctor. In the Report four specifications concerning death circumstances are mentioned: the disease or status leading imminently to death (immediate cause), preceding cause, primary cause and other relevant morbid statuses and changes; in the case of a work accident, accidental injury, murder or suicide the mechanism of death is also given. The procedure for inferring the underlying cause of death changed in some respects in the last decade (see *Poppová – Štyglerová,* 2012). The changes are apparent from a detailed inspection of the cause-of-death structure. These changes are geared towards harmonising the comparability of mortality data with the EU requirements and to improve the coding system and the way of selection the underlying cause of death.

In 2011 automated coding of cause of death was introduced using IRIS software. The new adjusted rules led to changes in the structure of causes of death in 2011. For example, the share of people who died

Table 13 **Standardised mortality rates*) by selected causes of death (per 100,000), 2001–2011**

Cause of death (code by ICD–10):	2001	2003	2005	2007	2008	2009	2010	2011
	Males							
Total	1,143.6	1,164.9	1,076.7	991.2	966.5	962.5	940.8	918.4
Neoplasms	317.5	321.1	296.8	277.5	272.8	268.9	266.9	249.2
Malignant neoplasm of the lung (C34)	85.6	80.8	77.1	71.0	67.6	66.9	65.9	62.9
Malignant neoplasm of the colon (C18)	30.3	29.7	26.7	22.4	22.6	22.1	21.5	18.7
Malignant neoplasm of the prostate (C61)	29.3	31.2	27.9	24.1	23.6	22.8	23.1	22.0
Diseases of the circulatory system	567.6	568.5	508.1	453.7	437.1	436.0	424.4	412.9
Ischaemic heart diseases (I20–I25)	252.5	237.5	231.3	239.1	227.3	218.3	213.3	219.9
Cerebrovascular diseases (I60–I69)	148.6	148.0	123.0	91.6	86.5	88.5	79.9	74.1
Diseases of the respiratory system	55.6	59.7	65.9	59.4	58.1	63.0	58.9	55.3
Diseases of the digestive system	50.7	50.8	52.4	49.5	48.2	47.3	45.2	43.2
External causes	90.4	96.3	82.8	78.0	76.5	75.2	74.7	73.1
Transport accidents (V01–V99)	20.8	20.7	17.9	17.4	15.7	13.6	12.9	11.9
Suicides (X60–X89)	24.9	26.2	23.8	20.8	20.2	21.8	22.1	23.6
	Females							
Total	692.2	703.6	657.2	595.4	576.7	576.5	557.1	545.5
Neoplasms	179.3	177.5	166.2	157.0	155.2	150.7	149.5	146.4
Malignant neoplasm of the lung (C34)	19.1	18.8	18.7	19.1	19.2	18.8	19.4	20.7
Malignant neoplasm of the colon (C18)	15.3	16.2	13.5	12.0	11.5	11.2	11.3	10.5
Malignant neoplasm of the breast (C50)	27.5	27.1	26.2	22.1	21.2	20.0	20.6	20.9
Diseases of the circulatory system	381.7	384.4	351.1	306.8	292.3	296.2	282.4	268.1
Ischaemic heart diseases (I20–I25)	135.6	132.4	137.9	145.8	137.4	133.6	123.3	128.5
Cerebrovascular diseases (I60–I69)	122.5	120.6	99.2	73.1	70.8	71.6	66.8	60.1
Diseases of the respiratory system	26.6	30.9	33.5	29.3	28.6	30.9	29.2	25.1
Diseases of the digestive system	25.8	27.5	26.8	25.5	25.2	25.8	24.1	23.2
External causes	33.8	35.4	29.3	26.1	25.4	23.8	23.4	23.4
Transport accidents (V01–V99)	6.7	6.4	5.5	5.1	4.9	4.5	3.3	3.7
Suicides (X60–X89)	5.4	5.8	4.8	3.6	4.2	3.7	4.2	4.1

Note: *) The European standard by WHO was used for standardisation.

of atherosclerosis (code I70) declined significantly, because many deceased persons were newly diagnosed with heart failure (I50) instead of atherosclerosis. The standardised atherosclerosis mortality rate fell year-on-year to one half due to this correction. Similarly, the decline in mortality from cerebrovascular diseases has its root in the new coding rules.

Standardised mortality rates[9] were lower for both men and women than in 2001 by one-fifth. A decreasing tendency prevailed among main causes of death. The deeper decline (by more than quarter to 412 deceased men and 268 women per 100,000 men and women, respectively) occurred in the standardised mortality rate from cardiovascular diseases. In 2011 this category of cause of death still accounted for nearly one-half of all causes of death among women (49%) and men (45%). The standardised rate of mortality from neoplasms decreased by one-fifth to 249 deaths among men and 146 among women per 100,000 men and women, respectively. A positive development was observed in the case of mortality from injury and poisoning, especially among women, whose mortality in these categories declined by 31% to 23 per 100,000, while among men the decline was by 25% to 73 deaths per 100,000 men in the standardised population.

EXTERNAL MIGRATION

With the exception of the year 2001, the Czech Republic shows continual positive net external migration in the monitored decade. Based on data from the Central Population Register Record of the Ministry of the Interor of the Czech Republic, in 2011 the Czech Republic gained 16.9 thousand citizens, i.e. by 1.2 thousand more than in 2010, due to foreign migration. A slight increase in net external migration was detected after years of considerable decreases

Table 14 External migration, 2001–2011

Indicator	2001	2003	2005	2007	2008	2009	2010	2011
Immigrants	12,918	60,015	60,294	104,445	77,817	39,973	30,515	22,590
at the age of: 0–14	2,297	4,506	4,297	6,537	5,944	4,813	4,750	3,087
15–64	10,279	55,005	55,497	96,904	71,037	34,553	25,169	18,974
20–34	5,043	30,278	30,815	55,469	41,629	20,245	14,438	11,278
65+	342	504	500	1,004	836	607	596	529
Emigrants	21,469	34,226	24,065	20,500	6,027	11,629	14,867	5,701
at the age of: 0–14	1,008	1,285	1,489	1,363	472	535	758	873
15–64	20,274	32,721	22,328	18,881	5,301	10,715	13,683	4,617
20–34	10,155	18,012	11,938	10,482	2,137	4,098	5,426	2,061
65+	187	220	248	256	254	379	426	211
Net external migration	–8,551	25,789	36,229	83,945	71,790	28,344	15,648	16,889
– males	–7,218	15,783	23,354	50,994	45,193	14,532	5,532	9,331
– females	–1,333	10,006	12,875	32,951	26,597	13,812	10,116	7,558
Net migration by citizenship								
– Slovakia	–6,082	5,573	8,161	13,129	7,007	1,442	–1,338	3,389
– Ukraine	–1,877	10,062	12,483	30,902	18,575	8,051	3,432	1,889
– Russia	–351	834	1,994	5,765	5,728	4,106	3,670	2,123
– Viet Nam	1,404	2,649	3,489	11,281	13,299	2,269	1,386	655
– Czech Republic	692	1554	–551	–142	–540	–505	83	–1,316
Volume of external migration	34,387	94,241	84,359	124,945	83,844	51,602	45,382	28,291

9) Standardised mortality rates are adjusted from the age structure influence. The age structure used in this paper is the standard age structure published by the World Health Organisation.

– in the years 2007 and 2008 the balance of foreign migration was extremely high (83.9 thousand and 71.8 thousand respectively). This was influenced by both the favourable economic situation and the changed data basis.

Based on data from the Central Population Register Record of the Ministry of the Interior of the Czech Republic (ISEO), in 2011 the number of emigrants from the Czech Republic was 5.7 thousand, by 9.2 thousand fewer than in 2010. In comparison with 2010 the number of immigrants also declined (by 7.9 thousand to 22.6 thousand) and therefore the total volume of foreign migration declined. The volume of external migration in 2011 was the lowest in the whole 2001–2011 period.

As is customary, men prevailed among both immigrants and emigrants, but in 2011 the shares of men and women among emigrants were considerably more even, not only compared to 2010 (from 74% to 55%) but also compared to preceding years.

In terms of age, people of younger productive age groups predominate in migration. Roughly one-half of immigrants are aged 20–34. Among emigrants the age groups 20–34 and 35–49 are more or less equally represented at two-thirds. In 2011 the average age of both immigrants (28.6 years) and emigrants (33.7 years) remained substantially lower than the average age in the population of the Czech Republic (41.1 years).

In both components of foreign migration there is a very low share of persons over the age of 65. In 2011 among both immigrants and emigrants this age group made up less than 5% of the total, whereas in the total population of the Czech Republic this age group accounts for 16%. To 2010, among emigrants there was a significantly lower share of children (aged 0–14), but due to the substantial decline in the total number of emigrants this share increased to 15% in 2011. In comparison with 2010 the number of children increased by 115 in absolute figures. Among immigrants the proportion of children was relatively higher, at 14% in 2011.

Citizens of Slovakia, Viet Nam, Ukraine, Russia and the Czech Republic added most to the foreign migration figure, and to a lesser extent also citizens of Germany and Poland. Based on data from the ISEO, in 2011 4.4 thousand immigrants from Slovakia were recorded, 2.1 thousand from Russia, 2.0 thousand from Ukraine and 1.9 thousand from the Czech Republic. The opposite flow of migration, from the Czech Republic abroad, was represented mostly by citizens of the Czech Republic (3.2 thousand, 57% of the total number of emigrants). Therefore, in 2011 the net foreign migration of citizens of the Czech Republic was a negative figure (minus 1.3 thousand people). This negative net migration was unique among all the countries whose citizens participated in foreign

Table 15 **Internal migration, 2001–2011**

Indicator	2001	2003	2005	2007	2008	2009	2010	2011
Volume of internal migration	204,622	211,487	213,688	255,689	250,071	233,262	240,695	231,694
– from municipality to municipality in the district	108,323	108,252	96,605	109,541	104,713	96,395	101,181	101,072
– from district to district in the region	33,706	36,089	41,414	47,745	47,444	45,002	47,774	47,064
– from region to region	62,593	67,146	75,669	98,403	97,914	91,865	91,740	83,558
Type of migration	**Structure (%)**							
– from municipality to municipality in the district	52.9	51.2	45.2	42.8	41.9	41.3	42.0	43.6
– from district to district in the region	16.5	17.1	19.4	18.7	19.0	19.3	19.8	20.3
– from region to region	30.6	31.7	35.4	38.5	39.2	39.4	38.1	36.1
Migrants at the age of: 0–14	39,725	39,579	41,223	48,065	47,775	46,534	50,397	52,960
15–64	150,467	158,031	158,616	195,684	190,745	175,611	178,328	165,221
20–34	88,399	90,107	89,426	108,087	104,727	94,741	92,481	82,841
65+	14,430	13,877	13,849	11,940	11,551	11,117	11,970	13,513

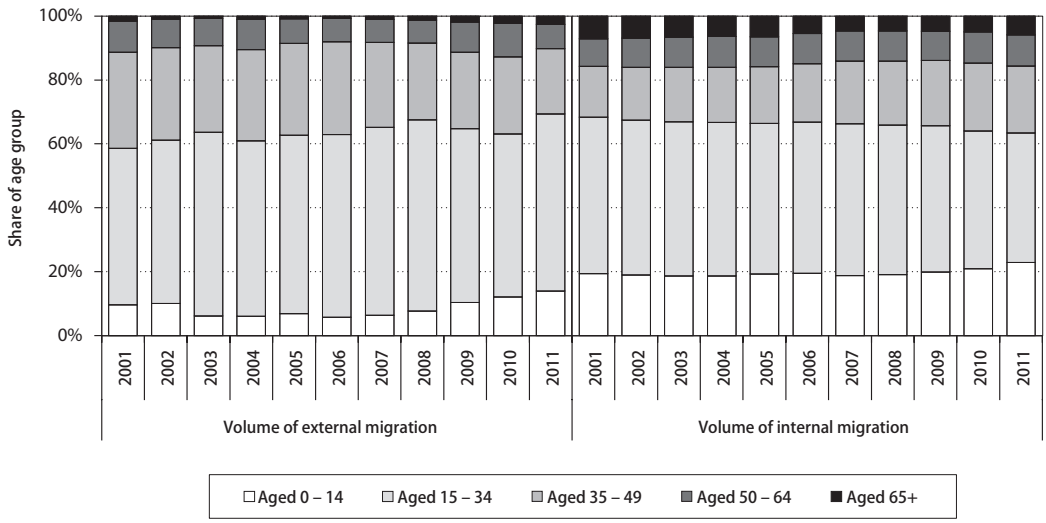
migration to or from the Czech Republic. Citizens of the other countries were significantly less numerous among emigrants from the Czech Republic. The second largest group of emigrants were citizens of Slovakia (less than 1,000 people) and Germany (400 people). The highest net foreign migration in 2011 was observed with Slovakia (3.4 thousand), Russia (2.1 thousand) and Ukraine (1.9 thousand).

INTERNAL MIGRATION

In 2011, 231.7 thousand changes of address within the Czech Republic were registered. In comparison with 2010 the number of changes of permanent address (in the case of foreigners also changes of long-term residence address) slightly decreased. Inter-municipal migration within a district was the most frequent type of internal migration. In 2011, this migration involved 100.1 thousand moves, i.e. 44% of the total (in 2001 it was as high as 108.3 thousand, i.e. 53%). The second most frequent type of internal migration is inter-region migration (36% in 2011), which involved more than 80 thousand moves within the Czech Republic every year in the last six years (83.6 thousand in 2011). The least frequent internal migration is inter-district migration within the region (47.1 thousand cases, i.e. 20%, in 2011).

The share of internal migration by sex is more balanced than in the case of external migration. In 2001–2011, men accounted for 47–49% of internal migrants. Much like in external migration, persons migrating within the Czech Republic are younger on average (by roughly 10 years) than the population as a whole. The average age of internally migrating persons has changed only slightly in the last decade; it hovered around 30.5 years for men and 31.5 years for women. Among internal migrants there is a relatively higher share of children up to the age of 15 (23% in 2011) than in the general population; the share of people aged 65 and over is conversely considerably lower (6%).

Figure 10 **Volume of migration by age group (%), 2001–2011**



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DOES THE CZECH SYSTEM OF FINANCIAL SUPPORT TO THE FAMILY PROVIDE ANY INCENTIVE TO COUPLES REMAINING IN INFORMAL PARTNERSHIP?[1)]

Olga Sivková

ABSTRACT

Taking into account the fact that today a substantial share of children are born outside marriage in the Czech Republic, the aim of the article is to examine whether the Czech tax and social security systems provide any financial incentive that, could be relevant to a couple's decision to remain in an informal partnership instead of getting married. It also analyses the trends in extramarital fertility and fundamental changes predominantly in the tax system aimed at providing financial support to Czech families with dependent children since 1989.

Keywords: extramarital fertility, family, tax system, joint taxation of married couples, Czech Republic

Demografie, 2012, **54: 356–368**

INTRODUCTION

Although the share of children born outside marriage has been increasing since 1974 in the Czech Republic, a profound change was documented in the last two decades, when the transformation process from a central planned economy to market economy took place. Till the year 1991, the share of live births outside marriage did not exceed 10%. Afterwards, the percentage began to rise to the recent share of 40% (Figure 1). In general, this significant extramarital fertility was frequently explained with respect to the process of modernisation and westernisation related to political and economic changes in the Czech Republic. In a simplified way, cohabitation was perceived as a substitute to marriage and confirmation of a partnership by the authorities came to be seen as unnecessary. Nevertheless, detailed analyses of demographic data revealed, as *Hamplová* (2007) and *Rychtaříková* (2006) point out, that the reality is more complex and the change in reproductive behaviour has been conditioned by a broad range of factors. The aim of this article is to examine whether the financial support provided by the state to families with dependent children through the tax and social systems in the Czech Republic since 1989 could serve as an incentive for couples to remain in an informal relationship instead of getting married.

1) The article was written with the support of the Czech Science Foundation under project no. P404/12/1097 'Is the Low Fertility in the Czech Republic an Inevitable Outcome of the New Reproductive Pattern?'.

Since the end of the 1980s fertility has significantly declined in the Czech Republic. The total fertility rate dropped from 1.87 children per woman in 1989 to 1.49 children per woman in 2010 (Table 1). A low of 1.13 children per woman was reached in 1999. Although in recent years the fertility trend has experienced a moderate recovery, the Czech Republic still ranks among the countries with a low fertility level[2] well below the replacement rate. If the total fertility rate is divided into the total fertility rate in marriage and outside marriage, two opposite trends emerge. While the total fertility rate in marriage declined from 1.73 children per married woman in 1989 to 0.87 child per married woman in 2010, the total extramarital fertility rate increased from 0.14 child per woman to 0.62 child per woman respectively.[3] Thus approximately 55% of the decline in the total marital fertility rate was offset by the growth of the total extramarital fertility rate between 1989 and 2010. In the past, most extramarital fertility was concentrated among younger women, around the ages 17–22, but these days the range extends from 18 years to 35 years (Figure 3 and Figure 4). Not just marital fertility, but also extramarital fertility was postponed to a later age, which is also evident from the average ages by marital status of the mothers. The average age of single mothers increased from 22.3 years in 1992 to 27 years in 2010, for married mothers the values grew from 24.9 years to 30.7 respectively and for divorced and widowed mothers the average ages rose from 29.7 years in 1992 to 34.1 years in 2010 and 32.3 years in 1992 to 35.2 years in 2010 respectively.[4] As regards birth order, in recent years more than 50% of first-order births occur outside marriage. In the period 1989–2010 a significant change was also documented in second-order live births. The change equals almost 25 percentage points, which could imply that for some people cohabitation is indeed a substitute for marriage. In sum, extramarital fertility became more significant in the fertility trend in the Czech Republic in the past two decades

Table 1 Extramarital fertility, the Czech Republic, 1989—2010

	1989	1995	2000	2005	2010	Difference 2010–1989
Live births (total)	128,356	96,097	90,910	102,211	117,153	–11,203
Live births in marriage	118,215	81,150	71,118	69,802	69,989	–48,226
Live births outside marriage	10,141	14,947	19,792	32,409	47,164	37,023
Live births to single mothers	x	10,910	15,064	25,753	39,529	28,619**
Share of live births outside marriage (%)	7.9	15.6	21.8	31.7	40.3	32.4
Share of live births to single mothers (%)	x	11.4	16.6	25.2	33.7	22.4**
Total fertility rate	1.87	1.28	1.14	1.28	1.49	–0.38
Total fertility rate in marriage	1.73	1.09	0.89	0.86	0.87	–0.86
Total fertility rate outside marriage	0.14	0.19	0.25	0.42	0.62	0.48
Pre-marital conceptions* (%)	54.2	50.8	41.6	31.7	26.0	–28.2

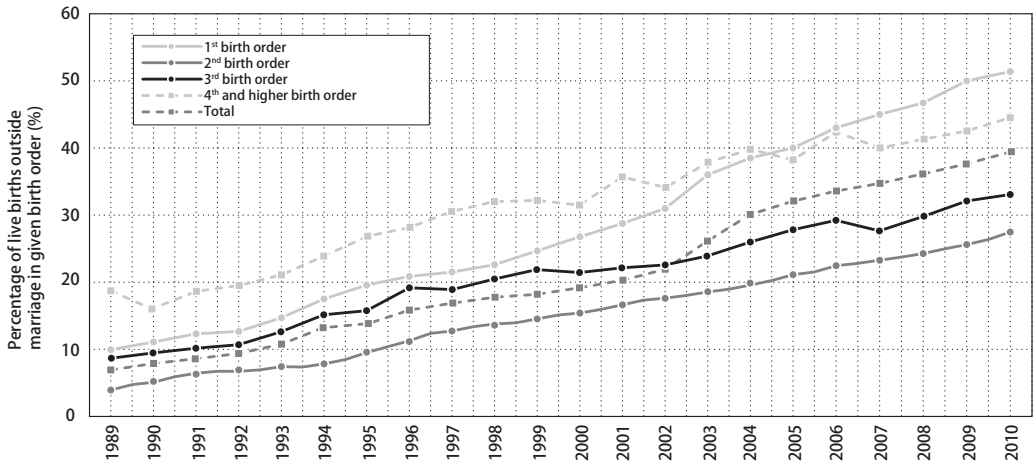
Note: *Share of the first-order births in marriage up to 8 months after the wedding out of total first-order births in marriage.
** Difference 2010—1995.
Source: Czech Statistical Office.

2) Low fertility was defined by *Kohler* et al. (2002) as a total fertility rate below 1.5 children per woman.

3) Total fertility rates in relation to marital status were calculated based on unconditional age-specific fertility rates.

4) Average ages in relation to marital status were calculated based on conditional age-specific fertility rates.

Figure 1 **Percentage of live births outside marriage in the given birth order, the Czech Republic, 1989—2010**



Source: Czech Statistical Office.

and partly offsets the fall in marital fertility. The given trend has often been explained by changes in the value system (*Katrňák*, 2006) and economic conditions (*Rychtaříková*, 2003; 2006), which consequently induced a significant change in the Czech marriage market.

Not surprisingly, the total number of marriages declined from 81,000 to almost 47,000 between 1989 and 2010. That corresponds to a 42% change, which implies that not only the total number of first marriages declined, but also a number of remarriages. While two-thirds of women aged 15–49 were married, less than one-quarter were single and every tenth woman was divorced or widowed in 1989, by the year 2010 the share of married women of fertile age had declined to 44% and the share of single women had increased to 43%. In addition, the average age of grooms at first marriage grew from 24.6 years in 1989 to 32.2 years in 2010 and the average age of brides at first marriage rose from 21.8 years to 29.4 years respectively. Taking into account this basic characteristic of the Czech marriage market and the fact that marriage is still perceived as an important institution in relation to family formation and child-raising in Czech society (*Chaloupková et al.,* in *Hamplová*, 2007), it is obvious that fewer children could be born inside marriage.

As stated above, cohabitation came to be seen by people as an equivalent to marriage. But this suggests that although children are born outside marriage, they are in complete family, which is not necessarily true in reality. Using data from the 2001 census, *Rychtaříková* (2008) found that 66.9% of children born in the year 2000 had parents who were married, 6.2% of children from the same cohort had parents living together without a formal commitment, and 26.7% of children in a given cohort lived with a single parent. In spite of the fact that not all married women had to share a dwelling with their husband, the figures indicate that children born outside marriage frequently live in a lone-parent family. Furthermore, in the case of a single parent, in accordance with the modernisation process it was assumed that a single mother is an independent and well-educated woman who is able to take care of her baby. In this perspective, extramarital fertility was not seen as an additional burden to the social security scheme. Nevertheless, Table 2 shows that the largest share of live births outside marriage over a given time period is to mothers with basic education. The share is even larger in the case of first-order births.

Table 2 **Live births outside marriage according to the mother's attained education and birth order, the Czech Republic, 1989–2010 (%)**

Education level, Total	1989	1995	2000	2005	2010
Basic	24.5	44.5	55.9	67.6	74.9*
Secondary without GCSE	7.1	14.4	23.1	37.2	50.5
Secondary with GCSE	3.6	7.8	13.5	23.8	34.9
University	2.9	5.7	8.0	13.7	22.2
Education level, 1st births					
Basic	x	55.5	69.0	80.0	85.4*
Secondary without GCSE	x	18.4	30.3	50.5	65.8
Secondary with GCSE	x	10.3	14.4	31.8	48.4
University	x	9.1	10.8	19.3	30.7

Note: GCSE = General Certificate of Secondary Education. * Including incomplete.
Source: Czech Statistical Office.

FINANCIAL SUPPORT PROVIDED BY THE STATE TO THE FAMILY CONSIDERING CHANGES SINCE 1989

The financial support provided by the state to families with dependent children has in general two main channels: direct support via the social security scheme and indirect via the tax system. While direct financial support comprises from a comprehensive system of benefits and allowances (e.g. parental allowance, birth grant, child benefit), indirect financial support is based on the application of tax provisions (e.g. in the case of a natural person, income tax: a tax deduction for a husband/wife or dependent child, tax relief, zero tax rate, etc.). Both systems have undergone a number of changes in the Czech Republic over last twenty years. While the social security scheme that existed before 1989 was retained and the main changes related to legal matters, amounts, eligibility and conditions for the disbursement of benefits, the tax system was established anew.

The basic classification of taxes in the Czech Republic is into direct and indirect. Direct taxes consist of income taxes (the income of a legal person or a natural person) and property taxes (real estate taxes, transfer tax, road tax, inheritance and gift tax). Indirect taxes include value added tax, excise duties and environmental taxes on the use of fossil fuels, natural gas and electricity. In spite of the fact that other taxes also have an impact on the family budget (e.g. inheritance and gift tax, value added tax) this article focuses only on income taxes according to the Act No. 586/1992 Coll., the Income Tax Act, as amended in the Czech Republic. In addition, the law deals with both legal and natural entities, but with respect to the theme of the article the discussion specialises in the income tax of natural persons with permanent residence in the Czech Republic,[5] who gains his/her income from employment[6]. The analysis refers to Article 6 of the act.

Since 1992 several important adjustments were made to income taxes. The method used to calculate the tax rate, which stayed progressive, has remained relatively uncomplicated (see e.g. *Sivková*, 2011), but the calculated tax burden underwent significant changes in certain years. Till 2004 the principle of tax deduction was applied according to the article 15, section 1–4 of the act. After that tax exemption for a dependent child was abolished and replaced by tax relief and tax bonus and joint taxation for married couples was introduced. In the next year, 2006, the non-taxable amount for a person was cancelled and substituted

5) A natural person who resides in the Czech Republic for at least 183 days in the relevant calendar year is regarded as a Czech tax resident.

6) The law defines incomes and gains from employment and functional benefits, self-employment, rental, capital, dividends and other income.

with tax relief.[7] Subsequent adjustments came into force in 2008. The concept of the 'supergross wage' and a flat tax rate of 15% were established and joint taxation of married couples was abolished (*Höhne*, 2008; *Mitchell*, 2010; *Sivková*, 2011). In 2010 and 2011 the tax relief amounts were once again changed.

Figure 2 shows the impact of the fundamental changes to the method for calculating tax on the income of a natural person from employment as they pertain to the income base and the number of children. The charts reveal the progressive character of the tax burden. The higher the income base is, the higher the tax burden is. Therefore, while a childless taxpayer with an annual income of 112,000 Czech crowns had to pay approximately 11,000 Czech crowns in tax in 2004, a person with an income of 995,000 Czech crowns paid more than 250,000 Czech crowns[8] respectively. The charts also show that the tax burden decreases with the number of dependent children.[9] For instance, in the case of a taxpayer with an income of 112,000 Czech crowns, the tax burden with one dependent child in 2004 equalled 7,260 Czech crowns, but with three dependent children the tax burden was zero. The effects of the changes were even more profound over time. While the progressive character of taxation with respect to tax base was preserved, the tax burden in general declined between 2004 and 2008. A childless taxpayer with a tax base of 112,000 Czech crowns saved approximately 9,000 Czech crowns in 2008 compared to 2004. If the final tax is compared over time with respect to the number of dependent children, it is obvious that the most favourable change occurred in 2008, when final taxation declined for all selected tax bases and numbers of children.

The changes in the tax provision for the year 2008 were broadly discussed, because joint taxation of married couples, which improved many family incomes, should have been abolished. A joint tax base for married couples is a provision allowed within the tax calculation method that has already long been applied in several countries (e.g. USA, Germany). In the Czech Republic joint taxation of married couples was introduced in 2005 and it was included in Article 13 of the Income Tax Act. The idea behind it was simple. A married couple could create one tax base which was equally divided between them. Although it is not immediately visible, this approach led to a lower tax burden on families with dependent children compared with previous years. For instance, for the family which consists of a married couple with three dependent children and with a tax base of 872,000 Czech crowns per year in the case that the mother did not have any personal income in 2005,[10] the joint taxation of married couples generated savings in the amount of almost 52,000 Czech crowns. The saved amount corresponds to 12% of net family income.

Although the joint tax base for married couples was in force in 2006 too, its impact changed, because the basic non-taxable amount of 38,040 Czech crowns (Article 15, Section 1a)[11] was abolished and replaced by tax relief of 7,200 Czech crowns (Article 35ba, Section 1). In addition, the non-taxable amount per spouse of 21,720 Czech crowns (Article 15, Section 1b) was substitute by tax relief for a spouse of 4,200 Czech crowns (Article 35ba, Section 1). Despite all the changes listed, joint taxation of married couples was beneficial to families in which married partners had significantly differ-

7) While a tax deductible item decreases the tax base, tax relief reduces the calculated tax.

8) The tax bases were chosen in reference to actual tax rates.

9) A dependent child is a biological child, adopted child, foster child, child of one spouse, a grandson/granddaughter if his/her parents do not have a substantial income from which tax advantages can be applied (Article 35c, section 6 of the Act No. 586/1992 Coll., the Income Tax Act, as amended). In addition, a dependent child is an underage child or one up to the age of 26 or in special cases 28 if he/she is still a student at any university level, as long as he/she has not interrupted his/her studies.

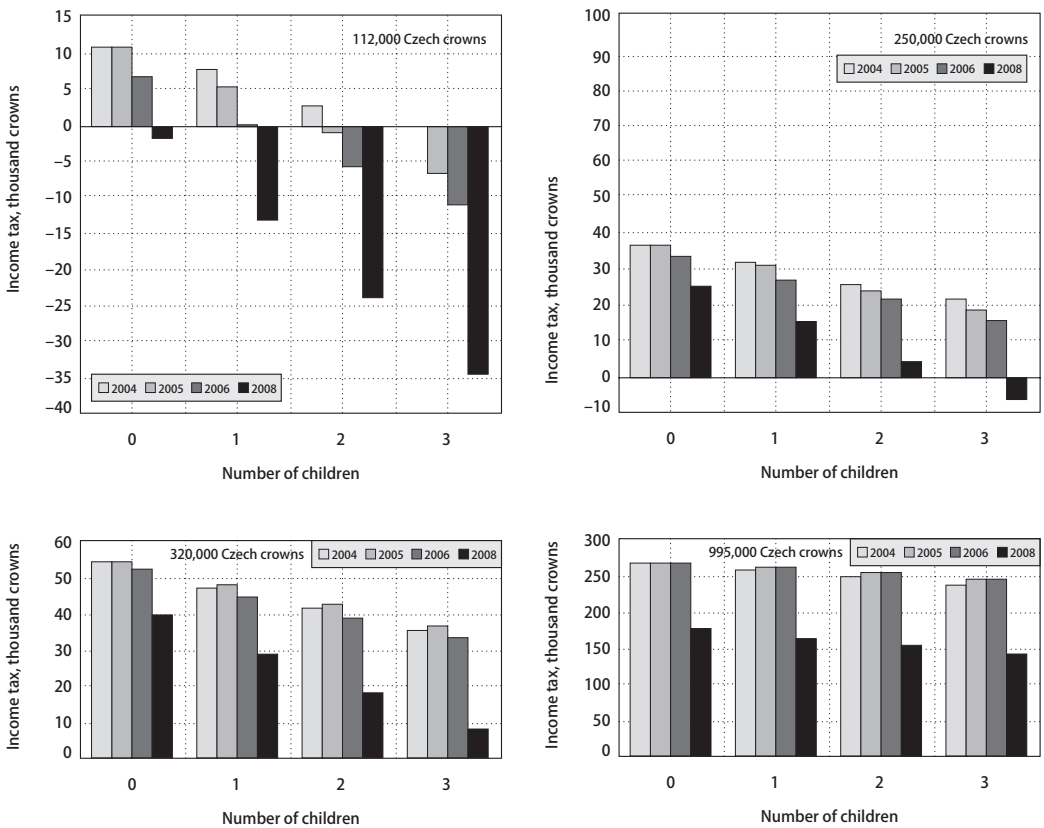
10) In this case the employer would deduct social and health insurance payments amounting to 109,000 Czech crowns from the employee's tax base, which would also be reduced by the tax advantage of three children (3 x 6,000 Czech crowns), basic non-taxable amount per a taxpayer (38,040 Czech crowns) and non-taxable amount per a wife (21,720 Czech crowns) .

11) The relevant article and section of the act law is cited in parentheses.

ent incomes. Therefore, this tax provision has mainly been beneficial to those families in which one parent is on parental leave, which is related to a significant fall in income. In addition, joint taxation of married couples clearly favoured families with binding commitments rather than cohabiting couples.

It is a question why joint taxation of married couples was abolished, considering that it brought savings to family income and sent a clear message to inhabitants which family form is preferred by the state. Several explanations are possible. On the one hand, this provision benefited only some types of families and under specific conditions. At the same time, a disadvantage to the method was in its administration. Most people were not used to submitting their tax return personally at the Revenue Office or to calculating the tax they owed because this was usually done by their employers. In the case of joint taxation of married couples, they had to submit at least their tax return themselves. It is necessary to note that joint taxation was not compulsory and was conditional upon their being at least one dependent child in the family. Based on data from the Czech Tax Administration, it is reasonable to assume that joint taxation of married couples was broadly utilised. While in the 2004/2005 tax year the number of tax revenues increased by 33.5%, in the 2007/2008 tax year it declined by 25.9% (*Czech Tax Administration*, 2011). Another reason why this tax provision was

Figure 2 **Income tax from employment, the Czech Republic, selected years and tax bases, Czech crowns**



Source: Pelcl, 2006; Author's calculations.

abolished may have been its use by some foreigners. Joint taxation of married couples could be used by foreigners working in the Czech Republic, while the family resided abroad. Therefore, a relatively substantial amount of money may have left the country. The amount may even have been higher than expected because it was administratively costly to prove that the number of dependent children was correct in a tax return submitted by a foreigner. In sum, it is reasonable to assume that the state was losing some money via tax advantages for a child due to flaws in the control process and the dishonesty of taxpayers.

The joint tax base for married couple was cancelled in the Czech Republic by Act No. 261/2007 Coll., on Stabilisation of Public Budgets, which came into force on 1 January 2008. The act also established a uniform flat tax rate on the income tax of natural persons at the level 15% and increased basic tax relief for a taxpayer to 24,840 Czech crowns for the year 2008. The advantage of a joint tax base for married couples was offset by an increase in tax relief for a spouse also in the amount of 24,840 Czech crowns (Article 35ba) if his/her income did not exceed 68,000 Czech crowns. For the year 2008, the tax advantage per child increased from 6,000 to 10,680 Czech crowns.

Another change was made relating to the definition of the partial tax base for taxation of income from employment and functional benefits (Article 6). The partial tax base was increased by the amount of social and health insurance and contribution to applied employment policy. The gross wage increased by the 35% paid by the employer. In addition, the mandatory social and health insurance payments made by employees amounting to 12.5% from their wages ceased to be considered a tax-deductible expenditure of employers. This new calculation of the tax based was called the 'supergross wage'. Although in public discussions concerns were expressed about declining family incomes, the effect of these changes contradicted this concern. For instance, a Czech household consisting of a couple and three dependent children, in which the wife was without income and the tax-paying member had income from employment equal to 420,000 Czech crowns, improved its financial situation in 2008 compared to 2007 by 8,228 Czech crowns with respect to the joint tax base and by 34,138 Czech crowns if the tax burden was calculated using the standard method. In this example it is obvious that joint taxation was still beneficial in 2007, but the change in 2008 was even beneficial for families with dependent children. The same result is illustrated in Figure 2. On the one hand, the financial situation of a family with dependent children improved, on the other hand, the family policy applied in the Czech Republic lost an instrument that signalled its direction.

In the following years, the core parts of the tax calculation method in the Czech Republic did not change. The main changes were made to the tax relief amounts. In 2010 the tax relief for a dependent child was raised from 10,680 to 11,604 Czech crowns. In 2011, the tax relief for a taxpayer was changed from 24,840 to 23,640 Czech crowns. The following year, 2012 both forms of tax relief were again adjusted to 24,840 Czech crowns for a tax-payer and to 13,404 Czech crowns for a dependent child. It is also necessary to note that the tax relief amount for a dependent spouse whose income did not exceed 68,000 Czech crowns remained unchanged at 24,840 Czech crowns over the period 2009–2012.

Table 3 **An overview of forms of tax relief, the Czech Republic, 2008–2012, Czech crowns**

Year	Tax-payer	Dependent child	Dependent spouse*
2008	24,840	10,680	24,840
2009	24,840	10,680	24,840
2010	24,840	11,604	24,840
2011	23,640	11,604	24,840
2012	24,840	13,404	24,840

Note: * With an income less than 68,000 Czech crowns.
Source: Research Institute for Labour and Social Affairs, 2012.

Table 4 shows the monthly overview of the financial situation in 2011 for various family forms, the parent's economic status (employed/unemployed) and incomes.[12] The calculations are based on Labour Statistics provided by the Czech Statistical Office. To be more precise, the figures are based on the average wages of men and women. In 2011 the average wage of men in the Czech Republic equalled 28,234 and of women 22,389 Czech crowns (*Czech Statistical Office*, 2012). Considering the evident wage gap between men and women, it is not surprising that a family headed by a single mother had, independently of the number of children and the level of her wage, a lower income per capita compared to a family headed by a single father.[13] With respect to lone-parent families it is necessary to note that in the case of a single mother with three dependent children the income was so low that the woman was eligible for the child benefit provided by the social security scheme.[14] This was also true for a single mother or father if they earned half of the average wage. It is also remarkable that if a single mother with one child or two children earned less than 11,000 Czech crowns and fulfilled all the eligibility conditions for the unemployment benefit it was better for her to be unemployed. Owing to the fact that, men's wages are higher, this effect was significant only for a single father with one child. The differences in family incomes in relation to economic status were relatively low, so it is reasonable to assume that single parents did not choose to be unemployed as a strategy.

Table 4 also presents a summary of calculations for two-parent families based on average wages in the Czech Republic in 2011. Not surprisingly, the highest monthly income per capita in the whole table was in families in which parents worked regardless the number of dependent children. Also, comparing low income families, when both the mother and the father earned only half of the average wage, they were better off than a low-income, single-parent family, but worse off than a single-parent family with average income. In addition, the figures in Table 4 indicate that the fall in per capita income in two-parent families was equal to 2,000 Czech crowns for each additional child. The fall in income would be even more profound the higher the wage of the mother collecting a parental allowance and the higher the birth order of the child. As *Sivková* (2011) documented on simulations of the given tax provisions, the fall in income per head in a family with each additional baby could be improved in the given Czech system only via an increase in the parental allowance. However, whether the given tax technique could be useful instrument for applied family policy significantly depends on the amount of change and political will.

Considering average wages in the Czech Republic for the year 2011, Table 5 illustrates what income per head in a family would look like if a couple were to pretend to live separately, even if they were sharing a dwelling and household costs. The figures reveal that although for low income families income per head was slightly higher than that of a family with declared low income, the differences were marginal. In the case of one dependent child, income per head in the low-income family in which a cohabiting couple officially qualifies as a single-parent family was higher by about 167 Czech crowns, while in the case of two dependent children it was 278 Czech crowns. Therefore, it seems that recently the way the tax system

12) The issue of unemployment was included in the example to illustrate its significant and different (in comparison with parental allowance) impact on family income.

13) Although this does not apply to all single-parent families, it is necessary to take into account that family income can in reality be improved by child support payments. In addition, it could also be improved by alimony for a single mother (or in general for a spouse). According to the Family Act (Article 95), the father of a baby born to a single mother must provide her with financial support for two years. Child support or other alimony payments are arranged independently and are specified by a court of law (Act No. 94/1963 Coll., on the Family, as amended). This income is not included in the discussion due to its specific nature.

14) Not all available benefits provided under the social security scheme in the Czech Republic were considered in this part of the article due to their specific conditions of eligibility..

Table 4 **Family income, the Czech Republic, 2011**

Family form	Monthly net income in 2011								
	100% of the average monthly net income			50% of the average monthly net income			100% of the average monthly net income, 2011, unemployment*		
	Czech crowns			Czech crowns			Czech crowns		
	1 child	2 children	3 children	1 child	2 children	3 children	1 child	2 children	3 children
Single father	22 ,379	23,346	24,313	12,650	13,617	14,584			
Tax bonus				87	1,054	2,021			
Unemployment benefit							13 762	13 762	13 762
Child benefit**				0	1,110	1,810			
Income per capita in the family	**11,190**	**7,782**	**6,278**	**6,325**	**4,909**	**4,099**	**6,881**	**4,587**	**3,441**
Single mother	18,347	19,324	20,281	10,635	11,602	12,569			
Unemployment benefit							11,925	12,560	13,182
Child benefit**			1,810	500	1,110	1,810			
Income per capita in the family	**9,174**	**6,441**	**5,523**	**5,568**	**3,817**	**3,595**	**5,963**	**4,187**	**3,296**
Husband & wife* **	39,759	40,726	41,693	22,318	23,285	24,252			
Husband + unemployed wife							22,379	23,346	24,313
Unemployment benefit							11,925	12,560	13,182
Child benefit**				0	0	1,810			
Income per capita in the family	13,253	10,182	8,339	7,439	5,821	5,212	11,435	8,977	7,500
Husband	24,514	25,481	26,448	13,530	14,497	15,464			
Parental allowance for wife	7,600	7,600	7,600	7,600	7,600	7,600	7,600	7,600	7,600
Unemployment benefit							13,762	13,762	13,762
Child benefit**						1,810			
Tax bonus	0	274	1,241	967	1,934	2,904			
Income per capita in the family	10,705	8,271	6,810	7,043	5,524	4,975	7,121	5,341	4,272

Note: * The 4th and 5th month of unemployment, a person aged 35.
** One child age 5, two children ages 5 and 8, three children ages 5, 8 and 16, in the case of the parental allowance the youngest child is age 2.
*** The net wage of a wife without children: 100% equalled 17,380 Czech crowns, 50% equalled 9,668 Czech crowns.
Source: Author's calculations.

has been set up is designed to eliminate the incentive for its abuse. The improvements to the tax system have been also documented by *Höhne* (2008) in an analysis of the period 2004–2008.

Although it seems that a working married couple with dependent children should be financially better off, this does not fully hold if additional direct financial support is taken into consideration. In general, the advantage of a cohabiting in genuinely single-parent family applies to very low-income families in which at least one person in the couple is economically inactive. The income of an economically inactive person is brought with financial support up to the level of the living minimum, which is the socially recognised minimum level of income to ensure sustenance and other basic personal needs (the Act No. 110/2006 Coll., on Living and Subsistence Minimum).[15] The monthly living minimum for a family depends on the number of family members

15) The Living Minimum and the Subsistence Minimum do not cover essential housing costs (*Ministry of Labour and Social Affairs*, 2012).

Table 5 **Income of the couple pretending to live separately, the Czech Republic, 2011**

Family form	Monthly net income in 2011							
	100% of the average monthly net income				50 % of the average monthly net income			
	Czech crowns				Czech crowns			
	1 child	2 children	3 children	0 child	1 child	2 children	3 children	0 child
Common-law husband				21,412				11,683
Common-law wife	18,347	19,314	20,281		10,635	11,602	12,569	
Tax bonus					672	1,639	2,606	
Income from employment	39,759	40,726	41,693		22,318	23,285	24,252	
Child benefit	0	0	1,810		500	1,110	1,810	
Family income	39,759	40,726	43,503		22,818	24,395	26,062	
Income per capita in family	**13,253**	**10,182**	**8,701**		**7,606**	**6,099**	**5,212**	

Source: Author's calculations.

and the family form. For instance, a family consisting of a married couple with two dependent children ages 7 and 14 had a monthly living minimum of 9,400 Czech crowns in 2011, while the same family in cohabiting form and thus officially qualifying as a single-parent family had a living minimum of 9,926 Czech crowns, if both parents attained the living minimum independently.[16] The difference is caused by the different amounts allotted to a single person, to the first and to each additional adult in the household.[17] In spite of the fact that the disparity between numbers is not too great, it must be taken into account that two identical families that differ only by their declared family form have unequal incomes that affect their eligibility for benefits provided under the social security scheme. In addition, it is reasonable to assume that the effect of the living minimum is minimal in the case of families with dependent children within the age range in which parents qualify for a parental allowance because the parental allowance does not depend on family income. For example, in the case of a family with a dependent child in which the mother had an income of 7,600 Czech crowns (the standard parental allowance) and the father had only the living minimum in the year 2011, the difference between a two-parent family and a two-parent family qualifying as single-parent family in monthly income including the child benefit, the housing allowance[18] and allowance for living[19] was 246 Czech crowns.[20] The financial situation of a family significantly changed if the father earned half of the average income in the year 2011, i.e. 14,117 Czech crowns. In such a case the family income was too high to apply for listed social benefits. Therefore, an un-

16) It must be taken into account that this is a model example and in reality the composition of the family is checked by the responsible office.

17) For the year 2012 the prescribed amounts were changed (*Ministry of Labour and Social Affairs,* 2012).

18) The provision of an allowance for housing depends also on housing costs, so it was assumed in the calculation that all the families live in Prague and in rental housing. The costs for a two-member family were 5,000 Czech crowns and for a family of three, four and more were 6,000 Czech crowns.

19) The allowance for living according to Act No. 111/2006 Coll., on Assistance in Material Need, as amended, the child benefit and the housing allowance according to Act No. 117/1995 Coll., on State Social Support, as amended.

20) It is assumed that the father did not apply for the social benefits.

married cohabiting couple was better off by approximately 6,000 Czech crowns than their married counterparts. The difference ceteris paribus equalled zero if both parents worked and earned at least half of the average wage by gender in the year 2011.

CONCLUSION

This article dealt with the issue of the financial incentives provided to unmarried couples by the tax and social schemes in the Czech Republic in recent years. The main motivation for work was in fact that more children have been born outside marriage in the Czech Republic since 1989; for example, more than 40% of live births were born outside marriage in the year 2011. There is no doubt that the figure is influenced by the fertility rate itself and the population structure by marital status, on the other hand alongside changes in values, the financial support provided by the state to families with dependent children could provide a financial incentive that could force cohabitating couples to remain unmarried.

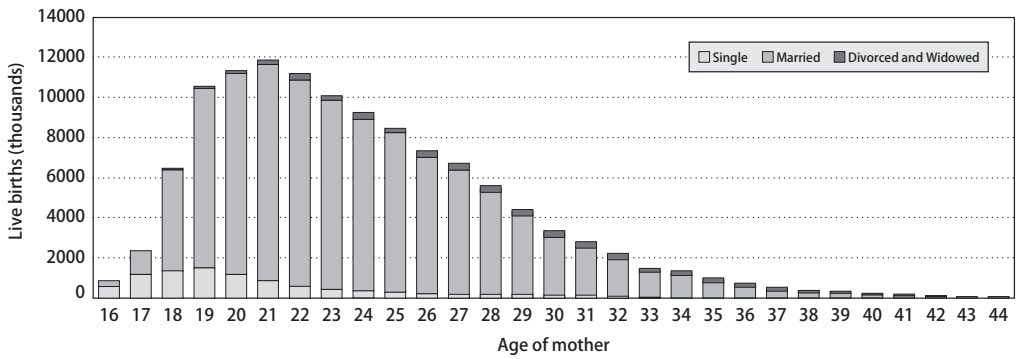
Both the tax and the social security systems underwent several changes in recent years, from the changed requirements for benefits eligibility to the tax provisions in effect. Based on an analysis of the financial situation of several model families with dependent children, considering only incomes from employment, it is obvious that the current tax system is progressive with respect to the tax base and the number of children. In addition, the introduction of the joint taxation of married couples was beneficial to families, but the introduction in 2008 of the supergross wage and a flat tax rate of 15% did not make families worse off, quite the contrary. In comparison with the recent system, a major advantage of joint taxation of married couples was its transparency for the general public. It provided the public with clear evidence as to which family form was favoured in the state's family policy.

Nevertheless, it is necessary to take into account that families with dependent children were not necessarily financially better off than a fictitious identical family pretending to be a single-parent family if social benefits were taken into consideration (*Soukupová et al.*, 2006). Using model examples *Soukupová et al.* (2006) illustrated that the financial advantage of a cohabiting couple qualifying as single-parent family was partly mitigated compared to a two-parent family by changes in the period 2005–2007, but the family based on marriage remained slightly worse off. From the perspective of the tax system, the example presented for the year 2011 revealed that the simulation of a single-parent family does not provide an advantage. However, if social benefits are also taken into account, then cheating could still partly benefit very low income families if the parents are each independently eligible for the living minimum benefit. But it is necessary to note that the misuse of benefits is penalised if discovered, so it is not always beneficial to simulate being a single-parent family.

In spite of the fact that the whole system has provided some financial incentive for couples to remain unmarried, it is reasonable to assume that the advantage of such a family form is so marginal that it cannot be relevant in couples' decisions. In addition, both systems of financial support underwent so many changes that it is hard to believe that the general public was able to follow all the implications the given changes had for the family budget.

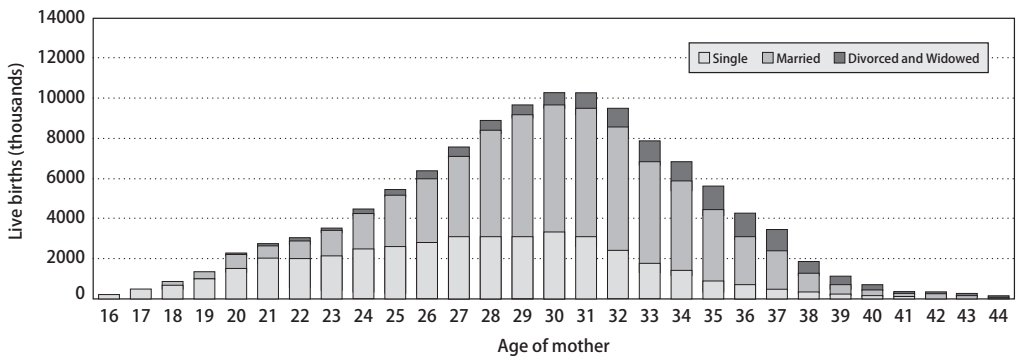
Annex

Figure3 Live births by age and marital status of the mother, the Czech Republic, 1992



Source: Czech Statistical Office.

Figure4 Live births by age and marital status of the mother, the Czech Republic, 2010



Source: Czech Statistical Office.

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  the Act No. 94/1963 Coll., on the Family, as amended,
  the Act No. 110/2006 Coll., on Living and Subsistence Minimum,
  the Act no. 111/2006 Coll., on Assistance in Material Need, as amended,
  the Act no. 117/1995 Coll., on State Social Support, as amended.

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QUALITY OF THE 2011 POPULATION AND HOUSING CENSUS

Tereza Krausová

ABSTRACT

The population and housing census is a complicated, expensive and important project, so it is necessary to examine its quality and limitations. The Czech Statistical Office focuses on two dimensions of quality: factual and statistical quality. A factual quality assessment is based on quantitative and qualitative analyses of audit reports. Audits examine all the processes and entities involved in the administration of the census. The statistical quality assessment is based on a quantitative analysis of quality indicators. Quality indicators are applied to recorded data about the life cycle of census forms and to the actual census data and assess the quality of the data and the collection and processing of data. Information about the quality of the 2011 census should aid in the planning of the 2021 census and facilitate the interpretation of the data obtained.

Keywords: census, quality, quality indicators

Demografie, 2012, **54: 369–381**

INTRODUCTION

The Czech Statistical Office (CZSO) conducted the 2011 Population and Housing Census in accordance with Act No. 296/2009 Coll. on the Population and Housing Census 2011 and Regulation No. 763/2008 of the European Parliament and of the Council on population and housing censuses. The complexity of the census lies not onlyin the need to include all persons with permanent or temporary residence and all other persons present in the Czech Republic on the census reference date (at midnight on 25 to 26 March 2011), but also in the need to interconnect and elaborate all identified data.

The purpose and importance of the census lie in the opportunity to gain statistical information about changes to the size, structure, and territorial distribution of the population and households, their living conditions, and every aspect of housing conditions both nationwide and in the smallest territorial detail. According to Regulation No. 763/2008, the Population and Housing Census shall conform to the essential features of a census, which are: individual enumeration, simultaneity, universality within a defined territory, availability of small-area data and defined periodicity. All collected data should be supplemented with information about the quality of the statistical information.

The subjects of the 2011 census were defined as follows: any natural person having permanent residence or permission for temporary residence on the territory of the Czech Republic on the census reference date, any other natural person present on the territory of the Czech Republic on the census reference date with neither permanent residence nor a temporary residence permit, and any house or dwelling, even those vacant.

In addition to the traditional census methods mentioned above the 2011 census also drew on administrative data sources, namely the CZSO Register of Census Districts and Buildings (RCD), which records information about the location and technical specifications of buildings (information gained from the previous census, land register, and construction statistics) and the Central Population Register of the Ministry of Interior, which contains information about the permanent residency of inhabitants and other data that complement the collected information and enhance the quality of the census. The 2011 census used three types of census forms: one census form (CF) for persons (CFP), one for

dwellings (CFD), and one for buildings (CFB). In addition, two versions of census form were available – pre-filled and bianco (i.e. not pre-filled). Pre-filled census forms contained automatically pre-filled data identifying the respondent (name, surname, address). The census forms for dwellings and buildings could contain pre-filled data on the identification and also pre-filled some other data concerning technical or administrative characteristics. Pre-filled information was obtained from administrative data sources. Bianco census forms contained no pre-filled data.

DIMENSIONS OF QUALITY

As the product of any census is information, the confidence in the quality of that information is crucial. The quality assurance and improvement system is an integral part of the Census 2011 Programme and is implemented at every stage of administration of the census, including planning, pre-enumeration, enumeration, document flow, coding, data capture, editing, data cleaning, tabulation and dissemination. There are two dimensions of quality: factual and statistical quality. Together they form a single entity and complement each other. Moreover, factual quality significantly influences statistical quality.

Eurostat outlines its statistical quality requirements in Regulation No. 763/2008 and Regulation No. 1151/2010 of the European Commission. Statistics should comply with the European quality standards to serve the needs of European institutions, governments, research institutions, business concerns and the public generally. Important issues of quality concern the extent to which the statistics are relevant, accurate and reliable, timely, coherent, comparable across regions and countries, and readily accessible by users.

One of the fundamental questions of the quality assessment is 'How well do the published data reflect the true size of the population?'. The target population is the ideal (true) population of statistical units. It is a theoretical concept, about which a census aims to report without ever achieving perfect coverage in practice. The estimated target population is the best available estimate for the (ideal) target population. The estimate is based on the census population corrected for the errors detected by a coverage assessment (*Eurostat*, 2011).

The census population is the population which the census data actually reflect. According to the census, there were 10,436,560 inhabitants living in the Czech Republic on the 2011 census reference date. The estimated target population is 0.7% higher. This estimate is based on a comparison of the census data with the population balance and the Central Population Register. A census undercount of up to 2% is commonly considered a good result.

FACTUAL QUALITY

Factual quality is based on an extensive system of controls and audits. Controls focus on project activities, tasks and adherence to schedules. Audits scrutinise the quality of all project tasks and the execution of activities. The other goals of audits are: to reveal areas of possible problems or risks, to reveal systemic weaknesses/flaws and how to correct them, to motivate employees and to be an effective form of learning and experience gaining.

There are three types of audits: internal audits of the census suppliers, audits of all the census processes and activities conducted by CZSO auditors in conformity with the Programme of Audits, and special audits of census processes and activities conducted by CZSO auditors and external specialists.

The methodology of the audit outcomes assessment enables both quantitative and qualitative analyses. The analysis describes the degree to which the census requirements are fulfilled by individual participants in the census and reveals sources of problems or risks. As of November 2012, 175 audits have been conducted. During the 'main stage' of the census (February – May of 2011), 144 audits were carried out in total, and they showed that the census activities had been completed to a level of 81.7% at the collection spots of the fieldwork supplier (Czech Post), 64.8% at the call centre of the fieldwork supplier, 77.8% at the mail-back workplace of the fieldwork supplier and 89.17% at the census worksites of the Czech Statistical Office (i.e. temporary branch offices of the CZSO).

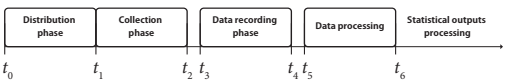
STATISTICAL QUALITY

The Czech Statistical Office developed a set of 'quality indicators' to document and assess the course and

development of all census activities. Quality indicators can also serve as the basis for census assessment by governmental institutions and by Eurostat. There are 53 measurable indicators in total that focus on different areas: data collection quality, data preparation quality, data quality and the quality criteria defined by Eurostat.

To begin it was necessary to identify the measurable features of quality. These features were then reduced to those that were measured and then recorded in the information systems during the course of the 2011 census. A very important concept for quality indicators is the life cycle of a census form, which is divided into six phases: the printing of census forms, their distribution, the collection of census forms, data recording, data processing and statistical outputs processing. Indicators were monitored and calculated on the basis of the life cycle of the census forms using the process and logistic reports and special applications.

Census forms and their life-cycle records:



t_0 – date of the receipt of census forms by the census enumerator
t_1 – date of the distribution of census forms
t_2 – date of the collection of census forms (recorded in the fieldwork suppliers' data systems)
t_3 – date of the scanning of census forms
t_4 – date of data entry into the input database
t_5 – date of the start of data processing
t_6 – date of data anonymisation and data entry into the processing database.

Individual census forms were identifiable by a unique bar code, so it was possible to measure the defined features of quality. These features are divided into four groups: features related to the distribution and collection of census forms, to the process of data recording, to data quality and to the quality issues defined by Eurostat.

The quality indicators cover quality features such as:

- timeliness (focusing on the time from when the census forms are taken by the enumerators to their delivery to the persons to be enumerated)
- coverage
- consistency of the administrative data with reality (how accurate the pre-filled identification data are)
- distribution reliability (number of incidents during the distribution)
- return rate of census forms through different collection channels
- time characteristics of the life cycle of census forms
- response rate
- completeness and reliability of answers
- credibility of answers

The indicator values are available as totals (for the whole census), for different types of census forms (the census forms for persons, dwellings, and buildings) and for groups of respondents categorised by defined factors (demographic characteristics – sex, age, marital status; geographical characteristics – region of residence, municipality size; socio-economic characteristics – education, economic activity; logistic factors – distribution channel, collection channel, region of distribution). Indicators are defined as a rate or as a statistical characteristic (mean value, variance, and data distribution).

The definitions of the quality indicators do not include any pre-defined desired values indicating successful implementation of the given process. Some indicators should ideally reach a level of 100% (such as the return rate of census forms, the completeness of answers, etc.), while others should approach 0% (e.g. multiple form usage, forced data corrections, etc.). Thus, the indicators should be evaluated with regard to the specific census 2011 processes and the conditions the processes had to comply with.

The information collected both on the individual processes (distribution, collection, processing) and the quality of the data can be used for planning future censuses. It can form the basis for decision making on such issues as the sufficient duration of individual processes (identifying bottlenecks) or the best ways of polling certain questions (intuitivity, clarity, conformity with respondent instructions). The information also aids in a better understanding of the gathered data; it testifies to the willingness of respondents to answer form questions.

Table 1 **Number of census forms by type and status (in thousands)**

Type of form	Printed	Distributed	Collected
CFP pre-filled	10,211	8,631	8,446
CFD pre-filled	4,726	4,358	4,260
CFB pre-filled	2,215	2,211	2,173
CFP bianco	3,651	2,107	1,974
CFD bianco	595	408	385
CFB bianco	186	106	99

Source: CZSO, 2012 a.

ANALYSIS OF SELECTED QUALITY INDICATORS OUTCOMES

For a better understanding it will be useful to mention some basic logistic information: the census forms were distributed between 7 and 25 March 2011. Some of the pre-filled census forms – for persons (about nine thousand) – were exceptionally distributed after the reference date. In total, about half a million census forms were distributed after the reference date. The reference date for the 2011 census was at midnight from 25 to 26 March 2011. The census forms were collected between 26 March and 19 April. From 19 to 30 May, a supplementary enumeration was carried out (the term for collecting electronic census forms was prolonged to June 5).

In total, 21.66 million census forms were printed, of which 13.86 million were census forms for persons (CFP), 5.40 million were census forms for dwellings (CFD) and 2.40 million were census forms for buildings (CFB). A total of 17.82 million census forms were distributed, of which 10.74 million were CFPs, 4.77 million were CFDs and 2.32 million were CFBs. In total, 17.34 million census forms were collected, of which 10.42 million were CFPs, 4.65 million were CFDs and 2.27 million were CFBs.

In a public tender Czech Post was selected as the principal provider of the census fieldwork. Czech Post distributed 98% of all census forms (17.48 million), of which 97% were returned (16.91 million). CZSO delivered 1.5% of the forms (275,000), of which 88% were returned (243,000).

Of the forms distributed by Czech Post, 63% were returned via mail-back (10.60 million), 25% were returned electronically (4.31 million) and 12% were returned by enumerators (2 million). Of the forms distributed by CZSO workers, 80% were returned by enumerators (194,000), 13.2% were returned via mail-back (32,000) and 7% electronically (17,000). These figures do not include about 175,000 forms returned through an unknown collection channel.

The analysis of the quality indicator results published in this article is based on internal CZSO documents: 'Statistical Quality Report of Preliminary Results', in which CZSO analysts discuss the quality indicator figures, and 'Statistical Quality Management of the Census 2011 Programme – Quality Indicators'.

QUALITY INDICATORS OF DATA COLLECTION

Indicator *TS* – census form delivery time

The indicator shows the number of days it took the enumerator to deliver the census form (CF) successfully to the target recipient after first receiving the form. The indicator is computed from pre-filled personal census forms only, since bianco forms are not intended for any concrete person and, if included, the results would be misleading. The indicator is expressed as an arithmetic average.

Most pre-filled CFPs were delivered to respondents on the same day that the enumerators received them (91.3%). For 5.7% of forms distribution took 1–7 days, for 2.8% of forms distribution took 8–15 days and for only 0.2% it took longer. The average delivery time of census forms to the recipient by a Czech Post enumerator is 0.63 of a day.

The longest delivery time of pre-filled CFPs was recorded in Prague – 1.35 days, while the shortest average delivery time was recorded in Vysočina (0.36 of a day). It was obviously much harder to reach the right

Table 2 **TR characteristics by collection channel (in days)**

Collection channel	Collection channel	CFP	CFD	CFB
Enumerator	4.70	8.60	4.54	4.53
Electronically	8.60	8.52	8.71	8.80

Source: CZSO, 2012 a.

Table 3 **Characteristics of m by distribution modes**

Distribution mode	All types of CF	CFP	CFD	CFB
CP Enumerator	1.07	1.05	1.08	1.11

Source: CZSO, 2012 a.

person in Prague; consequently, multiple deliveries had to be attempted, leading to higher indicator values.

Indicator *TR* – census form return time

The indicator shows the CF return time from the reference date. Return time is defined by the date on which the collected census form was recorded in the census logistical systems.

The indicator was evaluated only for the forms collected by enumerators or electronically. The indicator is expressed as an arithmetic average.

Return time varies markedly by the type of collection channel. The average return time of forms collected by enumerators was shorter (4.70 days) than in the case of electronic collection (8.60 days). The difference can be explained by the later deadline for returning electronic forms – 19 April, compared to 14 April for the other collection channels, but also by the fact that enumerators in most cases (98.5%) collected the forms within the first two weeks after the census reference date. Forms distributed after the reference date were mostly returned via mail-back and electronically, and this increased the indicator value. No strong connections were found between return time and the type of census form.

Within the first three weeks 99.5% of all returned CFs were filed.

The slowest return rate was recorded for the forms distributed in Prague (8.25 days), Zlín Region (7.69 days) and Liberec Region (7.68 days). By contrast, the fastest return rate was recorded in Vysočina Region (6.59 days), South Bohemia Region (6.88 days) and Pardubice Region (6.92 days). The differences among the regions are due to the different preferences for collection channel types and their different CF return times. The higher indicator value in Prague is partly due to the stronger preference of respondents for electronic form collection with a later return deadline.

Indicator *m* – number of attempts to deliver a CF

The indicator shows the number of attempts the enumerator had to make to deliver the CF successfully. It is evaluated only for distribution by Czech Post's (CP) enumerators. The indicator is expressed as an arithmetic average.

On average, the CF was successfully delivered on every 1.07 attempts. The CFP was delivered successfully on 1.05 attempts, the CFD on 1.08 attempts and the CFB on 1.11 attempts, while 93.4% of forms were delivered on the enumerator's first attempt, 6.6% on the second attempt (from the total count of all CFs delivered successfully).

The averages of indicator m do not vary much by CF distribution region. The highest average number of delivery attempts by enumerators was in Prague and in Central Bohemia Region (1.08 attempts), while the lowest number of attempts was in Vysočina Region, Zlín Region and Moravia-Silesia Region (1.05 attempts). The biggest difference between the regions was for CFBs (from 1.07 to 1.21 attempts in Prague).

Indicator *s* – the total number of attempts by enumerators to deliver a single CF

The indicator shows the number of attempts made by an enumerator to deliver and collect a single CF. The indicator is expressed as an arithmetic average.

Table 4 **Characteristics of s in total and by distribution mode**

Distribution mode	All types of CF	CFP	CFD	CFB
CP enumerator	1.23	1.17	1.29	1.39

Source: CZSO, 2012 a.

Table 5 **BCK in total and by distribution mode (in %)**

	All types of CF	CFP	CFD	CFB
Total	96.8	96.5	97.3	98.8
Distribution mode				
CP enumerator	96.8	96.5	97.0	97.6
CZSO enumerator	97.6	97.3	98.8	98.6

Source: CZSO, 2012 a.

On average, enumerators needed to make 1.23 attempts to deliver and collect a single CF. A higher than average number of attempts was needed for CFDs (1.29) and CFBs (1.39), while a lower number of attempts was needed for CFPs (1.17). The total average number of attempts made was not high because people preferred to use mail and electronic collection channels, which did not increase number of attempts made.

For 79% of forms only one attempt was needed, for 19% of forms two attempts were needed and for 2% three attempts were needed. There were only about 5,000 instances where four attempts were needed and a few dozen instances of five attempts needed.

A comparison of the average values of indicator *m* (number of attempts for a successful delivery – 1.07) and indicator *s* (number of attempts to deliver and collect – 1.23) shows that the vast majority of CFs were collected by different means than by enumerators since on average only 0.16 enumerator attempts remain for collection.

On average the highest number of attempts by an enumerator to deliver and collect a single CF was in Vysočina Region (1.29 attempts) and the lowest in Moravia-Silesia Region (1.18 attempts). Differences by distribution region are likely due to different preferences for collection channels in the regions. For example, Vysočina Region shows the highest rate of forms collected by enumerators and, at the same time, the highest average number of attempts.

Indicator BCK – census form return rate

The indicator shows the ratio of collected to distributed census forms.

The ratio of collected forms out of distributed forms was 96.8%. CZSO enumerators showed a slightly higher rate (97.6%), while CFDs (97.0%) and CFBs (97.6%) had slightly higher rates than CFPs (96.5%).

Return rates did not differ much by distribution region either. The lowest rate was found in Prague (95%) and the highest in Vysočina Region (98%). The lower rates from Prague, however, may be caused by the fact that some forms distributed in Prague were received by people who obtained and returned another form in a different region earlier (e.g. at their place of permanent residence) and did not return the other form from Prague. The high value of the indicator for the bianco form distribution rate in Prague (27%) seems to support this hypothesis. There may be other reasons too, such as problems during distribution and collection owing to various specifics of Prague's inhabitants.

Indicator DBF – bianco form distribution rate

The indicator shows the ratio of distributed bianco forms to all distributed census forms.

The bianco form distribution rate was 14.7% and was higher when distributed by a CZSO enumerator (18.4%). The rates vary considerably for different form types. The highest DBF was reached for CFPs (19.6%). The distribution factor did not affect the indicator value for CFPs. The high value for CFPs

testifies to the fact that a significant number of people do not live or were not found at the address of their permanent residence. For this reason a bianco form had to be issued (either by an enumerator or at a collection spot). In the case of CFDs the indicator value is lower, since only the address was pre-filled (while in the CFP the name is entered as well). Thus, the form could be used even if the inhabitants at the address changed. CFD distribution (8.6%) exhibited a pronounced difference between bianco CF distribution by a CP enumerator (8.4%) and by a CZSO one (44.8%). High values for CZSO enumerators are caused by the fact that in institutions CFDs were delivered only to families and the need for bianco forms was only identified on the spot during distribution. Records kept on flats in the CZSO Register of Census Districts and Buildings (RCD) are not as accurate as records on buildings (8.6% vs. 4.6%). Thus the DBF was lowest for CFBs (4.6 %) since new building construction is not as common. At the same time the low value of the indicator for CFBs is indicative of the high quality of the information on buildings in the RCD.

The bianco form distribution rate was the highest in Prague (27%), the lowest in Vysočina Region and Zlín Region (10%). For CFPs, the DBF indicator was about 34%, while in Zlín Region it was only 13%. Prague exhibited markedly higher values for the other two form types as well. The higher values of the DBF indicator in Prague are caused by a strong territorial mobility and the quite different daily rhythm of the population living in and around the city and also by the difficult distribution conditions.

The rate of bianco form distribution is slightly higher for men (18.8%) than women (17.0%). Higher DBF values were found for the population age groups 25–34 years and 35–44 years (over 20% for both groups). Members of these age groups typically belong to a more productive and spacially mobile population. A similar explanation goes for the education factor, where indicator values increase with growing education levels. In the case of children up to 14 years of age the results are hard to interpret since census forms are often filled in by their parents.

Table 7 **DBF by socio-demographic factors (in %)**

	CFP
Sex	
Male	18.8
Female	17.0
Age group	
to 14 yrs.	21.7
15–24 yrs.	18.5
25–34 yrs.	26.6
35–44 yrs.	20.3
45–54 yrs.	16.5
55–64 yrs.	12.5
65 yrs. and over	9.5
Education	
Elementary	15.5
Vocational	15.2
High school	17.7
College	21.7

Source: CZSO, 2012 a.

Utilisation of administrative data sources

UC – the undercoverage rate indicates the percentage of all census respondents (i.e. census form respondents, complemented by data on persons from the Central Population Register – CPR) who are not included in the CPR. The indicator thus verifies the utility of CPR data for census purposes.

OC – the overcoverage rate indicates the percentage of all persons filed in the CPR who should be excluded from the census (no change was logged in the CPR for at least five years and no CF was distributed).

AA – administrative source accuracy shows the percentage of persons registered in the CPR and participating in the census out of all census respondents, including those excluded from the CPR for census purposes.

Table 8 **Utilisation of information from administrative data sources (in %)**

Indicator	CFP
Undercoverage (UC)	1.2
Overcoverage (OC)	2.6
Administrative sources accuracy (AA)	92.4

Source: CZSO, 2012 a.

Table 9 **RSF in total and by distribution and collection modes (in %)**

	All types of CF	CFP	CFD	CFB
Total	92.9	94.0	88.0	97.9
Distribution mode				
CP enumerator	92.9	94.1	88.1	97.8
CZSO enumerator	90.1	89.9	76.7	98.7
Collection channel				
Enumerator	95.3	96.7	93.1	96.2
Mail-back	90.6	91.5	85.0	97.9
Electronically	97.7	99.3	92.4	99.8

Source: CZSO, 2012 a.

In total, 419,000 units were added to the census target population from the CPR, which were originally not included in the census forms. They applied mostly to males of middle age (25–45 years). The other added units correspond proportionally to the population structure of the Czech Republic. In total 274,000 units from the CPR were not included in the census since they did not comply with the criteria (see the definition of the undercoverage rate). In total 127,000 units, which were included in the census on the collected census form basis, were not included in the CPR. Cross-connection was found for 10,022,000 units (they were included in CPR and census forms were collected as well).

Data processing quality indicators

RSF indicator – CF completeness rate

RSF indicates the percentage of questions answered out of all the questions to be answered in relation to the essential characteristics of the respondent/object (age, sex, residency status, marital status, education, economic activity, house or dwelling inhabitancy).

On average, the CFB had the highest completion rate (98%). This may be in part due to its uncomplicated and intelligible form and also to its having the most pre-filled content. Conversely, the lowest completion rate was found for the CFD (88%). This was mostly due to the rare frequency of filled question on dwelling size (area size).

A form's completeness rate is significantly affected by its collection channel. The highest completion rate was observed for CFs turned in electronically. This was mostly due to automatic checking features. A higher degree of completion was also observed for forms collected by enumerators.

More than a half of all forms had a 100% completion rate and 99% of forms were at least half-completed.

Distribution region proved to be another differentiating *RSF* factor. The variation of *RSF* values between regions can be explained by the various channels of form collection. For example, while Vysočina Region and Zlín Region exhibited the highest ratio of forms collected by enumerators and electronically, they had the highest completion rate (94%). On the other hand, Karlovy Vary Region and Ustí nad Labem Region with the lowest completion rates (91%) had close to the highest ratio of mail-back collection. The education structure of the regions is yet another differentiating indicator factor.

The following table (Table 10) shows the resulting values of the *RSF* indicator (CF completeness rate), the *MLC* indicator (response consistency rate) and the *MRF* indicator (total response rate). See the ensuing text for the indicator descriptions and an interpretation of their values.

The completeness rate exhibits almost no variation by sex, age and marital status. Higher rates can be seen for married compared to divorced, however the *RSF* rate grows with education. The employed and the economically inactive had approximately the same rates, while the unemployed had a lower rate. This phenomenon can be in part substantiated by a hidden education factor since people with lower education have higher unemployment rates.

Table 10 **RSF, MLC and MRF by socio-economic factors (in %)**

	RSF	MLC	MRF
Sex			
Male	94.2	88.4	95.4
Female	94.3	85.4	95.4
Group age			
To 14 yrs.	93.9	67.2	98.2
15–24 yrs.	94.3	93.6	94.6
25–34 yrs.	95.0	92.2	95.6
35–44 yrs.	95.1	90.8	95.7
45–54 yrs.	94.5	90.0	95.4
55–64 yrs.	94.0	88.5	95.1
65 yrs. and over	93.9	87.5	95.0
Marital status			
Single	94.1	83.4	95.8
Married	95.3	90.3	96.1
Divorced	92.6	86.5	93.8
Widow/Widower	93.5	87.2	94.5
Education			
Elementary	92.9	90.0	93.8
Vocational	93.6	89.1	94.5
High school	96.6	90.5	97.0
College	98.0	93.6	98.3
Economic activity			
Employed	96.0	91.2	96.5
Unemployed	89.4	88.1	90.4
Economically inactive	95.3	82.8	97.4

Source: CZSO, 2012 a.

Table 11 **MLC in total and by distribution and collection mode (in %)**

	All types of CF	CFP	CFD	CFB
Total	86.5	86.9	83.5	91.2
Distribution mode				
CP enumerator	86.4	86.8	83.5	91.1
CZSO enumerator	90.3	90.5	78.4	96.3
Collection channel				
Enumerator	90.3	91.3	90.3	90.4
Mail-back	90.6	81.2	76.4	88.8
Electronically	97.7	98.9	97.3	98.5

Source: CZSO, 2012 a.

MLC indicator – response consistency rate

MLC indicates the percentage of forms, out of all forms collected, where no automatic data correction occurred.

This consistency was found in 86.5% of forms. The indicator varies by CF type. It shows relatively higher values for CFBs (91.2%) and lower values for CFPs (86.9%) and CFDs (83.5%). The higher consistency rate for CFBs can be explained by the fact that it was pre-filled and consequently had less room for errors. As with the RSF indicator, here we can observe behavioural variations according to the collection channel, including the effects of electronic form checking and enumerators' controls.

Distribution region dependencies exhibit the same trends as with the *RSF* indicator. Karlovy Vary Region and Ustí nad Labem Region show the lowest consistency rates, while the highest rates are observed in Vysočina Region and Zlín Region. Most likely it is the same steering factor – collection mode – that comes into play.

MLC indicator value dependencies on various socio-demographic factors (see Table 10) are difficult to interpret since certain categories of respondents filled in more answers, thereby leading to a higher probability of interference in the form's content. Some significant differences in response consistency were found to depend on the economic activity of the respondents. However, there is no clear evidence that all non-active respondents (non-working retirees, pupils, students, apprentices, dependants, self-employed persons) exhibit lower response consistency rates when sorted by the other factors (e.g. age, education). In general, the best responses were recorded from married respondents in a productive age, employed, with a high school or college degree.

Data quality indicators

The indicators are based on all collected forms except for those marked as erased in the processing database (there are about 370,000 of these empty or duplicit forms).

MRF indicator – total response rate of the census form

The indicator shows the percentage of usable answers out of all the questions to be answered. A usable answer is any non-empty one even after all the data modifications introduced during processing. An obligation to answer a question is determined by the respondent/object category.

MRF indicator values are in general somewhat higher than those of the *RSF* indicator (completeness rate) since during the data processing may be completed from available administrative data sources.

Most usable answers were found in the CFBs (99.2%), this relates to the larger amount of pre-filled content on these forms. A considerably lower percentage of usable answers was found in the CFDs (87.3%). This is due to the greater complexity of this form and to the fact that the other part of the CFB had not yet been evaluated in the preliminary results (thus this question is qualified as unanswered).

As can be seen in Table 10 above, the indicator values almost do not vary at all by sex and age. A slight anomaly can be observed in the age category of up to 14 years, where it reaches 98.2%. The higher response rate in the lower age categories is probably due to the simpler questions posed and the smaller number of compulsory questions. More pronounced differences in *MRF* values can be seen when the results are sorted by education and economic activity. Here we can observe the same trend as with the *RSF* indicator (the response rate grows together with education).

RF indicator – unit response rate (of census form)

The indicator shows the percentage of usable answers in a unit out of all the questions to be answered in that unit.

In the course of verifying form completeness it was found that about 58% of forms were filled in com-

Table 12 **MRF in total and by a form type (in %)**

	All types of CF	CFP	CFD	CFB
Total	93.7	86.9	95.4	99.2

Source: CZSO, 2012 a.

Table 13 **MRI in total and by a differentiating factor (in %)**

CFP item	MRI for all CFP	MRI with a differentiating factor
Personal identification number	98.4	no distinct factor dependencies
Date of birth	99.8	no distinct factor dependencies
Sex	100.0	no distinct factor dependencies
Country of citizenship	99.8	no distinct factor dependencies
Place of residence on census reference data	86.6	distribution region (Karlovy Vary Region – 81.1, Zlín Region – 89.3), education (elementary – 82.0, college – 94.0)
Place of residence one year prior to the census	99.6	no distinct factor dependencies
Place of residence of mother at the time of the person's birth	99.7	no distinct factor dependencies
Marital status	99.8	no distinct factor dependencies
Mother tongue	99.3	no distinct factor dependencies
Ethnicity	77.1	age (younger and middle – 73.6, 65 and over – 83.0), education (elementary – 75.7, college – 84.6)
Religious belief	61.5	distribution region (South Bohemia R. – 57.4, Zlín R. – 68.1), age (up to 14 yrs. – 54.7, 65 and over – 69.3), education (elementary – 60.8, college – 72.3)
Educational attainment	98.1	no distinct factor dependencies
Field of education	89.8	education (high school – 86.4, college – 98.1)
Total number of live-born children	97.7	age (15–24 yrs. – 89.2, 55–64 yrs. – 99.5)
Number of live-born children during current or last marriage	86.7	age (15–24 yrs. – 89.5, 25–34 yrs. 95.0, 65 yrs. and over – 80.8), education (elementary – 80.0, college – 95.6)
Main economic activity	97.1	education (elementary – 94.5, college – 99.5)
Occupation	84.7	education (elementary – 59.8, college – 94.4)
Status in employment	87.6	education (elementary – 63.2, college – 96.4)
Industry (branch of economic activity)	81.5	education (elementary – 52.2, college – 95.2)
Location of place of work or school	87.8	education (elementary – 83.8, college – 94.7)

Source: CZSO, 2012 a.

pletely, about 93% of forms exhibited a greater than 80% completion rate and only 0.3% of forms were less than half completed.

MRI indicator – item response rate

The item response rate shows the number of forms containing a usable answer to a given question.

Willingness to answer non-compulsory questions (nationality, belief) grew with the age and education of respondents. The question on belief was also affected regionally – the most frequent responces were from Zlín Region, which is the region with traditionally the highest religiosity among inhabitants. The education factor pushed the response rate towards higher values with higher education for the compulsory questions of address on the reference date, field of education, number of children born in the last marriage, economic activity, employment, employment position, economic activity sector and workplace or school location. It is possible that respondents with lower education had difficulties understanding and answering these questions. Also, these respondents tend not to answer questions diminishing their social status (e.g. questions on the field of education are more frequently not answered by respondents with lower education levels) or are generally less inclined to respond to census forms (as observed in other indicators as well).

Table 14 **MRI in total (in %)**

CFD item	MRI for all CFD
Household dwelling type	100.0
Occupancy status of the dwelling	97.6
Legal title for the use of the dwelling	99.1
Dwelling size	43.5
Position of dwelling in house	98.8
Piped gas	95.7
Water supply system	97.9
Hot water	98.4
Type of heating	99.0
Energy used for heating	95.7
Bathroom or shower	99.3
Toilet facilities	99.4
Personal computer and Internet connection	93.6

Source: CZSO, 2012 a.

Table 15 **MRI – in total (in %)**

CFB item	MRI for all CFB
Number of dwellings in the house	100.0
Type of building	99.6
Occupancy status	98.1
Type of owner	99.7
Period of construction or reconstruction	99.5
Material of bearing walls	99.7
Number of floors (above the ground)	97.2
Connection to sewage	99.1
Central heating and type of fuel	99.4
Lift	99.5

Source: CZSO, 2012 a.

A dependency on distribution region was clearly exhibited in the case of the address on the reference date. Lower response rates were observed in Karlovy Vary Region and Ustí nad Labem Region and higher rates in Vysočina Region and Zlín Region. The lower response rate among women in the age group of 15–24 years to the question on the number of live-born children was likely caused by the fact that the respondents had no children and for this reason ignored the question. Similar results were obtained for the question on the number of live-born children in the last marriage. The lower response rates among women across all age groups indicates that the question was probably not understood correctly by divorced and widowed women, who did not think they needed to answer it.

The response rate for the dwelling form is greater than 95% for most items. There are only two items where it is lower. The response rate to the question on dwelling size is only 43.5%. The question on dwelling size is completed only when questions on the sizes of all the dwelling's components are also completed (kitchen, dining area, number and size of living rooms 8m^2 or more in size, number and size of living rooms 4–7.9m^2, size of the flat areas). Thus it is obvious that people mostly did not fill in all the data on dwelling size (e.g. if they had no room specified in the form, they skipped the question instead of putting in 0). The item number and size of living rooms 4–7.9m^2 was filled in on only about 2 million dwelling forms. For the question on the PC and Internet connection the response rate was only slightly lower than for most items – 93.6%. No factor was found to affect response rate of CFDs.

The response rate for most CFB items is around 99%. Slightly lower rates are observed only for the number of above-ground floors (97.2%) and house inhabitancy (98.1%). No factor was found to affect the response rate of CFBs.

CONCLUSION

It is generally recognised that a Population and Housing Census is not perfect and that errors can occur in all stages of the census operation. Most errors in the census results are classified into two major categories – coverage errors and content errors. Coverage errors are errors that arise due to omissions or duplications of persons or housing units in the census enumeration. Coverage is a critical element – it has a direct influence on the quality of population counts and an indirect impact on the quality of all other data produced by the census. Content errors are errors that arise from the incorrect reporting or recording of the characteristics of persons, households, and housing units enumerated in the census. A third type of error is classified as operational errors. These can occur during field data collection or during data processing (*UNECE*, 2006).

There is no single standard quality control and improvement system that can be applied to all censuses or even to all steps within a census. No matter how much effort is expended, complete coverage and accuracy in the census data are unattainable goals. However, efforts to first detect and then to control errors should be at a level that is sufficient to produce data of a reasonable quality within the constraints of the budget and time allotted (*UNECE*, 2006).

The processing of the 2011 census data is currently under way. Qualitative aspects of the individual outputs will be discussed in a separate article.

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WHAT RATE OF FERTILITY AND EXTENT OF MIGRATION WOULD BE NEEDED FOR STABLE POPULATION DEVELOPMENT IN THE CZECH REPUBLIC IN THIS CENTURY?[1)]

Tomáš Fiala – Jitka Langhamrová

ABSTRACT

Is foreign migration able to offset low fertility and to prevent the population decrease and population ageing? It has been demonstrated that the annual number of immigrants needed to restrict the decline in the population is relatively small, while the number of immigrants preventing population ageing had to be unrealistically high. The article shows what extent of total fertility rate (in the case without migration) or what extent of net migration (in the case of lower fertility rate below the replacement level) would be necessary to stabilise the size and structure of the population of the Czech Republic in the sense of its convergence with the 'adjusted' stationary population model.

Keywords: population ageing, population projection, stationary population, total fertility rate, replacement migration, the Czech Republic

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INTRODUCTION

In connection with the decline of fertility below the replacement level in many economically developed countries, demographers have been asking themselves whether in the future there will be a decline in population size in those countries (which includes the Czech Republic and also the other EU countries), what will be the consequences of the continuing ageing of the population, and to what extent immigration from abroad can offset low fertility.

There exist several analyses and studies dealing with this question. The United Nations (*Replacement*, 2000; 2001) developed the concept of replacement migration and presented computations for several countries indicating the volume of net migration necessary to maintain the population size and to stabilise the age structure of the population (in the sense of maintaining the values of various dependency ratios). Similar computations have been done for all EU countries (*Bijak – Kupiszewska – Kupiszewski – Saczuk*, 2005). The analysis of replacement migration for the Czech Republic can be found in *Burcin – Drbohlav – Kučera*, 2008.

All the analyses mentioned demonstrated that, whereas the annual number of immigrants needed

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to restrict the decline in the population is relatively small in most countries, foreign migration is not capable of preventing the ageing of the population, as for this the number of immigrants would have to reach unrealistically high values. Migration may, however, lessen the effects of population ageing.

It is clear that, assuming mortality continues to decrease (and life expectancy at birth thus continues to rise) the only way to stop population ageing (i.e. to maintain the value of average age or the values of dependency ratios at present levels) is a permanent increase of the population size. This seems to be unsustainable and unrealistic.

The article deals with an analysis based on a modified stationary population model (without migration) where the annual number of live births is decreasing in time proportionally to increasing life expectancy at birth. This model would produce a relatively stable population size, relatively stable age structure of the population and relatively slowest ageing. The results of a population projection show the total fertility rate (in the variant without international migration) or the amount of net migration (in three variants of a total fertility rate lower than the replacement level) needed in order for the population of the Czech Republic to reach convergence with the stationary model mentioned above.

A STATIONARY POPULATION MODEL AND ITS MODIFIED VARIANT

While the population in many less economically developed countries, such as those in Africa or Asia, is still increasing, the population in many European countries (including the Czech Republic) is facing the threat of population decline. From the economic, social, and ecological point of view there would probably be favourable population development if no great changes occurred in both the size and also the sex and age population structure. In such a population, where there would be, for instance, relatively stable numbers of school students, labour force, and pensioners, there would be no population ageing.

Such a population model is well-known. It is the stationary population model with an unchanging size and sex and age structure. But this model supposes a stable level of mortality, i.e. no changes in the age-specific mortality rates. In the coming decades, however, it is more realistic to assume that mortality will continue to decline and life expectancy at birth will further increase. It is logical that with such development it is impossible to prevent the ageing of the population by other means than by a constant increase in the annual number of births or of the annual number of immigrants, i.e. by constantly raising the number of inhabitants. This development would not be permanently sustainable from the long-term viewpoint. Even if the annual number of live births were to remain stable, the population size would permanently increase due to the mortality decline.

The sex-and-age structure of the stationary population of total size S corresponding to mortality in year t can be determined using the following formula (see, e.g., *Roubíček*, 1997).

$$S_{t,x}^{(M)} = k_t * (1-\delta) * L_{t,x}^{(M)}, \; S_{t,x}^{(F)} = k_t * \delta * L_{t,x}^{(F)}; \quad (1)$$

where

$S_{t,x}^{(M)}, S_{t,x}^{(F)}$ is the number of males (respectively females) at age x, in year t.
δ is the proportion of girls at birth,

$$k_t = \frac{S}{(1-\delta) * T_{t,0}^{(M)} + \delta * T_{t,0}^{(F)}}, \quad (2)$$

and $L_{t,x}^{(M)}, L_{t,x}^{(F)}, T_{t,0}^{(F)}, = \sum_{x=0}^{\omega-1} L_{t,x}^{(M)} \; T_{t,0}^{(F)} = \sum_{x=0}^{\omega-1} L_{t,x}^{(F)}$ are the corresponding values from the life tables of males (respectively females) at age x for year t.
The value of coefficient k_t can also be expressed by means of the weighted average of the life expectancies at birth of males and females.

$$k_t = \frac{S}{l_0 * [(1-\delta) * e_{t,0}^{(M)} + \delta * e_{t,0}^{(F)}]} \quad (3)$$

The annual number of live births in this population is then equal to $N_t = k_t * l_0$, *i.e.*

$$N_t = \frac{S}{(1-\delta) * e_{t,0}^{(M)} + \delta * e_{t,0}^{(F)}}. \quad (4)$$

It is then indirectly proportional to life expectancy at birth.

PROJECTIONS OF THE POPULATION OF THE CZECH REPUBLIC TO 2100

The projections were calculated using the cohort component method (see, e.g., *Bogue – Arriaga – Anderton*, 1993). We suppose that the demographic behaviour of immigrants is the same as that of Czech population. In computations thus we assume only immigration (at the level of net migration, of course) and consider emigration to be zero. This method was used, for example, to create a projection of human resources (*Fiala – Langhamrová*, 2009). The numbers and structure of migrants are therefore always understood to mean the size and structure of the net migration. A more detailed description of this method is given, for example, in *Fiala – Langhamrová – Průša*, 2011. The proportion of girls δ at birth is assumed to equal 0.485 for the entire period of the projection.

Scenario of mortality trend in the Czech Republic

For the sake of simplicity we are considering only one variant of the mortality trend. We shall assume that the life expectancy at birth of both males and females in the Czech Republic will grow throughout the period of the projection, but its annual increment will decline smoothly. At the same time there will be a continual decrease of the difference between the life expectancy at birth of males and females. In 2011 the life expectancy at birth of males was 74.69 years while the life expectancy at birth of females was 80.74 years (*CZSO*, 2012b). By the year 2100 it is assumed that the life expectancy at birth of males will increase to 88.4 years and that of females to 92.4 years (see Table 1). This scenario does not differ too much from the scenario of the medium variant of the last projection of the population processed by the Czech Statistical Office (see *CZSO*, 2009) and it corresponds approximately to the scenario of the high variant in the projection of Burcin and Kučera (see *Burcin – Kučera*, 2010).

The numbers of live births over time for a stationary population of 10.5 million given this mortality trend – see formula (4) – are given in Table 2.

Whereas with mortality at the level of 2011 roughly 135,000 live births per annum would be needed to preserve the size of the population of the Czech Republic, with mortality at the expected level for the year 2100 the number of live births that would be sufficient would be approximately 20,000 lower.

Model projection of a stationary population in the Czech Republic

Let us first consider the hypothetical situation where the present sex-and-age structure of the population of the Czech Republic (as of 31. 1. 2011) would be regular and would correspond to the stationary population for 2011. We can model further development (assuming the mortality scenario is as given above) by calculating two variants of the natality trend using the component method without migration:

Table 1 **Assumed trend of life expectancy at birth**

Sex	2011	2020	2030	2040	2050	2060	2070	2080	2090	2100
Males	74.7	76.8	78.9	80.8	82.6	84.1	85.5	86.7	87.6	88.4
Females	80.7	82.7	84.7	86.5	88.1	89.6	90.8	91.9	92.7	93.4

Source: Authors' calculations.

Table 2 **Numbers of live births for a stationary population in the Czech Republic with 10.5 million people**

Year	2011	2020	2030	2040	2050	2060	2070	2080	2090	2100
Live births	135,263	131,824	128,480	125,599	123,122	121,007	119,223	117,743	116,545	115,607

Source: Authors' calculations.

a) A falling number of births: The number of live births in further years is always assumed to be equal to the number needed for a stationary population corresponding to the mortality rate in the given year (see Table 2).
b) A constant number of births: The number of live births in further years is assumed to always be at the level for a stationary population in the year 2011.

The basic results of this projection are given in Table 3.

Under the assumption of declining mortality the number of inhabitants rises, not only in the variant assuming a constant number of live births (where by the end of the century the number of inhabitants would increase by more than 1,600,000), but also in the variant where the number of births drops (in spite of this the number of inhabitants would increase by the end of the century by almost 600,000). In both variants the population is ageing. In the variant with the decline in births the average age increases by more than 7 years and in the variant with a constant number of births by almost 6 years.

The number of persons aged 20–64 years in the variant with a declining number of births drops, while in the variant with a constant number of births it naturally increases. In both variants, however, there is a decrease in the proportion of persons aged 20–64 years in the population and there is a rise in the ratio of the number aged 65+ years to the number aged 20–64 years. On the other hand, the ratio of the number of persons of retirement age to the number of persons of productive age (taking into account the increase in the retirement age in the Czech Republic according to present legislation) declines in both variants.

It is therefore evident that, in the case where the initial age structure is regular, it is possible, with the expected further decline in mortality, to stop the ageing of the population only by continuously increasing number of births or by continuously increasing number of immigrants. This would lead to a continuous and relatively marked increase in the number of inhabitants, as shown by two other variants of projecting a stationary population.

If we wished, for instance, to maintain the average age of the population of the Czech Republic at the initial level (40.1 years), then the total fertility rate up to the year 2020 would have to rise to almost 2.4 and at the end of the century it would be higher than 2.7, which we consider highly unrealistic. The annual number of live births would come close to 300,000 at the end of the century and the number of inhabitants would exceed 18 million. In spite of this there would be a decline in the proportion of people aged 20–64 years in the population and also a drop in the ratio of people aged 65+ to those aged 20–64 years. (see Table 4).

For the value of the ratio of people aged 65+ to those aged 20–64 years at the end of the century to remain at the present level the growth of fertility would have to be even higher. Assuming that population growth remains linear, the total fertility rate in 2080 would have to be higher than 3.5. The number of live births in that year would already be almost 370,000 and the number of inhabitants would come close to 18 million.

We can see that, even in the ideal hypothetical case, where the present sex-and-age structure of the Czech Republic would be the structure of the stationary population and the total fertility rate would be around the replacement level, it is not realistic to expect that the further ageing of the population will stop as long as life expectancy at birth is expected to go on rising.

As a reference (model) population, with which we shall compare the projection of the real population of the Czech Republic, we shall use the population modelled by a projection according to the first variant, assuming a decline in birth numbers. Henceforth in the text we shall refer to this population as the model population. This model of population development can be regarded as a 'compromise' between the model with no ageing (but rapid increasing population size) and the model with no change in population size (but relatively rapid population ageing).

Table 3 **Main results of the model projection of a stationary population**

Variant with a decline in the number of births

Characteristics	2011	2020	2030	2040	2050	2060	2070	2080	2090	2100
Population (as of 31 Dec.)	10,500,000	10,581,467	10,737,448	10,890,966	11,016,883	11,106,278	11,156,532	11,168,205	11,144,045	11,089,148
Total fertility rate	2.075	2.025	1.972	1.934	1.933	1.947	1.962	1.976	1.989	2.002
Number of live births	135,263	131,824	128,480	125,599	123,122	121,007	119,223	117,743	116,545	115,607
Average age (as of 31 Dec.)	40.1	40.5	41.4	42.5	43.5	44.6	45.5	46.2	46.8	47.2
Number of people aged 20–64	5,840,727	5,853,919	5,881,069	5,892,150	5,864,868	5,803,097	5,711,339	5,598,250	5,494,127	5,403,894
Proportion of people aged 20–64 (in %)	55.6	55.3	54.8	54.1	53.2	52.3	51.2	50.1	49.3	48.7
Ratio of 65+/20–64 (in %)	33.6	35.0	37.9	41.4	45.1	49.0	53.0	57.0	60.0	62.1
Ratio of retirement age/ productive age (in %)	46.5	41.7	37.9	37.2	36.7	36.6	36.0	35.6	34.5	33.1

Variant with a constant number of births

Characteristics	2011	2020	2030	2040	2050	2060	2070	2080	2090	2100
Population (as of 31 Dec.)	10,500,000	10,598,834	10,807,862	11,045,162	11,281,256	11,503,346	11,705,133	11,883,364	12,036,490	12,163,969
Total fertility rate	2.075	2.078	2.076	2.074	2.072	2.070	2.069	2.068	2.067	2.067
Number of live births	135,263	135,263	135,263	135,263	135,263	135,263	135,263	135,263	135,263	135,263
Average age (as of 31 Dec.)	40.1	40.4	41.2	42.0	42.8	43.6	44.3	45.0	45.5	45.9
Number of people aged 20–64	5,840,727	5,853,919	5,881,069	5,909,463	5,935,042	5,956,699	5,974,429	5,988,820	5,999,873	6,008,253
Proportion of people aged 20–64 (in %)	55.6	55.2	54.4	53.5	52.6	51.8	51.0	50.4	49.8	49.4
Ratio of 65+/20–64 (in %)	33.6	35.0	37.9	41.2	44.6	47.8	50.7	53.3	55.6	57.5
Ratio of retirement age/ productive age (in %)	46.5	41.7	37.9	37.1	36.3	35.7	34.6	33.6	31.9	30.5

Source: Authors' calculations.

Table 4 **Main results of the model projection of a stationary population**

Variant in which the average age remains at the initial level

Characteristics	2011	2020	2030	2040	2050	2060	2070	2080	2090	2100
Population (as of 31 Dec.)	10,500,000	10,700,199	11,166,635	11,773,402	12,493,715	13,329,709	14,299,513	15,432,472	16,760,460	18,310,809
Total fertility rate	2.075	2.393	2.539	2.692	2.563	2.534	2.580	2.632	2.721	2.773
Number of live births	135,263	155,762	165,451	179,467	188,880	202,510	221,185	240,794	267,437	295,988
Average age (as of 31 Dec.)	40.1	40.1	40.1	40.1	40.1	40.1	40.1	40.1	40.1	40.1
Number of people aged 20–64	5,840,727	5,853,919	5,881,069	6,010,517	6,292,555	6,682,008	7,180,611	7,780,382	8,362,938	9,023,391
Proportion of people aged 20–64 (in %)	55.6	54.7	52.7	51.1	50.4	50.1	50.2	50.4	49.9	49.3
Ratio of 65+/20–64 (in %)	33.6	35.0	37.9	40.6	42.1	42.6	42.2	41.3	42.3	43.4
Ratio of retirement age/ productive age (in %)	46.5	41.7	37.9	36.5	34.3	32.1	29.3	26.6	23.9	22.6

Variant in which the ratio of people aged 65+ to those aged 20–64 years remains at the initial level

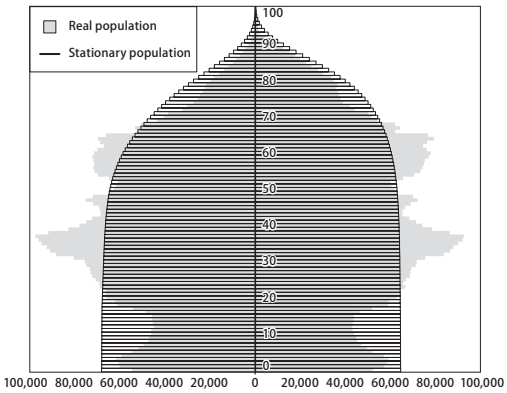
Characteristics	2011	2020	2030	2040	2050	2060	2070	2080	2090	2100
Population (as of 31 Dec.)	10,500,000	10,668,321	11,106,121	11,741,712	12,635,342	13,910,747	15,645,049	17,887,613	20,749,241	24,367,826
Total fertility rate	2.075	2.295	2.539	2.783	3.027	3.272	3.516	3.515	3.515	3.515
Number of live births	135,251	149,379	165,441	184,304	217,580	260,953	314,859	369,453	442,897	529,916
Average age (as of 31 Dec.)	40.1	40.2	40.2	40.1	39.6	38.6	37.4	36.3	35.4	34.7
Number of people aged 20–64	5,840,727	5,853,919	5,881,069	5,978,737	6,232,299	6,650,657	7,322,577	8,368,372	9,757,732	11,518,928
Proportion of people aged 20–64 (in %)	55.6	54.9	53.0	50.9	49.3	47.8	46.8	46.8	47.0	47.3
Ratio of 65+/20–64 (in %)	33.6	35.0	37.9	40.8	42.5	42.8	41.4	38.3	35.7	33.6
Ratio of retirement age/ productive age (in %)	46.5	41.7	37.9	36.7	34.6	32.3	28.8	24.9	20.8	18.0

Source: Authors' calculations.

Projection of the real population of the Czech Republic

The present sex-and-age structure of the Czech population (as of 31. 12. 2011 – see CZSO 2012a) differs quite considerably from the structure of a stationary population (see Figure 1). Compared to a stationary population, in the real population there is a larger number of people roughly between the ages of 20 and 65, whereas the number of people under the age of 20 and aged 65 and over are, on the contrary, lower. Similarly, in recent years the total fertility rate has consistently been well below the replacement level. Let us consider whether and to what extent there might be, in this century, a gradual convergence of the composition of the population of the Czech Republic with that of the model population, projected as a stationary population according to the variant with a declining number of births (described above). This convergence could occur through an increase in either fertility or migration, or possibly in both of these characteristics.

Figure 1 **Comparison of the real and stationary populations of the Czech Republic as of 31. 12. 2011**



Source: CZSO 2012a; Authors' calculations.

We shall consider four variants of development of the population of the Czech Republic (see Table 5).

a) A variant without migration, assuming only a marked increase in fertility.
b) A variant with migration and a high level of fertility (the 'high variant'), where the total fertility rate is expected to rise gradually up to 2.0 in 2050, and in subsequent years will remain steady at this level.
c) A variant with migration and a medium level of fertility (the 'medium variant'), where the total fertility rate will gradually increase to 1.7 in 2040, and in subsequent years will remain steady at this level.
d) A variant with migration and a low level of fertility (the 'low variant') envisages a drop of the total fertility rate to 1.4 until 2020 and remaining steady at this level for the subsequent projected period.

We assume that the initial sex-and-age structure of migrants will be the same as the structure of the net migration of the Czech Republic in the years 2006–2009, with a gradual convergence towards the structure of net migration structure modelled on that of the EU, in which there is typically a larger proportion of migrants over the age of 30 (and of course a smaller share of migrants under the age of 30).

Our aim is to demonstrate what in future years the fertility trend would have to be like (in the variant without migration) or what the trend in net migration would have to be like (in the variants with migration and the given development of fertility) in order for the composition of the population of the Czech Republic gradually to converge towards that of the model population. The gradual convergence of the composition of the real population of the Czech Republic with that of the model population can be assessed according to the following four characteristics:

a) The total number of inhabitants
b) The number of persons aged 20–64
c) The average age
d) The ratio of the number of persons aged 65 and over to the number aged 20–64 years.

Table 5 **Variants of the trend in the total fertility rate**

Variant	2012	2020	2030	2040	2050	2060	2070	2080	2090	2100
High	1.45	1.70	1.80	1.90	2.00	2.00	2.00	2.00	2.00	2.00
Medium	1.44	1.60	1.65	1.70	1.70	1.70	1.70	1.70	1.70	1.70
Low	1.42	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40

Source: Authors' calculations.

Table 6 **Projection of the convergence of the total number of inhibitants with the model population**

Variant	2011	2020	2030	2040	2050	2060	2070	2080	2090	2100
Population as of 31 December										
Stacionary population model	10,500,000	10,581,467	10,737,448	10,890,966	11,016,883	11,106,278	11,156,532	11,168,205	11,144,045	11,089,148
No migration	10,505,445	10,603,789	10,623,993	10,618,788	10,823,117	11,106,278	11,252,001	11,204,112	11,139,475	11,089,148
High fertility	10,505,445	10,687,444	10,792,067	10,848,132	10,992,616	11,106,278	11,127,983	11,117,030	11,098,242	11,089,148
Medium fertility	10,505,445	10,687,466	10,812,654	10,898,925	11,029,468	11,106,278	11,128,022	11,168,205	11,181,813	11,089,148
Low fertility	10,505,445	10,668,465	10,793,073	10,898,268	11,029,316	11,106,278	11,133,202	11,168,205	11,180,442	11,089,148
Total fertility rate										
Stacionary population model	2.08	2.03	1.97	1.93	1.93	1.95	1.96	1.98	1.99	2.00
No migration	1.42	2.03	2.27	2.51	2.64	2.78	2.08	1.38	1.38	1.38
High fertility	1.42	1.70	1.80	1.90	2.00	2.00	2.00	2.00	2.00	2.00
Medium fertility	1.42	1.60	1.65	1.70	1.70	1.70	1.70	1.70	1.70	1.70
Low fertility	1.42	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Live Births										
Stacionary population model	135,263	131,824	128,480	125,599	123,122	121,007	119,223	117,743	116,545	115,607
No migration	108,673	126,389	109,786	137,310	152,700	155,817	134,710	100,570	100,713	89,404
High fertility	108,673	110,271	97,097	114,113	117,753	112,320	120,449	120,846	114,748	117,033
Medium fertility	108,673	104,502	91,660	105,462	101,552	96,497	102,447	101,692	96,727	95,202
Low fertility	108,673	92,353	81,049	90,498	83,580	78,830	82,613	81 041	77,503	76,036
Net migration										
Stacionary population model	0	0	0	0	0	0	0	0	0	0
No migration	0	0	0	0	0	0	0	0	0	0
High fertility	16,889	21,542	23,339	25,137	26,194	27,252	16,539	5,826	2,913	0
Medium fertility	16,889	27,876	32,121	36,365	38,862	41,359	39,509	37,659	26,626	15,594
Low fertility	16,889	37,102	44,911	52,721	57,314	61,908	63,144	64,379	55,172	45,965

Table 6 **Projection of the convergence of the total number of inhibitants with the model population** (Continued)

Variant	2011	2020	2030	2040	2050	2060	2070	2080	2090	2100
Average age (as of 31 December)										
Stacionary population model	40.1	40.5	41.4	42.5	43.5	44.6	45.5	46.2	46.8	47.2
No migration	41.1	42.7	44.3	45.0	44.3	43.4	42.8	43.3	44.8	47.0
High fertility	41.1	42.8	44.8	46.0	46.3	46.6	46.6	46.2	46.5	47.0
Medium fertility	41.1	42.9	45.0	46.3	47.1	47.9	48.1	48.1	48.6	49.4
Low fertility	41.1	43.1	45.4	47.1	48.2	49.5	50.1	50.4	51.0	51.8
Persons aged 20–64 years (as of 31 December)										
Stacionary population model	5,840,727	5,853,919	5,881,069	5,892,150	5,864,868	5,803,097	5,711,339	5,598,250	5,494,127	5,403,894
No migration	6,721,663	6,160,188	5,827,058	5,430,988	5,004,870	4,995,986	5,529,253	5,917,657	6,141,909	6,192,031
High fertility	6,721,663	6,306,679	6,181,298	5,910,915	5,523,359	5,435,559	5,661,473	5,548 629	5,452,445	5,484,891
Medium fertility	6,721,663	6,332,869	6,277,137	6,066,735	5,718,744	5,642,609	5,837,561	5,731,234	5,651,291	5,578,389
Low fertility	6,721,663	6,371,016	6,416,734	6,274,723	5,953,959	5,869,914	5,992,599	5,816,701	5,744,592	5,659,081
Proportion of persons aged 0–19 years (as of 31 December, in %)										
Stacionary population model	25.7	25.3	24.5	23.5	22.7	22.1	21.7	21.3	21.1	21.0
No migration	19.8	21.2	21.9	22.4	24.9	27.0	26.4	23.3	19.7	17.7
High fertility	19.8	20.5	19.8	19.3	20.5	21.0	20.9	21.5	21.6	21.0
Medium fertility	19.8	20.2	19.1	18.2	18.7	18.6	18.1	18.5	18.3	17.7
Low fertility	19.8	19.7	17.6	16.2	16.3	15.7	15.0	15.2	15.0	14.5
Proportion of persons aged 20–64 years (as of 31 December, in %)										
Stacionary population model	55.6	55.3	54.8	54.1	53.2	52.3	51.2	50.1	49.3	48.7
No migration	64.0	58.1	54.8	51.1	46.2	45.0	49.1	52.8	55.1	55.8
High fertility	64.0	59.0	57.3	54.5	50.2	48.9	50.9	49.9	49.1	49.5
Medium fertility	64.0	59.3	58.1	55.7	51.8	50.8	52.5	51.3	50.5	50.3
Low fertility	64.0	59.7	59.5	57.6	54.0	52.9	53.8	52.1	51.4	51.0

(Continued)

Variant	2011	2020	2030	2040	2050	2060	2070	2080	2090	2100
Proportion of persons aged 65 years and older (as of 31 December, in %)										
Stacionary population model	18.7	19.4	20.8	22.4	24.0	25.6	27.2	28.6	29.6	30.3
No migration	16.2	20.7	23.2	26.5	28.9	28.0	24.5	23.9	25.2	26.4
High fertility	16.2	20.5	22.9	26.2	29.3	30.0	28.2	28.6	29.3	29.6
Medium fertility	16.2	20.5	22.9	26.2	29.4	30.6	29.4	30.2	31.1	32.0
Low fertility	16.2	20.6	23.0	26.3	29.8	31.5	31.1	32.7	33.6	34.4
Ratio of 65+/20–64 (in %)										
Stacionary population model	33.6	35.0	37.9	41.4	45.1	49.0	53.0	57.0	60.0	62.1
No migration	25.3	35.6	42.3	51.8	62.5	62.2	49.8	45.3	45.7	47.3
High fertility	25.3	34.8	40.0	48.1	58.3	61.3	55.5	57.3	59.6	59.8
Medium fertility	25.3	34.6	39.4	47.0	56.7	60.3	56.1	58.9	61.6	63.5
Low fertility	25.3	34.4	38.6	45.6	55.1	59.6	57.8	62.8	65.4	67.5
Ratio of persons in retirement age/persons in productive age (in %)										
Stacionary population model	46.5	41.7	37.9	37.2	36.7	36.6	36.0	35.6	34.5	33.1
No migration	38.8	42.7	42.3	44.9	50.7	48.9	37.3	28.8	25.8	26.2
High fertility	38.8	41.7	40.0	41.8	47.2	47.1	39.8	35.2	33.9	32.8
Medium fertility	38.8	41.5	39.4	40.8	45.9	46.0	39.7	35.8	34.9	34.2
Low fertility	38.8	41.3	38.6	39.7	44.5	45.0	40.2	37.6	37.2	35.9

Source: Authors' calculations.

The first two characteristics, then, concern the size of the population while the last two are characteristics of its structure and the extent of population ageing.

By calculating the population projection we shall show what the fertility or migration trends would have to be in order for the value of the selected characteristic would be equal in 2060 and 2100 to the corresponding value of the model population. We expect a somewhat linear trend in the values of the total fertility rate (or of the values of net migration), with points of change of the linear trend occurring in the years 2020, 2040, 2060 and 2080. Net migration is expected always to be positive or zero. The annual change in the total fertility rate (in the variant without migration) and the annual change in the amount of net migration was always set so that the value of the characteristic tracked would be equal in 2060 and 2100 to the corresponding value for the model population, or (if it was not possible to achieve equality) so that the difference would be as small as possible.

The main results are given in Table 6 – Table 9.

Convergence of the total number of inhabitants with the model population

Given the relatively small number of persons under the age of 20 and the low fertility in the next few decades there is a risk of a decline in the number of inhabitants of the Czech Republic. If the number of inhabitants were to converge with the model population without migration, then total fertility rate would have to rise in the next 50 years to almost 2.8 (which is an unrealistically high value), and in subsequent years there might be a decline. In addition, this would result either in a marked increase in the number of inhabitants (if fertility remained high also in the second half of the century) or in further irregularities in the age structure (if in the second half of the century fertility declined further so that it restricted further growth in the number of inhabitants).

The number of migrants required in order for the size of the population of the Czech Republic to converge with that of the model stationary population is relatively low. Understandably, this depends first and foremost on which variant of the fertility trend can be expected.

In the variant with a high fertility it would be sufficient to have an increase in net migration to just under 30,000 persons a year, which corresponds to the expected net migration in the medium variant of population projection by Burcin and Kučera (see *Burcin – Kučera*, 2010). Later net migration could drop to zero. In the medium variant of fertility, the net migration in roughly 50 years would have to be around 40,000 persons, which is the expected level of net migration in the high variant of a projection by the Czech Statistical Office (*CZSO*, 2009). In the low variant of fertility, an annual net migration of around 60,000 persons a year would be needed. No recent estimated projections of the Czech population envision such a high net migration.

In all the variants with migration the number and the proportion of persons aged 20–64 would be higher than in the model population. We find that the highest numbers are in the variant with low fertility. This is a logical consequence of the fact that this variant assumes the highest immigration and the majority of immigrants are persons aged 20–64. On the other hand it is understandable that in the variant with the lowest fertility (and consequently with the highest immigration) the population will age most rapidly (see Table 6).

Convergence of the number of people aged 20–64 with the number in the model population

This age group can be considered to be the group of economically active people in the population. At present the number of people in this group in the Czech Republic is considerably higher than in the model population, where we assume a stationary age structure. Given the small number of persons of preproductive age and the low fertility at present time, however, it is possible to expect the number of people in this age group to decline substantially in the future.

If the number of people aged 20–64 were to be maintained without migration at the level of the model population, total fertility rate would have to rise in the next 30 years to a value greater than 3, and then in subsequent years it could, on the contrary, drop again to a relatively low value. Once again, this is not realistic scenario, and like in the preceding case it would have the result of either considerably increasing population size or perpetuating irregularities in the age structure.

Table 7 **Convergence of the number of people aged 20–64 with the number in the model population**

Variant	2011	2020	2030	2040	2050	2060	2070	2080	2090	2100
Population as of 31 December										
Stacionary population model	10,500,000	10,581 467	10,737,448	10,890,966	11,016,883	11,106,278	11,156,532	11,168,205	11,144,045	11,089,148
No migration	10,505,445	10,776 340	11,092,108	11,429,548	11,836,318	11,728,561	11,336,029	11,023,184	10,615,132	10,097,311
High fertility	10,505,445	10,717 088	10,904,515	11,080,490	11,375,338	11,668,242	11,493,897	11,332,775	11,243,285	11,176,749
Medium fertility	10,505,445	10,700,528	10,861,781	10,999,627	11,193,619	11,344,398	11,370,544	11,255,735	11,079,085	10,909,389
Low fertility	10,505,445	10,662,951	10,772,640	10,856,872	10,962,458	11,010,268	10,972,754	10,875,049	10,770,015	10,668,635
Total fertility rate										
Stacionary population model	2.08	2.03	1.97	1.93	1.93	1.95	1.96	1.98	1.99	2.00
No migration	1.42	2.55	2.85	3.15	2.17	1.19	1.19	1.19	1.19	1.19
High fertility	1.42	1.70	1.80	1.90	2.00	2.00	2.00	2.00	2.00	2.00
Medium fertility	1.42	1.60	1.65	1.70	1.70	1.70	1.70	1.70	1.70	1.70
Low fertility	1.42	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Live Births										
Stacionary population model	135,263	131,824	128,480	125,599	123,122	121,007	119,223	117,743	116,545	115,607
No migration	108,673	158,846	138,114	180,636	151,212	84,106	95,174	84,952	57,814	53,160
High fertility	108,673	110,934	99,625	118,206	123,806	120,664	120,228	120,365	117,246	116,299
Medium fertility	108,673	104,778	92,685	107,080	103,808	99,558	104,437	99,688	93,056	93,495
Low fertility	108,673	92,250	80,679	89,932	82,802	77,802	80,720	77,276	73,207	73,479
Net migration										
Stacionary population model	0	0	0	0	0	0	0	0	0	0
No migration	0	0	0	0	0	0	0	0	0	0
High fertility	16,889	27,053	30,980	34,906	37,216	39,526	0	0	0	0
Medium fertility	16,889	30,313	35,499	40,686	43,737	46,787	32,402	18,016	18,016	18,016
Low fertility	16,889	36,066	43,475	50,884	55,242	59,601	55,161	50,722	50,722	50,722

Table 7 **Convergence of the number of people aged 20–64 with the number in the model population** (Continued)

Variant	2011	2020	2030	2040	2050	2060	2070	2080	2090	2100
Average age (as of 31 December)										
Stacionary population model	40.1	40.5	41.4	42.5	43.5	44.6	45.5	46.2	46.8	47.2
No migration	41.1	42.0	42.8	42.6	42.1	43.5	45.3	46.7	49.4	53.0
High fertility	41.1	42.8	44.6	45.7	45.9	46.2	46.6	46.7	46.9	47.3
Medium fertility	41.1	42.9	44.9	46.2	46.9	47.7	48.1	48.3	49.1	49.9
Low fertility	41.1	43.1	45.5	47.1	48.3	49.5	50.3	50.7	51.4	52.0
Persons aged 20–64 years (as of 31 December)										
Stacionary population model	5,840,727	5,853,919	5,881,069	5,892,150	5,864,868	5,803,097	5,711,339	5,598,250	5,494,127	5,403,894
No migration	6,721,663	6,160,188	5,827,058	5,603,003	5,471,218	5,803,097	6,535,217	6,486,286	5,896,258	5,403,894
High fertility	6,721,663	6,329,466	6,264,685	6,076,022	5,787,552	5,803,097	5,820,953	5,604,779	5,445,237	5,432,861
Medium fertility	6,721,663	6,342,946	6,314,013	6,139,702	5,834,978	5,803,097	5,976,190	5,733,149	5,518,453	5,403,894
Low fertility	6,721,663	6,366,732	6,401,057	6,243,743	5,904,996	5,803,097	5,882,516	5,612,763	5,471,263	5,403,894
Proportion of persons aged 0–19 years (as of 31 December, in %)										
Stacionary population model	25.7	25.3	24.5	23.5	22.7	22.1	21.7	21.3	21.1	21.0
No migration	19.8	22.5	25.2	26.4	27.4	24.0	18.0	16.5	15.2	12.2
High fertility	19.8	20.5	19.9	19.4	20.6	21.2	21.1	21.2	21.3	21.0
Medium fertility	19.8	20.2	19.1	18.2	18.8	18.6	18.2	18.4	18.1	17.4
Low fertility	19.8	19.7	17.6	16.1	16.2	15.6	15.0	15.1	14.8	14.4
Proportion of persons aged 20–64 years (as of 31 December, in %)										
Stacionary population model	55.6	55.3	54.8	54.1	53.2	52.3	51.2	50.1	49.3	48.7
No migration	64.0	57.2	52.5	49.0	46.2	49.5	57.6	58.8	55.5	53.5
High fertility	64.0	59.1	57.5	54.8	50.9	49.7	50.6	49.5	48.4	48.6
Medium fertility	64.0	59.3	58.1	55.8	52.1	51.2	52.6	50.9	49.8	49.5
Low fertility	64.0	59.7	59.4	57.5	53.9	52.7	53.6	51.6	50.8	50.7

(Continued)

Variant	2011	2020	2030	2040	2050	2060	2070	2080	2090	2100
Proportion of persons aged 65 years and older (as of 31 December, in %)										
Stacionary population model	18.7	19.4	20.8	22.4	24.0	25.6	27.2	28.6	29.6	30.3
No migration	16.2	20.3	22.2	24.6	26.4	26.5	24.3	24.7	29.2	34.3
High fertility	16.2	20.5	22.7	25.7	28.5	29.1	28.3	29.4	30.3	30.4
Medium fertility	16.2	20.5	22.8	26.0	29.1	30.2	29.2	30.6	32.1	33.0
Low fertility	16.2	20.6	23.0	26.4	29.9	31.7	31.4	33.3	34.4	35.0
Ratio of 65+/20–64 (in %)										
Stacionary population model	33.6	35.0	37.9	41.4	45.1	49.0	53.0	57.0	60.0	62.1
No migration	25.3	35.6	42.3	50.2	57.2	53.5	42.2	41.9	52.6	64.1
High fertility	25.3	34.6	39.5	46.9	56.0	58.4	55.9	59.4	62.6	62.5
Medium fertility	25.3	34.6	39.2	46.5	55.8	59.0	55.6	60.1	64.5	66.7
Low fertility	25.3	34.4	38.7	45.8	55.5	60.1	58.5	64.5	67.7	69.1
Ratio of persons in retirement age/persons in productive age (in %)										
Stacionary population model	46.5	41.7	37.9	37.2	36.7	36.6	36.0	35.6	34.5	33.1
No migration	38.8	42.7	42.3	43.6	46.7	42.6	31.9	26.4	26.7	32.1
High fertility	38.8	41.6	39.5	40.8	45.4	44.7	39.7	36.3	35.5	34.6
Medium fertility	38.8	41.5	39.2	40.4	45.1	45.0	39.3	36.4	36.3	35.8
Low fertility	38.8	41.3	38.7	39.8	44.8	45.4	40.7	38.5	38.5	36.9

Source: Authors' calculations.

It is therefore far more realistic to try to preserve the number of people aged 20–64 by increasing of migration. In the high fertility variant it would be sufficient around 2060 to have a net migration of around 40,000 persons, and in subsequent years migration would no longer be necessary (given the relatively high fertility rate). In the medium fertility variant net migration would have to rise gradually over the next 50 years to more than 45,000 persons, which is the rate of net migration in the high variant of Burcin and Kučera's projection (*Burcin – Kučera*, 2010). In the low variant it would have to rise to as much as 60,000 persons annually. In the second half of the century it would then be possible gradually to reduce net migration.

In all the variants with migration the population size would grow, but (with the exception of the high fertility variant) it would not reach the level for a stationary population (see Table 7).

Convergence of the average age with that in the model population

It is impossible to stabilise the average age of the population without a steady and marked increase in the number of inhabitants, so it is not even realistic. Let us therefore deal with the question of whether it is possible at least to bring the average age closer to the average age of the model population.

At present the average age is already roughly 1 year higher than that of the model population. If it were to converge by 2060 with the model's average age without migration, then the total fertility rate would have to rise gradually to 2.6 in order to offset the small number of women of reproductive age. In subsequent years lower fertility would then be enough to maintain the average age at the level in the model. This increase in fertility, however, is clearly not realistic.

If migration were to contribute to achieving the model average age it would have to occur at a rate far higher than that needed to maintain the size of the population. Even in the variant with high fertility net migration would have to rise by 2060 to almost 100,000 persons a year, a value more than twice as high as the rate of net migration expected in the high variant of Burcin and Kučera's projection (see *Burcin – Kučera*, 2010). But then in subsequent years migration would almost be unnecessary. The population size would grow to 15 million. In the medium variant net migration would have to rise to almost 180,000 and even at the end of the century it could not be allowed to drop below 140,000 persons a year. In the low variant net migration would have to rise by 2060 to more than 330,000 persons per annum, and owing to the constantly low fertility rate it would have to continue to grow. At the end of the century the annual migration increment would have to be more than half a million (see Table 8).

This development is clearly not realistic, and in the medium fertility variant it would moreover also mean increasing the number of inhabitants of the Czech Republic to 25 million by the end of the century, while in the low fertility variant the required increase would actually be as much as 40 million.

The analysis shows that not only is migration unable to stop the ageing of the population, but even its ability to slow down the ageing of the population (to a level corresponding to development with fertility at the replacement level) is very limited when accompanied by a low or medium fertility. This is a logical consequence of the fact that the 'best' way to minimise the average age is to maximise the number of people of young age, i.e. to maximise the share of children in the population.

Convergence of the ratio of people aged 65 years and older to people aged 20–64 to the ratio in the model population

The situation in this case is similar to that in the preceding case and migration has only a limited ability to reduce this ratio.

At present the ratio is roughly 8 percentage points lower than in the model population. This is mainly a consequence of the baby boom in the 1970s and the baby boom after the Second World War, which peaked in 1947 and then continued in further years. It is the strong cohorts born after the Second World War, however, who will soon be reaching the age of 65 (i.e. exiting the productive age group). The cohorts under the age of 20 are, on the contrary, very small in number, so the next few years will see a relatively rapid rise in the observed ratio.

Table 8 **Projection of the convergence of the average age to the average age of the model population**

Variant	2011	2020	2030	2040	2050	2060	2070	2080	2090	2100
Population as of 31 December										
Stacionary population model	10,500,000	10,581,467	10,737,448	10,890,966	11,016,883	11,106,278	11,156,532	11,168,205	11,144,045	11,089,148
No migration	10,505,445	10,574,497	10,537,845	10,456,737	10,533,718	10,642,747	10,635,203	10,509,575	10,404,151	10,325,574
High fertility	10,505,445	10,856,980	11,435,176	12,177,033	13,181,472	14,320,256	15,240,773	15,656,969	15,765,324	15,826,931
Medium fertility	10,505,445	11,016,918	12,051,722	13,438,805	15,169,629	17,112,076	19,107,844	21,024,070	22,805,512	24,406,024
Low fertility	10,505,445	11,322,990	13,218,700	15,812,670	18,966,347	22,504,035	26,392,903	30,603,312	35,314,441	40,723,521
Total fertility rate										
Stacionary population model	2.08	2.03	1.97	1.93	1.93	1.95	1.96	1.98	1.99	2.00
No migration	1.42	1.94	2.15	2.35	2.47	2.59	2.03	1.48	1.48	1.48
High fertility	1.42	1.70	1.80	1.90	2.00	2.00	2.00	2.00	2.00	2.00
Medium fertility	1.42	1.60	1.65	1.70	1.70	1.70	1.70	1.70	1.70	1.70
Low fertility	1.42	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Live Births										
Stacionary population model	135,263	131,824	128,480	125,599	123,122	121,007	119,223	117,743	116,545	115,607
No migration	108,673	120,879	103,832	127,693	137,214	136,884	122,018	97,090	95,647	86,777
High fertility	108,673	114,062	111,555	137,523	152,371	160,043	173,867	169,327	162,432	167,393
Medium fertility	108,673	111,458	117,507	146,282	158,464	173,695	196,191	207,716	217,152	229,550
Low fertility	108,673	104,533	124,932	157,676	175,942	200,892	233,253	261,693	296,916	343,822
Net migration										
Stacionary population model	0	0	0	0	0	0	0	0	0	0
No migration	0	0	0	0	0	0	0	0	0	0
High fertility	16,889	53,061	67,036	81,011	89,232	97,453	48,726	0	0	0
Medium fertility	16,889	89,344	117,338	145,332	161,800	178,267	169,320	160,373	151,427	142,480
Low fertility	16,889	160,102	215,434	270,767	303,315	335,864	372,318	408,773	485,614	562,455

Table 8 **Projection of the convergence of the average age to the average age of the model population** (Continued)

Variant	2011	2020	2030	2040	2050	2060	2070	2080	2090	2100
Average age (as of 31 December)										
Stacionary population model	40.1	40.5	41.4	42.5	43.5	44.6	45.5	46.2	46.8	47.2
No migration	41.1	42.8	44.6	45.5	45.1	44.6	44.1	44.2	45.4	47.2
High fertility	41.1	42.6	44.0	44.5	44.5	44.6	44.7	45.3	46.3	47.2
Medium fertility	41.1	42.4	43.5	43.9	44.1	44.6	45.0	45.6	46.4	47.2
Low fertility	41.1	42.2	42.8	43.1	43.6	44.6	45.4	46.2	46.9	47.2
Persons aged 20–64 years (as of 31 December)										
Stacionary population model	5,840,727	5,853,919	5,881,069	5,892,150	5,864,868	5,803,097	5,711,339	5,598,250	5,494,127	5,403,894
No migration	6,721,663	6,160,188	5,827,058	5,401,787	4,919,041	4,834,628	5,241,389	5,464,229	5,585,217	5,618,313
High fertility	6,721,663	6,437,001	6,658,203	6,855,189	7,034,329	7,537,574	8,129,776	8,056,661	7,860,432	7,758,119
Medium fertility	6,721,663	6,587,023	7,207,202	7,907,091	8,650,366	9,690,381	10,852,503	11,630,508	12,371,016	13,024,295
Low fertility	6,721,663	6,879,584	8,277,817	9,952,619	11,766,586	13,802,181	15,924,171	17,939,985	20,441,172	23,439,594
Proportion of persons aged 0–19 years (as of 31 December, in %)										
Stacionary population model	25.7	25.3	24.5	23.5	22.7	22.1	21.7	21.3	21.1	21.0
No migration	19.8	21.0	21.3	21.4	23.6	25.4	24.8	22.6	19.9	18.2
High fertility	19.8	20.5	20.1	20.0	21.2	21.8	21.8	22.0	21.4	20.8
Medium fertility	19.8	20.3	19.5	19.4	19.9	19.7	19.4	19.4	19.0	18.5
Low fertility	19.8	19.8	18.4	18.0	18.0	17.4	16.9	16.7	16.3	16.2
Proportion of persons aged 20–64 years (as of 31 December, in %)										
Stacionary population model	55.6	55.3	54.8	54.1	53.2	52.3	51.2	50.1	49.3	48.7
No migration	64.0	58.3	55.3	51.7	46.7	45.4	49.3	52.0	53.7	54.4
High fertility	64.0	59.3	58.2	56.3	53.4	52.6	53.3	51.5	49.9	49.0
Medium fertility	64.0	59.8	59.8	58.8	57.0	56.6	56.8	55.3	54.2	53.4
Low fertility	64.0	60.8	62.6	62.9	62.0	61.3	60.3	58.6	57.9	57.6

(Continued)

Variant	2011	2020	2030	2040	2050	2060	2070	2080	2090	2100
Proportion of persons aged 65 years and older (as of 31 December, in %)										
Stacionary population model	18.7	19.4	20.8	22.4	24.0	25.6	27.2	28.6	29.6	30.3
No migration	16.2	20.7	23.4	26.9	29.7	29.2	25.9	25.4	26.5	27.4
High fertility	16.2	20.2	21.7	23.7	25.4	25.6	24.9	26.6	28.7	30.2
Medium fertility	16.2	19.9	20.7	21.8	23.0	23.7	23.8	25.3	26.8	28.1
Low fertility	16.2	19.4	19.0	19.1	19.9	21.3	22.8	24.7	25.8	26.3
Ratio of 65+/20–64 (in %)										
Stacionary population model	33.6	35.0	37.9	41.4	45.1	49.0	53.0	57.0	60.0	62.1
No migration	25.3	35.6	42.3	52.1	63.6	64.3	52.6	48.9	49.3	50.3
High fertility	25.3	34.1	37.3	42.0	47.6	48.6	46.7	51.6	57.6	61.6
Medium fertility	25.3	33.3	34.6	37.0	40.4	41.8	41.9	45,7	49.4	52.7
Low fertility	25.3	32.0	30.3	30.3	32.2	34.7	37.8	42.2	44.5	45.7
Ratio of persons in retirement age/persons in productive age (in %)										
Stacionary population model	46.5	41.7	37.9	37.2	36.7	36.6	36.0	35.6	34.5	33.1
No migration	38.8	42.7	42.3	45.1	51.6	50.4	39.1	30.9	28.1	28.0
High fertility	38.8	40.9	37.3	36.6	38.6	36.8	32.4	31.1	31.9	32.5
Medium fertility	38.8	39.9	34.6	32.3	32.7	31.0	28.2	27.3	27.2	26,9
Low fertility	38.8	38.2	30.3	26.5	25.8	25.0	24.4	24.7	24.3	23.0

Source: Authors' calculations.

It is almost impossible to maintain the ratio of people aged 65+ to people aged 20–64 level with the ratio in the model population up to the year 2060 without migration. The increasing of fertility will of course only influence this ratio in 20 years' time. By 2040 the total fertility rate would therefore have to increase to 3.6, but in the second half of the century there could, on the contrary, be a drop in fertility, which would cause further irregularities in the age structure.

If migration were to contribute to maintaining the age ratio at the same level as that in the model population, it would have to reach values similar to those described in the preceding case. In the high fertility variant net migration around 2060 would have to be around 95,000 persons a year, in the medium variant it would have to be higher than 100,000, and in the low variant it would have to come close to 130,000. These values are a little bit lower than in the preceding case of a convergence of the average age, but net migration is still 2–3 times higher than the high variants in current population projections. In subsequent years there could then be a reduction in migration, which in the case of high fertility could even be zero (see Table 9).

This development would again bring about an increase in the population size of the Czech Republic, although nothing like as great as in the preceding case. The number of citizens of the Czech Republic at the end of the century would be something over 15 million in all three variants.

CONCLUSION

This analysis confirms that it is almost impossible to stabilise the number and sex-and-age structure of the population of the Czech Republic without migration. The chief cause is the irregular age structure as a consequence of development in the last century, when strong and weak generations alternated. The currently small number of persons under the age of 20 will result in a further drop in the number of births and in the future could only be offset without migration through an increase in the total fertility rate well above the replacement level. This is not realistic and it would result either in a considerable increase in the number of inhabitants (if such high fertility continued to be maintained) or in continued irregularities in the age structure (if fertility dropped again in the second half of this century well below the replacement level).

Migration may, therefore, significantly contribute to stabilising demographic development in the Czech Republic. The number of migrants necessary to maintain or even slightly increase the population size of the Czech Republic amounts to some tens of thousands of migrants per annum, even under the assumption that there is no increase in the current low level of fertility.

On the other hand, the ability of migration to slow down population ageing and maintain it at the optimal level (corresponding to replacement level fertility) is limited. Given the currently low fertility, the annual number of migrants in the future would have to over 100,000. This would naturally lead not only to an increase in the number of inhabitants, but also to a considerable increase in the proportion of foreigners in the Czech population.

And there arises the important question of whether Czech society would be able to accept the increasing proportion of immigrants and their descendants in the population. Even according to the projection of the convergence of the number of inhabitants to the model population (where net migration is relatively low) the proportion of immigrants and their descendants in the Czech population in 2100 in the high fertility variant would be greater than 20%, in the medium fertility variant greater than 35%, and in the low fertility variant greater than 50% of the population. In the other projections the proportion of immigrants and their descendants would be even greater.

The best contribution to optimal population development would therefore be the gradual increase in fertility to a total fertility rate close to 2.0 and the currently constant rate of immigration from abroad, the volume of which could later gradually be reduced.

Table 9 **Projection of the convergence of the ratio of people aged 65 and older to the people aged 20–64 with the ratio in the model population**

Variant	2011	2020	2030	2040	2050	2060	2070	2080	2090	2100
Population as of 31 December										
Stacionary population model	10,500,000	10,581,467	10,737,448	10,890,966	11,016,883	11,106,278	11,156,532	11,168,205	11,144,045	11,089,148
No migration	10,505,445	10,878,173	11,380,946	11,962,565	12,691,350	12,740,581	12,389,736	12,137,447	11,739,661	11,168,408
High fertility	10,505,445	10,849,262	11,405,899	12,116,535	13,081,825	14,173,941	15,010,995	15,299,164	15,375,321	15,422,473
Medium fertility	10,505,445	10,843,185	11,398,312	12,099,426	12,986,359	13,944,982	14,759,071	15,249,070	15,537,159	15,767,670
Low fertility	10,505,445	10,824,344	11,370,753	12,068,667	12,919,575	13,820,733	14,647,400	15,309,972	15,860,410	16,332,579
Total fertility rate										
Stacionary population model	2.08	2.03	1.97	1.93	1.93	1.95	1.96	1.98	1.99	2.00
No migration	1.42	2.86	3.24	3.62	2.35	1.08	1.08	1.08	1.08	1.08
High fertility	1.42	1.70	1.80	1.90	2.00	2.00	2.00	2.00	2.00	2.00
Medium fertility	1.42	1.60	1.65	1.70	1.70	1.70	1.70	1.70	1.70	1.70
Low fertility	1.42	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Live Births										
Stacionary population model	135,263	131,824	128,480	125,599	123,122	121,007	119,223	117,743	116,545	115,607
No migration	108,673	178,001	157,004	212,983	180,759	86,953	101,302	91,089	57,451	51,247
High fertility	108,673	113,889	110,897	136,457	150,795	157,871	170,284	163,548	158,568	163,424
Medium fertility	108,673	107,790	103,877	124,756	128,452	132,986	143,467	139,980	136,037	139,829
Low fertility	108,673	95,254	91,500	106,497	105,577	107,900	116,142	115,626	114,908	118,384
Net migration										
Stacionary population model	0	0	0	0	0	0	0	0	0	0
No migration	0	0	0	0	0	0	0	0	0	0
High fertility	16,889	51,626	65,047	78,468	86,362	94,257	40,313	0	0	0
Medium fertility	16,889	56,929	72,400	87,870	96,970	106,070	77,524	48,978	48,978	48,978
Low fertility	16,889	66,395	85,522	104,650	115,901	127,153	116,548	105,944	105,944	105,944

Table 9 **Projection of the convergence of the ratio of people aged 65 and older to the people aged 20–64 with the ratio in the model population** (Continued)

Variant	2011	2020	2030	2040	2050	2060	2070	2080	2090	2100
Average age (as of 31 December)										
Stacionary population model	40.1	40.5	41.4	42.5	43.5	44.6	45.5	46.2	46.8	47.2
No migration	41.1	41.7	41.9	41.3	40.3	41.8	44.1	46,0	49,3	53,5
High fertility	41.1	42.6	44.0	44.6	44.5	44.6	44.8	45,5	46,5	47,3
Medium fertility	41.1	42.7	44.2	45.0	45.4	45.9	46.4	47,1	48,1	49,0
Low fertility	41.1	42.8	44.7	45.8	46.6	47.6	48.3	49,0	49,9	50,7
Persons aged 20–64 years (as of 31 December)										
Stacionary population model	5,840,727	5,853,919	5,881,069	5,892,150	5,864,868	5,803,097	5,711,339	5,598,250	5,494,127	5,403,894
No migration	6,721,663	6,160,188	5,827,058	5,704,520	5,758,979	6,333,804	7,385,310	7,464,723	6,747,706	6,125,340
High fertility	6,721,663	6,431,068	6,636,492	6,812,202	6,965 543	7,441,880	7,983,269	7,832,214	7,639,877	7,535,627
Medium fertility	6,721,663	6,452,997	6,716,742	6,936,599	7,104,406	7,555,831	8,093,246	8,077,707	8,013,784	7,998,281
Low fertility	6,721,663	6,492,135	6,859,964	7,150,640	7,338,276	7,759,039	8,258,490	8,321,010	8,443,230	8,575,809
Proportion of persons aged 0–19 years (as of 31 December, in %)										
Stacionary population model	25.7	25.3	24.5	23.5	22.7	22.1	21.7	21.3	21.1	21.0
No migration	19.8	23.2	27.1	28.8	30.0	25.9	18.1	15,9	14,6	11,1
High fertility	19.8	20.5	20.1	20.0	21.2	21.7	21.7	21,9	21,3	20,8
Medium fertility	19.8	20.3	19.3	18.8	19.4	19.2	18.9	18,9	18,3	17,8
Low fertility	19.8	19.7	17.8	16.7	16.9	16.3	15.8	15,8	15,3	14,9
Proportion of persons aged 20–64 years (as of 31 December, in %)										
Stacionary population model	55.6	55.3	54.8	54.1	53.2	52.3	51.2	50.1	49.3	48.7
No migration	64.0	56.6	51.2	47.7	45.4	49.7	59.6	61,5	57,5	54,8
High fertility	64.0	59.3	58.2	56.2	53.2	52.5	53.2	51,2	49,7	48,9
Medium fertility	64.0	59.5	58.9	57.3	54.7	54.2	54.8	53,0	51,6	50,7
Low fertility	64.0	60.0	60.3	59.2	56.8	56.1	56.4	54,4	53,2	52,5

(Continued)

Variant	2011	2020	2030	2040	2050	2060	2070	2080	2090	2100
Proportion of persons aged 65 years and older (as of 31 December, in %)										
Stacionary population model	18.7	19.4	20.8	22.4	24.0	25.6	27.2	28.6	29.6	30.3
No migration	16.2	20.1	21.7	23.5	24.6	24.4	22.2	22.6	27.9	34.1
High fertility	16.2	20.2	21.7	23.8	25.5	25.8	25.1	26.9	29.0	30.4
Medium fertility	16.2	20.2	21.8	23.9	25.9	26.6	26.3	28.1	30.1	31.5
Low fertility	16.2	20.3	21.8	24.0	26.3	27.5	27.8	29.9	31.5	32.6
Ratio of 65+/20–64 (in %)										
Stacionary population model	33.6	35.0	37.9	41.4	45.1	49.0	53.0	57.0	60.0	62.1
No migration	25.3	35.6	42.3	49.3	54.3	49.0	37.3	36.7	48.6	62.1
High fertility	25.3	34.1	37.4	42.3	48.0	49.0	47.2	52.5	58.4	62.1
Medium fertility	25.3	34.0	37.0	41.6	47.3	49.0	47.9	53.0	58.3	62.1
Low fertility	25.3	33.8	36.2	40.5	46.4	49.0	49.3	55.0	59.1	62.1
Ratio of persons in retirement age/persons in productive age (in %)										
Stacionary population model	46.5	41.7	37.9	37.2	36.7	36.6	36.0	35.6	34.5	33.1
No migration	38.8	42.7	42.3	42.9	44.5	39.2	28.5	23.2	23.9	30.4
High fertility	38.8	40.9	37.4	36.8	38.9	37.2	32.7	31.6	32.4	32.9
Medium fertility	38.8	40.8	37.0	36.3	38.3	37.0	32.9	31.8	32.3	32.4
Low fertility	38.8	40.5	36.2	35.3	37.5	36.7	33.4	32.6	33.0	32.2

Source: Authors' calculations.

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THE FIRST FINAL RESULTS OF THE 2011 POPULATION AND HOUSING CENSUS

Pavel Čtrnáct

Starting on 3 October 2012 the Czech Statistical Office gradually releases the final results of the 2011 Population and Housing Census. The work on processing the census outcome is proceeding according to schedule. The results are available in *xml* and *xls* formats. Those interested in using these data will have at their disposal both statistical tables and dynamic outputs from the Public Database of the Czech Statistical Office; for the time being – with some exceptions – these data are only available in the Czech version. Results are available from the website of the Czech Statistical Office (www.czso.cz) and the census portal (www.scitani.cz). An English version of the tables is currently being prepared.

The data are processed in conformity with Conference of European Statisticians Recommendations for the 2010 Censuses of Population and Housing, Regulation (EC) No. 763/2008 of the European Parliament and of the Council on population and housing censuses and Eurostat guidelines for the censuses in 2010. The data will be submitted to Eurostat in the standard format (hypercubes) including metadata (Commission Regulation (EU) No. 519/2010) and to other international organisations. Users will also of course have access to the data in traditional formats. The Czech Statistical Office is a participant in the Census Hub project organised by Eurostat and will publish a 'Report on the Quality of the Census' in conformity with Commission Regulation (EU) No. 1151/2010. International compatibility and access of results has thus in every direction been ensured.

Print publications will only be published in Czech and with a limited print run. According to the schedule for publishing print and electronic publications, during October and November 2012 the results for the census themes of Population and Housing were posted on the website of the Czech Statistical Office, and by the end of 2012 data on households and women's fertility will also be posted. By March 2013 detailed data on communing to work and school will be released. In 2013 the traditional census publications will also be released: Reference Book on the 2011 Census and Statistical Lexicon of Municipalities. The Czech Statistical Office will also publish the Atlas of the 2011 Census Results, mapping the findings from the census, and Historical Lexicon of Municipalities, with data from as early as 1869, converted to the country's current territorial structure (this will be available only as an electronic publication). Because no English version of processed results is yet available online, in this issue of *Demografie* we provide readers with a selection of basic results for a general orientation.

Table 1 **Census results 1961–2011**

Date of census, intercensal change		Total population [1]	Males	Females	Index of masculinity
Date of census					
1 March 1961		9,571,531	4,640,631	4,930,900	941.1
1 December 1970		9,807,697	4,749,511	5,058,186	939.0
1 November 1980		10,291,927	4,988,095	5,303,832	940.5
3 March 1991		10,302,215	4,999,935	5,302,280	943.0
1 March 2001		10,230,060	4,982,071	5,247,989	949.3
26 March 2011		10,436,560	5,109,766	5,326,794	959.3
Intercensal change					
1961–1970	absolute	236,166	108,880	127,286	-2.1
	in %	102.5	102.3	102.6	x
1970–1980	absolute	484,230	238,584	245,646	1.5
	in %	104.9	105.0	104.9	x
1980–1991	absolute	10,288	11,840	-1,552	2.5
	in %	100.1	100.2	100.0	x
1991–2001	absolute	-72,155	-17,864	-54,291	6.3
	in %	99.2	99.6	99.0	x
2001–2011	absolute	206,500	127,695	78,805	10.0
	in %	102.0	102.6	101.5	x

Note: [1] Population with permanent residence in 1961–1991, population with permanent and long-term residence in 2001, population with usual residence in 2011.
Source: Czech statistical Office, www.czso.cz.

Table 2 **Population aged 15+ by economic activity and by educational attainment as of 26 March 2011**

Economic activity, educational attainment	Total	in %	Males	in %	Females	in %
Population aged 15+, total	**8,947,632**	**100.0**	**4,345,817**	**100.0**	**4,601,815**	**100.0**
Economic activity						
Ecomically active	5,080,573	56.8	2,750,039	63.3	2,330,534	50.7
of which:						
Employed	4,580,714	51.2	2,491,996	57.3	2,088,718	45.4
Employers	164,921	1.8	120,477	2.8	44,444	1.0
Employees	3,568,223	39.9	1,841,495	42.4	1,726,728	37.5
Own account workers	589,168	6.6	408,896	9.4	180,272	3.9
Unemployed	499,859	5.6	258,043	5.9	241,816	5.3
Not economically active	3,295,995	36.8	1,260,866	29.0	2,035,129	44.2
of which:						
Pensioners	2,308,294	25.8	882,539	20.3	1,425,755	31.0
Other with own source of livelihood	174,730	2.0	22,607	0.5	152,123	3.3
Economic activity not identified	571,064	6.4	334,912	7.7	236,152	5.1
Educational attainment						
Primary and not completed primary (ISCED 1,2)	1,571,602	17.6	579,016	13.3	992,586	21.6
Lower secondary (ISCED 3C)	2,952,112	33.0	1,703,103	39.2	1,249,009	27.1
Higher secondary and post-secondary (ISCED 3A, 3B, 4, 5B)	2,790,112	31.2	1,200,316	27.6	1,589,796	34.5
Tertiary (ISCED 5A, 6)	1,114,731	12.4	577,685	13.3	537,046	11.7
No formal education (ISCED 0)	42,384	0.5	19,698	0.5	22,686	0.5
Educational attainment not identified	476,691	5.3	265,999	6.1	210,692	4.6

Source: Czech Statistical Office, www.czso.cz.

Table 3 **Total population by citizenship, ethnicity and religious belief as of 26 March 2011**

Citizenship, ethnicity, religious belief	Total population	in %	Males	in %	Females	in %
Total population	**10,436,560**	**100.0**	**5,109,766**	**100.0**	**5,326,794**	**100.0**
Citizenship						
of which:						
Czech Republic	9,924,044	95.1	4,817,652	94.3	5,106,392	95.8
Other EU countries	150,571	1.4	88,584	1.7	61,987	1.2
of which:						
Germany	14,907	0.1	11,561	0.2	3,346	0.1
Poland	16,800	0.2	7,993	0.2	8,807	0.2
Slovakia	82,251	0.8	44,186	0.9	38,065	0.7
Other countries	271,705	2.6	153,719	3.0	117,986	2.2
of which:						
Russian Federation	31,545	0.3	14,264	0.3	17,281	0.3
Ukraine	116,139	1.1	66,573	1.3	49,566	0.9
Vietnam	52,612	0.5	30,996	0.6	21,616	0.4
Double citizenship	28,530	0.3	14,809	0.3	13,721	0.3
No citizenship	1,502	0.0	897	0.0	605	0.0
Citizenship not identified	60,208	0.6	34,105	0.7	26,103	0.5
Ethnicity [1)]						
of which:						
Czech	6,711,624	64.3	3,193,082	62.5	3,518,542	66.1
Moravian	521,801	5.0	272,026	5.3	249,775	4.7
Silesian	12,214	0.1	7,445	0.1	4,769	0.1
Slovak	147,152	1.4	70,840	1.4	76,312	1.4
Polish	39,096	0.4	16,696	0.3	22,400	0.4
German	18,658	0.2	9,166	0.2	9,492	0.2
Roma	5,135	0.0	2,876	0.0	2,259	0.0
Ukrainian	53,253	0.5	26,786	0.5	26,467	0.5
Vietnamese	29,660	0.3	16,854	0.3	12,806	0.2
Other or double ethnicity	255,301	2.5	134,340	2.6	120,961	2.3
Religious belief [1)]						
Believers identified with a church or religious society	1,463,584	14.0	643,382	12.6	820,202	15.4
of which:						
Roman Catholic Church	1,082,463	10.4	467,493	9.1	614,970	11.5
Czechoslovak Hussite Church	39,229	0.4	15,150	0.3	24,079	0.5
Evangelical Church of Czech Brethren	51,858	0.5	22,214	0.4	29,644	0.6
Believers not identified with a church or religious society	705,368	6.8	316,694	6.2	388,674	7.3
No religious belief	3,604,095	34.5	1,838,898	36.0	1,765,197	33.1

Note: [1)] According to the Census Act, filling the questions on ethnicity and religous belief were not obligatory.
Source: Czech Statistical Office, www.czso.cz.

Table 4 **Population by marital status and age as of 26 March 2011**

Sex, age	Total population	Never married	Married	Divorced	Widowed	Unknown	Registered partnership [1)]
Total population	**10,436,560**	**4,164,427**	**4,409,474**	**1,072,947**	**761,146**	**26,323**	**2,243**
Males	**5,109,766**	**2,287,597**	**2,211,579**	**466,461**	**126,475**	**16,086**	**1,568**
0–14	763,949	763,949	x	x	x	x	x
15–19	295,309	294,172	325	132	25	652	3
20–24	343,536	334,432	7,203	498	52	1,271	80
25–29	367,862	302,902	58,193	5,217	93	1,283	174
30–34	443,510	231,562	184,809	25,135	303	1,366	335
35–39	453,130	134,533	260,621	55,694	759	1,178	345
40–44	358,009	64,194	224,174	66,996	1,335	1,108	202
45–49	351,023	45,574	227,611	74,354	2,357	988	139
50–54	330,699	34,403	224,553	66,667	4,166	817	93
55–59	365,384	28,871	261,249	66,099	8,377	714	74
60–64	353,328	19,634	267,049	51,686	14,435	473	51
65–69	254,313	10,420	198,533	28,359	16,682	288	31
70–74	165,376	5,353	129,639	12,996	17,185	178	25
75–79	121,381	3,333	90,829	6,826	20,260	123	10
80–84	80,131	1,967	53,085	3,456	21,532	88	3
85–89	35,027	924	18,597	1,265	14,183	56	2
90+	7,897	222	2,917	237	4,490	30	1
Age unknown	19,902	11,152	2,192	844	241	5,473	–
Females	**5,326,794**	**1,876,830**	**2,197,895**	**606,486**	**634,671**	**10,237**	**675**
0–14	724,979	724,979	x	x	x	x	x
15–19	280,506	279,016	762	98	19	608	3
20–24	330,311	306,029	21,438	1,674	76	1,051	43
25–29	351,071	230,753	107,116	11,781	360	931	130
30–34	421,879	143,522	236,075	39,926	1,395	766	195
35–39	432,858	71,859	279,139	77,270	3,738	731	121
40–44	342,185	28,655	223,378	83,447	6,014	631	60
45–49	340,530	19,001	226,072	84,098	10,661	639	59
50–54	331,361	14,092	225,207	72,658	18,776	601	27
55–59	383,759	13,182	257,977	74,716	37,370	502	12
60–64	390,919	11,552	250,059	63,630	65,276	393	9
65–69	306,356	8,160	173,945	40,714	83,306	227	4
70–74	221,401	5,177	101,439	21,972	92,620	190	3
75–79	189,215	4,041	59,802	15,726	109,516	129	1
80–84	151,982	3,617	26,558	11,157	110,558	88	4
85–89	86,702	2,603	6,563	5,611	71,861	61	3
90+	25,055	863	626	1,328	22,203	34	1
Age unknown	15,725	9,729	1,739	680	922	2,655	–

Note: [1)] Minimal legal age for entering into registered partnership is 18 years.
Source: Czech Statistical Office, www.czso.cz.

Table 5 **Selected census results by regions as of 26 March 2011**

Czech Republic, region (NUTS 3)	Area (sq km)	Number of municipalities	Total population	Males	Females	Foreign citizens	Age groups						Average age (years)	Population per sq km
							0–14	in %	15–64	in %	65+ and unknown	in %		
Czech Republic	78,865	6,251	10,436,560	5,109,766	5,326,794	422,276	1,488,928	14.3	7,267,169	69.6	1,680,463	16.1	41.0	132
Praha (Capital of)	496	1	1,268,787	613,740	655,047	162,790	153,613	12.1	908,321	71.6	206,853	16.3	41.2	2,558
Středočeský kraj	11,015	1,145	1,289,217	637,252	651,965	55,492	199,306	15.5	895,024	69.4	194,887	15.1	40.3	117
Jihočeský kraj	10,057	623	628,334	308,296	320,038	13,979	91,117	14.5	435,187	69.3	102,030	16.2	41.2	62
Plzeňský kraj	7,561	501	570,400	282,134	288,266	25,559	79,468	13.9	396,468	69.5	94,464	16.6	41.4	75
Karlovarský kraj	3,314	132	295,594	145,483	150,111	16,600	42,158	14.3	207,480	70.2	45,956	15.5	41.0	89
Ústecký kraj	5,335	354	808,963	397,453	411,510	26,922	121,694	15.0	565,358	69.9	121,911	15.1	40.5	152
Liberecký kraj	3,163	215	432,443	211,539	220,904	14,768	64,601	14.9	301,267	69.7	66,575	15.4	40.7	137
Královéhradecký kraj	4,759	448	547,920	268,971	278,949	13,584	79,131	14.5	374,898	68.4	93,891	17.1	41.6	115
Pardubický kraj	4,519	451	511,627	252,308	259,319	12,339	75,093	14.7	352,543	68.9	83,991	16.4	41.0	113
Kraj Vysočina	6,796	704	505,562	250,191	255,371	7,487	73,795	14.6	347,663	68.8	84,104	16.6	41.1	74
Jihomoravský kraj	7,193	673	1,163,510	567,885	595,625	36,316	162,796	14.0	808,861	69.5	191,853	16.5	41.1	162
Olomoucký kraj	5,267	399	628,430	305,529	322,901	8,850	90,401	14.4	434,573	69.1	103,456	16.5	41.2	119
Zlínský kraj	3,963	305	579,940	282,498	297,442	7,518	82,263	14.2	399,942	69.0	97,735	16.8	41.5	146
Moravskoslezský kraj	5,427	300	1,205,833	586,487	619,346	20,072	173,492	14.4	839,584	69.6	192,757	16.0	41.0	222

Source: Czech Statistical Office, www.czso.cz.

Table 6 **Population by economic activity and age as of 26 March 2011**

Age, sex	Total population	Economically active	of which		Not economically active	of which				Economic activity not identified
			Employed	Unemployed		Pensioners	Other with own source of livelihood	Other not economic active	Students	
Both sexes	**10,436,560**	**5,080,573**	**4,580,714**	**499,859**	**4,784,923**	**2,308,294**	**174,730**	**855,761**	**1,446,138**	**571,064**
0–14	1,488,928	x	x	x	1,488,928	x	x	729,545	759,383	x
15–19	575,815	66,831	45,218	21,613	450,365	989	882	4,072	444,422	58,619
20–24	673,847	386,160	310,025	76,135	237,754	4,602	10,145	10,844	212,163	49,933
25–29	718,933	571,657	510,544	61,113	83,318	7,029	33,119	18,663	24,507	63,958
30–34	865,389	689,252	627,696	61,556	105,369	10,954	63,806	29,260	1,349	70,768
35–39	885,988	743,806	684,883	58,923	77,009	14,731	38,538	23,740	-	65,173
40–44	700,194	608,612	560,419	48,193	40,036	16,843	10,761	12,432	-	51,546
45–49	691,553	606,135	555,912	50,223	38,786	24,992	4,992	8,802	-	46,632
50–54	662,060	565,642	511,338	54,304	53,487	42,026	4,403	7,058	-	42,931
55–59	749,143	530,839	474,918	55,921	179,076	169,181	4,501	5,394	-	39,228
60–64	744,247	207,348	196,307	11,041	509,547	506,601	1,772	1,174	-	27,352
65–69	560,669	64,067	64,067	-	476,791	475,711	664	416	-	19,811
70–74	386,777	22,031	22,031	-	358,572	357,927	391	254	-	6,174
75–79	310,596	8,454	8,454	-	297,514	296,957	285	272	-	4,628
80–84	232,113	2,937	2,937	-	225,987	225,618	206	163	-	3,189
85–89	121,729	840	840	-	119,415	119,193	108	114	-	1,474
90 +	32,952	199	199	-	32,364	32,275	32	57	-	389
Unknown	35,627	5,763	4,926	837	10,605	2,665	125	3,501	4,314	19,259
per 1,000 inhabitants	1,000	487	439	48	458	221	17	82	139	55

(Continued)

Age, sex	Total population	Economically active	of which		Not economically active	of which				Economic activity not identified
			Employed	Unemployed		Pensioners	Other with own source of livelihood	Other not economic active	Students	
of which females										
Total	**5,326,794**	**2,330,534**	**2,088,718**	**241,816**	**2,760,108**	**1,425,755**	**152,123**	**456,823**	**725,407**	**236,152**
0–14	724,979	x	x	x	724,979	x	x	354,018	370,961	x
15–19	280,506	28,799	19,709	9,090	224,100	388	612	2,181	220,919	27,607
20–24	330,311	170,755	139,161	31,594	136,439	1,757	8,560	7,805	118,317	23,117
25–29	351,071	262,753	235,236	27,517	61,140	2,676	30,619	15,371	12,474	27,178
30–34	421,879	300,272	268,122	32,150	92,046	4,693	60,789	25,909	655	29,561
35–39	432,858	343,664	310,363	33,301	63,114	7,013	35,293	20,808	-	26,080
40–44	342,185	295,954	269,502	26,452	26,939	8,494	8,237	10,208	-	19,292
45–49	340,530	300,081	273,471	26,610	22,716	13,148	2,531	7,037	-	17,733
50–54	331,361	283,511	254,525	28,986	30,096	22,384	1,964	5,748	-	17,754
55–59	383,759	237,045	212,425	24,620	130,447	124,343	1,899	4,205	-	16,267
60–64	390,919	67,031	65,875	1,156	311,420	310,082	615	723	-	12,468
65–69	306,356	25,711	25,711	-	269,585	268,937	322	326	-	11,060
70–74	221,401	8,317	8,317	-	213,077	212,654	223	200	-	7
75–79	189,215	2,966	2,966	-	186,249	185,848	167	234	-	-
80–84	151,982	1,077	1,077	-	150,905	150,619	141	145	-	-
85–89	86,702	331	331	-	86,371	86,195	81	95	-	-
90+	25,055	96	96	-	24,959	24,883	24	52	-	-
Unknown	15,725	2,171	1,831	340	5,526	1,641	46	1,758	2,081	8,028
per 1,000 inhabitants	1,000	438	392	45	518	268	29	86	136	44

Source: Czech Statistical Office, www.czso.cz.

Table 7 **Largest cities as of 26 March 2011**

City	Region (NUTS 3)	Total population	Males	Females	Occupied	
					Buildings	Dwellings
Praha	Praha (Capital of)	1,268,787	613,740	655,047	92,927	542,168
Brno	Jihomoravský	385,912	185,403	200,509	37,700	163,596
Ostrava	Moravskoslezský	296,222	142,828	153,394	24,643	127,641
Plzeň	Plzeňský	170,320	83,015	87,305	16,536	73,158
Liberec	Liberecký	102,757	49,716	53,041	11,544	42,679
Olomouc	Olomoucký	101,005	47,564	53,441	9,952	43,070
Hradec Králové	Královéhradecký	94,312	45,280	49,032	10,908	39,744
České Budějovice	Jihočeský	93,714	44,663	49,051	9,950	40,396
Ústí nad Labem	Ústecký	93,002	44,763	48,239	7,755	39,660
Pardubice	Pardubický	90,764	44,537	46,227	9,738	38,414
Havířov	Moravskoslezský	76,693	36,878	39,815	5,201	33,191
Zlín	Zlínský	75,319	35,815	39,504	11,211	31,702
Kladno	Středočeský	68,103	32,561	35,542	7,530	28,629
Most	Ústecký	65,194	31,534	33,660	3,371	28,840
Opava	Moravskoslezský	58,352	27,905	30,447	7,052	23,462
Karviná	Moravskoslezský	56,897	27,568	29,329	3,829	24,302
Frýdek-Místek	Moravskoslezský	56,356	27,281	29,075	5,007	23,638
Jihlava	Vysočina	50,074	24,208	25,866	5,800	20,926
Teplice	Ústecký	49,641	23,740	25,901	4,191	22,360
Děčín	Ústecký	49,107	23,730	25,377	6,006	21,037
Karlovy Vary	Karlovarský	48,640	23,028	25,612	4,642	21,488
Chomutov	Ústecký	48,327	23,774	24,553	3,752	21,108
Prostějov	Olomoucký	44,855	21,177	23,678	5,485	18,887
Jablonec nad Nisou	Liberecký	44,566	21,462	23,104	5,054	18,610
Přerov	Olomoucký	44,359	21,340	23,019	4,035	19,024
Mladá Boleslav	Středočeský	44,301	22,163	22,138	3,846	18,628

Source: Czech Statistical Office, www.czso.cz.

THE CZECH REPUBLIC IN INTERNATIONAL COMPARISON: ECONOMIC AND SOCIAL INDICATORS[1)]

Zdeněk Pavlík

The book consists of six chapters, each of which has an independent conclusion (only the references are common for the whole book). They were also written by different authors under the editorial direction of Jiří Večerník, who contributed two chapters himself: on personal earnings and household income, and the development and structure of self-employment. Olga Nešporová writes about changing life trajectories and the composition of households, Martina Mysíková about income inequalities within couples and Vladimír Benáček and Eva Michalíková about family businesses and their factors of growth. Zdeněk R. Nešpor's chapter deals with the special topic of the household as a religious group. The common feature of all the chapters is the geographical focus on the countries of Central and Eastern Europe (CEE). The makeup of this region is not the same in every chapter: in some only four countries are compared (the Czech Republic, Hungary, Poland and Slovakia), in others the comparison is extended to include Austria and Germany; two chapters contain tables with comparisons of 11 countries and even 28 countries.

Some of the chapters touch on demographic processes. Olga Nešporová analyses changes in household structure (decreasing household size), the increase in the number of divorces, the postponement of marriage and fertility, the growing number of extramarital births and the increased rate of unmarried cohabitation since the 1960s. These changes had already begun before 1989, but they only gained momentum afterwards. It is apparent that the changes after 1989 are the consequences of political changes and the economic transition from a planned to a market economy. Nešporová concludes that the post-communist societies have a tendency to follow the path of Western countries. The six countries compared can be divided into three groups: the first consists of Austria and Germany, which continue to be distinct from the Czech Republic and Hungary, which form the second group, and from Poland and Slovakia, the third group, which in many aspects is more traditional than both the first and second groups. In this respect, she mentions the Hajnal line that divided Europe demographically into Western and Eastern parts.

Other chapters are related less to demography, but this does not mean that the processes they analyse do not have any impact on demographic behaviour. Based on sample surveys conducted in eleven countries (the sample ranged in size from 1,202 in the Czech Republic to 3,747 in Germany) Martina Mysíková shows that the female share of gross earned income of a couple ranges from 25.6% in Luxemburg to 41.3% in Slovakia. The Czech Republic, with the relatively low share of 32.6%, differs from other post-communist countries and more resembles the old EU member states. In the book's third chapter Jiří Večerník examines the changes in the distribution of earnings and household income since 1989. He calculates the Gini coefficient and concludes that earning disparities and income inequalities rose in all CEE countries after 1989. This was not a feature specific to these countries because income inequalities rose also in the other European

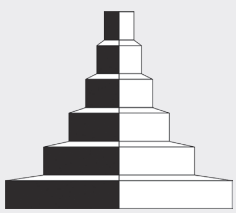
1) Jiří Večerník (ed.): *Individuals and Households in the Czech Republic and CEE Countries.* Sociologický ústav AV ČR, Prague, 2010. ISBN 978-80-7330-186-6.

countries, with the exception of Austria and the western part of Germany. Večerník quotes the interesting finding of two authors (D. Checchi and C. Garcia-Peñalosa) that there is a trade-off between institutions that decrease inequality and the unemployment rate.

Jiří Večerník is also author of the chapter describing the development of self-employment in CEE countries after the collapse of communism. After the previous period of the suppression of private ventures and freedom for business, the re-emergence of self-employment occurred rather quickly. The author notes, however, a problem with data: The numbers are often overestimated because the number of self-employed working is unknown and, at the same time, they are also underestimated because many people (e.g. unemployed or retirees) earn money by working unofficially without paying taxes. In another chapter Vladimír Benáček and Eva Michalíková set out to evaluate the significance of family business for the national economy. Family businesses account for a smaller share of the total value added in the economy than their respective share of total employment. Nevertheless, family businesses play an essential role in the provision of employment and they have higher gross capital returns per unit of capital than do large businesses.

In the last chapter Zdeněk Nešpor deals with the specific problem of religion and its impact on the social and demographic behaviour of people. The differences between the four countries analysed (Austria, the Czech Republic, Germany, Slovakia) are significant, but some common features do exist. People who report belonging to some religion are more commonly found among married people and less commonly among divorcees. They tend to agree more with the traditional model of the family than do people of no religious faith. They are less tolerant of pre-marital and extramarital sex or of homosexuality. Catholics prefer marriage and have children at a younger age; they tend to have more children and come from families with more children. The author arrives at the interesting finding that various forms of religion still play an important role in terms of personal attitudes and behaviour, but it is not known how.

The book represents a collection of analyses and some new views on different aspects of the social, economic, and demographic changes that occurred during the transition period after the collapse of communism. It should be useful to anybody who is interested in this part of Europe and in the problems of the transition from a planned to a market economy and its consequences.



The XLIII. conference of the Czech Demographic Society with a theme ‚Health – challenges and threats' will be held on 22–23 May 2012 in Prague. Official languages of the conference are Czech and English. More information can be found at http://www.natur.cuni.cz/cds.

FUNDAMENTAL PROBLEMS OF DEVELOPING COUNTRIES[1)]

Hana Bednářová

The monograph describes in eight parts the basic problems of third world countries. In the introductory section, the authors focus on the processes that have contributed to the current state of uneven development. **Internationalisation and interdependence** cannot be viewed only as issues of inquiry, but must also be understood as processes that cannot be avoided. However, they occur symmetrically and asymmetrically owing to the inability of the human population to recognise opportunities and use them correctly in order to offset this imbalance. It is often criticised that interdependence always strengthens the stronger and weakens the weaker.

At present, the world is developing in such a dynamic and chaotic manner that it is even very hard to quantify and categorise problems, and all the more difficult because of wide cross-links. All global problems have both an economic and a non-economic dimension. Most of them relate to economics, but it is wrong to attribute them only to that. This fact unshakably evokes anecdotal allusions to Murphy's Law ('If any can go wrong, it will.'), Hoare's Law ('Inside every large problem is a small problem struggling to get out.') and Schneiker's Law ('Inside every small problem is a large problem struggling to get out.').

The authors acknowledge that the problems are not only in developing countries but are evident in developed countries too. The development of human society is inseparable from the development of nature; however, human society is much more active in its interaction with nature. That's why society is an active element determining changes.

The second and third chapters briefly describe the **current global problems** characteristic for developing countries, their socio-economic differentiation and their place in the world economy. They focus on three developing regions of the world: **Latin America, Asia and Africa**. The authors mention two parallel ways of understanding development studies: classical criteria based on an understanding of the socio-economic system (dual economy, colonial past, illiteracy, tribalism, etc.) and a new understanding based on a certain level of income per inhabitant. Although the authors criticise the new method, in other parts of the book, compared to the detail on GDP levels, little information is given on historical and ethnic contexts.

The next chapters analyse in detail the fundamental problems that plague developing regions. Industrial progress as a basic precondition for the passive development of third-world countries is closely linked to the availability of **energy and raw natural resources**. Countries of the world are at present facing the problem of energy dependence on imported resources from politically unstable third countries. Fossil fuel resources are regionally highly concentrated and in the future countries will have to address the issue of becoming energy independent (European countries in particular are significantly dependent on outside energy sources).

1) Jeníček, V. – Srnec, K. 2012: *Fundamental Problems of Developing Countries.* Aleš Čeněk, s.r.o., Pilsen, 268 pp., ISBN: 978-80-7380-375-9.

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Finding alternative energy resources will be necessary owing to the growing consumption in the emerging economies of China and India.

The chapter on **environmental issues** is very well conceived and focuses on desertification, soil erosion, use of DDT in agriculture, climatic changes, deforestation, etc. These effects are closely linked; deforestation causes water erosion and floods, inappropriate agricultural methods (e.g. excessive use of fertilizers, irrigation) cause desertification, water contaminated soil, and famine. All of this has a negative impact on human health. In developing countries, hygienically safe drinking water and an efficient sewage system are among the main civilisation needs. Illnesses caused by bacteria, viruses or parasites in connection with the water environment afflict a large part of the world's population. Diseases are also closely connected with poverty.

Human health is also threatened by **natural catastrophes and ecological accidents**. Besides the harm to human lives, they also cause economic damage. In some cases, it is difficult to distinguish precisely to what extent these catastrophes are a natural occurrence or are man-made (mudslides, floods). Natural catastrophes from earthquakes to cyclones kill approximately ten times more people than armed conflicts.

From a demographic viewpoint the **chapter on population** may seem insufficiently prepared. Although the main problems of developing countries are caused by just a high population growth, more attention could be paid to the difference between growing large city agglomerations and rural areas or to the distorted age structure as a result of HIV/AIDS, all of which also influence demographic projections in affected countries. It would be appropriate to mention also religious and ethnic composition, a legacy of colonial times. In some countries ethnic tensions are still present.

In many parts of the book the attention turns from the core theme of developing countries and more widely describes the situation in developed countries (e.g. the chapter on 'The European Union and Energy' or population ageing).

Missing from the book is the wider historical context of developing countries, particularly the impact of colonisation and international companies (e.g. the impact of oil extraction on society and the environment). A few sentences in the Introduction touch on the phenomenon of colonialism that most developing countries have in common. In the early 1990s, the world economy significantly changed and market relations are now the most important feature. However, I believe that market relations are largely affected by economic relations established in the past from which it is very difficult to break free (a successful example could be NICs).

For a better orientation it would have been useful to include tables or figures in some chapters, for example, on the progress of deforestation in developing countries.

The book suffers from neglected editorial work, in particular the lack of copyediting on the text and graphical content. In some parts references are missing. The list of abbreviations is not sorted alphabetically.

The book allows insight into the problems of developing countries from the point of view of economists and is written in English.

A NEW DICTIONARY OF DEMOGRAPHY: COMPREHENSIVE, CONTEXTUAL, RECENT

Markéta Pechholdová

A brand new dictionary of demography and the social sciences made its debut in 2011[1]. The publication is the outcome of an editorial project launched at Institut National d'Etudes Démographiques (INED) in 2005 and coordinated by three INED research directors: France Meslé, Laurent Toulemon, and Jacques Véron, each of whom specialises in a different field of demography. Speaking in numbers, the editors gathered contributions from 68 authors, mostly researchers from INED, and ended up with more than 500 pages of text, nearly 400 entries, and 22 mini-essays.

The dictionary presents itself as a tool for 'grasping demography'. An integral part of it are therefore basic demographic concepts and terms, as well as explanations of the main demographic indicators (e.g. rates, expectancies, indexes). The dictionary however goes far beyond simple definitions. In the case of, for example, life expectancy, the entry begins with a short definition of life expectancy and presents three contexts of this indicator: the longitudinal versus the cross-sectional perspective, life expectancy inequalities in the world, and decreasing sex differences in life expectancy. The entry is accompanied with a graph depicting the trend in (French) life expectancy along with a list of additional references. From this perspective, the dictionary can be viewed as contextual. Although the language of the dictionary is French, the examples do not concern only France, but cover a large number of countries and, where possible, an international perspective.

The dictionary is also highly recent, encompassing new fields and methods in demography – intergenerational transfers, healthy life expectancy, social inequality, new families, longevity, event history analysis, multilevel analysis, microsimulation, and record linkage.

Another aim of the dictionary is to define the borders of demography and to transcend them at the same time. As the title suggests, demography is presented as one of many population sciences, and by this logic the dictionary contains several large entries capturing the links between demography and other scientific disciplines. These entries are entitled 'Demography and …': anthropology, ecology, economy, epidemiology, geography, history, mathematics, medicine, sociology, statistics, mathematics, and medicine. It is therefore not surprising to find entries such as malaria, sexuality, pension systems, urbanisation, poverty, vaccination, the value of human life, the cost of a child, disability, or euthanasia.

Beyond its standard dictionary entries, the book contains 22 mini-essays. The essays are placed near relevant entries and deal with current topics in today's societies where demography provides a relevant perspective. In contrast to the neutrality of the main body of the dictionary, this is where the authors express their expert opinions. Most of the essays take the form of questions and answers and deal with topics such as ageing and longevity (Is there a limit to human life? Living longer, living better? Are all deaths avoidable?), new families and life cycles (Will the family disappear? More and more delayed childbearing? Choosing the sex of a child? Unavoidable generational conflict? Working longer? Society and sexuality), migration-related topics (Should we open the borders? Did you say 'il-

1) Meslé, F. – Toulemon, L. – Véron, J. (dir). *Dictionaire de démographie et des science sociales.* Armand Collin, Paris, 2011. ISBN 978-2-200-34744-4.

legal'?) or wider socio-demographic topics (War and population, Do we need a population policy? Which population for Europe? Towards 10 billion people?). The inclusion of these mini-essays adds to the dictionary's utility for advanced population scientists.

The entries are presented in alphabetical order based on the French term, with an English translation of the term as subtitle. Around eighty figures accompany the entries, the majority focusing on France. Many entries include further literature references. The dictionary begins with a list of French terms sorted by author. At the end, alphabetically ordered lists of both French and English terms are given. An index of proper names (excluding references) is available as well. There can certainly be no real objections to the formal side of the publication.

The publication represents a comprehensive, interdisciplinary and recent reference work. Primarily marketed to a larger public, the publication's basic purpose of helping readers obtain a grasp of demography is wholly fulfilled. For professionals, the dictionary's assets lie in the inclusion of larger sphere of population-related topics and terms, in the presentation of expert opinions and in the numerous examples presented. The dictionary can therefore serve as both a reference and a teaching tool or for comparison with the situation in other countries.

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Jan Auerhan (*2. 9. 1880 † 9. 6. 1942)

The year 2012 marks seventy years since the death of the prominent Czechoslovak statistician and demographer and head of the National Statistical Office of the Czechoslovak Republic JUDr. Jan Auerhan. This brave man's life was cut short after the assassination attempt on Reinhard Heydrich, Deputy Reich-Protector of Bohemia and Moravia, when Auerhan was arrested and then executed several days later.

Jan Auerhan's career was linked to the statistical office throughout his life. After completing his studies in law and economics at Charles University (1904), he began the compulsory articling stage of his profession at the Provincial Court, but in 1906 he began working at the Land Statistical Office of the Czech Crown Lands.

Auerhan's entry into the statistical service, which signified a fundamental turning point in his career, was no accident.

In the forward to the book *Univ. Doc. Dr. Jan Auerhan – His Life and Work* (by Josef Hůrský), Josef Forejt (a friend and colleague) wrote: '[J. Auerhan was a] *man of science and literature with two loves – one for the office, for statistics, the other for another branch of science and learning, for the affairs of minorities and Czechoslovak compatriots abroad*'.

From his youth, Auerhan had taken an interest in emigration and Czechoslovak minorities abroad. In 1902, while still a student (not yet 22 years of age) he published an article in the weekly *Vyšehrad* on Czech emigration, with the proposal to form an organisation *'that would regulate this important socio-political phenomenon*'. In 1906 he published another, larger, and remarkable study on emigration, which according to J. Hůrský was instrumental in his being hired by the Provincial Statistical Office of Bohemia. This study so caught the attention of D. Krejčí in particular, who at that time headed the office, and K. Engliš (later a minister) that Auerhan was offered a job at the office. Soon after starting there he quickly established himself as one of the statistical office's recognised experts, and this was reflected in the successful career he had there.

His intense activity as an author, producing work on various subjects, was apparent from outset. Of the many articles and books he wrote while working at the Provincial Statistical Office of Bohemia (1906–1914) we can note, for example, his study on migration – population migration based on findings from the population census in 1910 – which mainly provided information on the number of people born in the Czech lands who were living abroad.

By 1914 he had visited most of the places with Czechoslovak minorities around Europe – Lodomeria (Western Ukraine), Banat, Croatia, Silesia, Poland, Bosnia, Crimea and the Caucasus. It should be noted that, but for perhaps one exception, he undertook these trips at his own expense. He published what he learned from his journeys in various contemporary periodicals, most often in *Pokroková revue* (The pro-

gressive review), but also in *Národopisný věstník* (Journal of ethnography) 1911, *Sborník České společnosti zeměpisné* (Almanac of the Czech Geographic Society), and many other periodicals (see the bibliography).

After the war and the founding of the Czechoslovak Republic, these extremely valuable articles were published in book form. *'These articles contain as yet not fully appreciated and mostly original material on Czech settlements abroad, describing their scope and origin and their economic conditions, and particularly their social circumstances in the wider, above all religious and educational sense, and their relations with surrounding ethnic groups. The author complements his own experience with sources of literature and statistics, wherever any even exist, or using written reports from the settlements he was unable to visit himself published in periodicals'* – J. Korčák.

After the establishment of National Statistical Office of the Czechoslovak Republic, which Auerhan played an instrumental role in organising, in 1921 he became a ministerial advisor, then head of department, and then Vice President and from 1929 to 1939 President of the National Statistical Office. He had an ineffaceable impact on the development of the statistical office and helping it to attain the standards required of such an institution. *'The task of statistics is to put forth as true a picture of the real situation, as only then can it be of assistance to the management of the state'* (J. Auerhan). And in the interest of fulfilling this goal he worked hard to build up the statistical office.

Alongside his organisational and managerial activities, Auerhan continued to engage in research and publishing work. Some of Auerhan's demographic and anthropo-geographic work was altogether outstanding, new, and in some cases unique, and most of this work was published in the periodical *Statistický obzor* (Statistical horizons). Must mentions are his five studies on longevity, tracing this subject back to 1869 in the Czech lands, comparing contemporary information on 23 European countries, and examining the issue from various perspectives. These works offered many new insights and overturned some views that had previously prevailed. An example is found in the conclusions he drew on the influence of employment on longevity. And the same is true of another study on the physical stature of recruits, where he showed ethnicity to be a stronger factor than geography.

However, Auerhan continued also to focus on his life-long 'love' – the issue of ethnic groups and minorities and the life of Czech compatriots abroad. In 1920 and 1921 he summarised many of his earlier studies and added some new findings in three books: *Osady českých emigrantů v Prusku, Polsku a Rusku* (Settlements of Czech emigrants in Prussia, Poland, and Russia; many of these people emigrated for religious reasons), *České osady na Volyni, na Krymu a na Kavkaze* (Czech settlements in Lodomeria, Crimea, and the Caucasus; people who emigrated in the 19th century mainly for economic reasons), and *Čechoslováci v Jugoslávii, v Rumunsku, Maďarsku a v Bulharsku* (Czechoslovaks in Yugoslavia, Romania, Hungary and Bulgaria).

With financial assistance from the Foreign Ministry, he understood more research study trips to a number of European countries (e.g. France, Germany, Alsace, Switzerland, Austria, Yugoslavia) with the primary aim of preparing a comparative study of minorities rights in 24 countries in Europe. In 1924 he published one of his most highly regarded books, *Jazykové menšiny v Evropě* (Linguistic minorities in Europe). He dealt with a similar theme in his 1935 book *Naše jazykové menšiny v evropském zahraničí* (Our linguistic minorities abroad in Europe).

Of Auerhan's many other works, it is important not to forget his biggest and broadest book *Československá větev v Jugoslávii* (Czechoslovaks in Yugoslavia) published in 1930. In this study among other things he deals with the definition of 'nation'. This was also his professorial thesis. In the 1931/1932 academic year Auerhan began teaching as a senior lecturer at Charles University in Prague and he continued to work on his next big work *Česká a slovenská vesnice v zahraničí* (Czech and Slovak villages abroad).

The magnitude of Jan Auerhan's lifetime work is extraordinary. A summary of his contribution to statistics, demography, and related scientific fields can be found inter alia in a paper by the prominent Czechoslovak statistician Jaromír Korčák, 'Vědecká činnost prezidenta doc. Dr. J. Auerhana' (The scientific work of President doc. Dr. J. Auerhan), which was published in 1940 in *Statistický obzor* (Statistical horizons), volume XXXI, book 7-8.

On 1 April 1939 Jan Auerhan officially retired, after he had submitted a request to this end in 1938 given his poor state of health. He nevertheless continued to go to the statistical office and work intensively there until the start of June 1942. However, he was unable to continue his next big work in progress, 'Česká a slovenská vesnice v zahraničí' (Czech and Slovak villages abroad).

After constituting the Protectorate of Bohemia and Moravia in 1939 the Czechoslovak Foreign Institute, which Auerhan had co-founded and chaired throughout its existence (1928–1939), was shut down as a "patriotic institution". The order to cease activity, personally signed by K. H. Frank, also demanded the confiscation of all of the institute's property. Auerhan was working there during this difficult period and helped to hide various documents and his personal archive, concealing them in Náprstek Museum in Prague. He visited Náprstek Museum for the last time on 25 April 1942.

On Saturday, 6 June 1942, after arriving at the State Statistical Office, he was informed that he was being sought by the Gestapo. That day was the last time his colleagues saw him. He was arrested upon returning home. After the assassination attempt on Reinhard Heydrich lists of executed Czech patriots were announced and published daily on the radio, in the newspaper, and in posters The execution of Dr. Jan Auerhan, along with many other patriots, was announced as having taken place on 9 June 1942. This extraordinary individual became the victim of the atrocities of Nazi despotism.

The significance of Jan Auerhan and his life and work cannot of course be summed up in this commemorative text marking the anniversary of his death. Those interested should look at the excellent biography of Auerhan written by Hůrský, the paper by J. Korčák, and above all to the vast body of work by Auerhan, which represents an exceptional source of knowledge.

Jiřina Růžková

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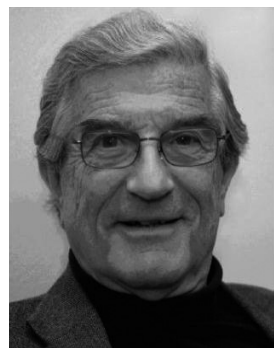
Jiří Musil (1928–2012)

Jiří Musil, a top Czech scientist of international calibre, passed away on 16 September 2012 at the age of 84. He was an exponent of the integrated approach to the social sciences and his work was acknowledged by sociologists, historians, social geographers, social anthropologists, philosophers, ecologists, urban studies experts, and demographers. He was known not just in the Czech Republic, but around the world, as many of his books were translated into several languages.



He was born on 20 February 1928 in Ostrava into the intellectual family of a bank clerk, where he was exposed to the writings of Masaryk and other books in various branches of the humanities and philosophy. The death of his father on a transport between two Nazi concentration camps in 1945 left its mark on him for the rest of his life. His interest in the development of society began after the Second World War while he was still a student at secondary school, and he quickly grasped the essence of the conceptual conflict between the advocates and opponents of Marxist ideology.

In 1947 he began studying sociology at the Faculty of Arts of Charles University. There he met professors who in the years that followed the communist coup would be forced to leave the university. He was lucky, however, in that he still got the opportunity to hear them lecture. One such professor was Jan Patočka, who introduced Musil to the study of Max Weber; another was Josef Král, who even after February 1948 went on lecturing in sociology in the same spirit as before, as though it had not been labelled a bourgeois pseudoscience; and yet others included the philosopher Jan Blahoslav Kozák, Otakar Machotka, Zdeněk Ullrich, and, last but not least, the de facto founder of Czechoslovak demography Antonín Boháč, who opened up the doors to this discipline for him. Musil graduated from the Faculty of Arts in 1952.

He started working as a documentalist at the Institute of Hygiene, which is where I met him when I joined the institute in 1956 as a statistician. We formed a relationship as friends and colleagues that continued even when later we followed separate paths to different places of work. We shared not just our rejection of Marxist ideology, but also a common interest in demography, which was less susceptible to ideological influence. This was one reason why Musil's first studies, clearly inspired by Antonín Boháč, focused on such subjects as three centuries of population development in the village of Příkazy near Olomouc (*Vesmír,* 1955), differences in population mortality in urban and rural areas, and analyses of the demographic and social structure of towns (*Statistický obzor,* 1958). The distinct influence of Antonín Boháč was apparent again in his study

of population issues in ancient Greece and Rome (*Demografie,* 1961). He was a frequent contributor to the journal *Demografie* since its founding in 1959, and he also published work in *Demografický sborník* (Demographic almanac; 1959–1961) and *Statistika a demografie* (Almanac of statistics and demography; 1959–1972).

The breadth of Jiří Musil's interests made itself apparent in the late 1960s when he was able to return to the subject of his dissertation and publish a study on the opinions of Max Weber about the role of science in society (*Sociologický časopis,* 1966). That study constituted a fundamental contribution to the development of the Czech social sciences. After 1968 it became the target of sharp criticism, but by that time Musil was setting up a sociology department at the Research Institute on Housing Development and Architecture, where, in addition to internal publications he also wrote, edited, and contributed to major studies. Some of these books earned wide international recognition and were translated into different languages, in particular *Sociologie soudobého města* (Contemporary urban sociology; 1967), *Sociologie bydlení* (Sociology of housing; 1971), *Urbanizace v socialistických zemích* (Urbanisation in socialist countries; 1977), and *Lidé a sídliště* (People and housing estates 1985). In 1982 he moved to the Faculty of Architecture of the Czech Technical University, where he lectured on urban sociology.

However, it was only after 1989 that he attained the recognition he deserved and was able to devote himself to the subjects he was interested in. In 1990 he became the director of the Institute of Sociology of the Czechoslovak Academy of Sciences, and in 1992 he was appointed as the academic director of the Prague branch of the Central European University. He nevertheless still found time to publish, and here are just a couple of examples of his more recent work: *The End of Czechoslovakia* (1995) and *Zrod velkoměsta* (The birth of the big city; 2002). He also wrote many papers, and he was chair of the Masaryk Sociological Society. His rich body of work, which I have only touched on here, had a profound impact on the history of Czech and world science. His opus will undoubtedly one day be given a critical assessment and due acknowledgement. This will be an ominous task, as the number of works he penned, including his books, their translations into different languages, his studies and articles and shorter papers, figures the several hundreds.

Jiří Musil's name will always be associated with the study of urban sociology. He could have been named a professor of sociology or some other field of his interest. I am pleased, however, that in 1994 he was appointed a professor of demography, as his contribution to this field in this country was extraordinary.

Zdeněk Pavlík

The European Forum for GeoStatistics Conference 2012

From 24 to 26 October 2012 the international conference of the European Forum for GeoStatistics (EFGS) was held in Prague. This year's EFGS conference, now the fifth, was hosted by the Czech Statistical Office (CZSO) as part of its involvement in the Eurostat grant project **'GEOSTAT 1B – Representing Census Data in a European Population Grid'.** The main aim of this project is to create cartographic visualisations of selected variables from the last series of national population censuses in the form of 1 x 1 km grids. The production of population grids was the central theme of the conference.

A total of 65 experts in geostatistics from 28 countries and 40 institutions came to Prague. Most

of the participants were employees of national statistical institutes in Europe or overseas, representatives of relevant institutions of the European Commission (Eurostat, DG Regional Policy, JRC), and experts from the academic and research sphere who work on producing population grids based on geostatistical data and their practical applications.

The motto of this year's conference was **'If you cannot describe it, you cannot manage it'** and was intended to express the need to integrate spatial, temporal, and statistic information, the need to integrate geography and statistics. The conference programme was divided into three main sessions dealing with the production and use of spatial statistics, in particular census data, from the global, European, and national perspectives.

The first day of the conference opened with the Keynote Session, tabling the key ideas, visions, and best practices for discussion in the Closing Session. The first speaker in the Keynote Session was *Lars H. Backer*, Executive Director of the EFGS, whose paper, **'In Search of a Vision for the EFGS',** formulated the idea of creating a 'European system of geospatial information management' as an equivalent to the recently founded United Nations Initiative on Global Geospatial Information Management. He was followed by three speakers who focused on the domestic production geostatistics. In **'Statistics, Geodata and Our Way to Geoinformation',** *Zdeňka Udržalová* from the CZSO described the development of the process of building a national geoinformation infrastructure and a system of statistical registers, and presented examples of user outputs and their practical applications. In **'Gridded Register-based Data for Detail Spatio-temporal Monitoring and Modelling. A Vision of Data Harmonisation and Integration',** *Jiří Horák* from the Technical University in Ostrava drew attention to the main problems of public administration registers, proposed measures to improve their harmonisation and integration, and, using the example of data on social inequality, highlighted the significance of registers and grids for detailed spatio-temporal monitoring and modelling. *Jaroslav Kraus* of the CZSO, in a paper titled **'Comparison of Bottom-up and Top-down Methods Used to Create Grid Data from the Population and Housing Census 2011',** drew on the preliminary results of the 2011 Population and Housing Census to try to construct the first grid maps of census data using both standard production methods. The first-day opening session concluded with a paper by *Ekkehard Petri* of Eurostat titled **'Towards a Better Integration of Statistics and Geography – an ESS Strategy',** which began by introducing the institutional framework of the European Statistical System and then proceeded to describe its existing and upcoming strategy for the improved integration of statistics and geography and the role of the EFGS in this strategy.

The second day of the conference opened with a session devoted to the production and use of geostatistics from a global perspective. The session began with a paper by *Tracy Kugler* from the University of Minnesota titled **'Terra Populus: Integrated Data on Population and Environment'** about the data sources and the key challenges of the Terra Populus project, which aims to build an organisational and technical framework for the storage, integration, analysis, and dissemination of population and environmental data on a global scale. In **'Methods of Reconciling Geographic Boundaries in Integrated Research'** *Kytt MacManus* of Columbia University - CIESIN in the United States described the methods used to reconcile boundary mismatches by taking low elevation coastal zones as his example and combining data sources with different resolution . In a paper titled **'Describing Mexican Population: GIS in Census – Data Dissemination and Making Decisions'** by *Carole Schmitz* from the National Institute of Statistics and Geography in Mexico focused on introducing the thematic content and functions of SCINCE 2010, a web geoportal intended for disseminating the results of the 2010 Mexican population and housing census through a GIS system. Her colleague *Elsa Resano* followed up on this by presenting another publicly accessible geovisualisation application of the last Mexican census, namely the **National Dwelling Inventory**, compiling selected census data on dwellings and the population at the block level. The conference's global section closed with the paper **'Geovisualisation of Statistical Data within Spatial Data Infrastructure'** by *Vít Voženílek* of Palacký University in Olomouc devoted to various forms of geovisualisation of statistical data and national spatial data infrastructure as its principal platform.

The conference programme continued with a session on the production and use of geostatistics from a European perspective. *Roger Milego* from the Autonomous University of Barcelona opened the section with a paper titled **'Harmonised Population Time-series (1990–2010) for Europe by Means of the OLAP Technology',** where OLAP is understood as on-line analytical processing based on a multidimensional data model allowing complex analytical and ad-hoc queries with a rapid execution time. *Felipe Batista e Silva* from the European Commission's Joint Research Centre presented a paper on **'Detailed Population Distribution Maps for Europe's Cities',** an ambitious EU project focusing on detailed visualisations and estimations of population distribution in the 305 biggest cities on the continent using geodata on soil sealing and land use/cover polygons from an Urban Atlas. Another EU project related to the Urban Atlas was described by *Hugo Poelman* from DG Regional Policy in **'Towards Indicators of Proximity to Services in Europe's Major Cities',** examining indicators of proximity/accessibility to green urban areas and public transit services in European cities. *Miloš Sedláček* from GEODIS in Brno described the development, scope, methodology, organisational and technological framework and examples of the use of **LUCAS (Land Use/Cover Area Frame Statistical Survey)**, a survey conducted by Eurostat for the purpose of collecting, processing and analysing data on land use and cover. *Pavol Hurbánek* from the Catholic University in Ružomberok and *Konštantín Rosina* from the Slovak Academy of Sciences presented **'Top-down Population Density Grid Based on European Land Monitoring Services'** describing the general advantages and disadvantages and various forms of top-down method of grid production, which the authors applied in a disaggregation of the population size in 2,920 communes in Slovakia into 100 x 100 m grids. *Erik Sommer* from the Statistics Denmark presented the results of responses from national statistical offices regarding the possibility and price conditions of providing statistical data in the form of grids in **'Market Watch/Business Report – Grid Statistics'.** *Ola Nordbeck* from the Statistics Norway and *Arslan Ahmedov* from the National Statistical Institute of Bulgaria compared degrees of integration of GIS activities into statistical processes at their respective bureaus in an effort to answer the question of whether there is **'An Ideal Way of Integrating the Spatial Dimension into the Statistical Production Chain – Does It Exist?'.** This section closed with a paper by *Marja Tammilehto-Luode* from the Statistics Finland titled **'Workflow to Create Grid Data',** outlining the different stages of three types of process flows used to generate harmonised European population grid based on accessible georeferenced national microdata or already created national grid data. A complete grid creation workflow should form part of an instruction manual that will be made available on the website of the EFGS in the spring of 2013.

The final session was devoted to the production and use of geostatistics from a national perspective. Because this section had the largest number of papers it had to be divided into three sub-sections. The first sub-section looked at dissemination issues in small areas and included three papers. The first, **'Statistical Confidentiality in Small Area Statistics Dissemination',** was presented by *Igor Kuzma* from the Statistical Office of the Republic of Slovenia, who documented the changes in the perception of confidentiality and disclosure issues in statistical data dissemination in small areas in reference to the increasing detail and thus greater identifiability of statistical data in recent decades. The second paper, '**Applying Disclosure Control on Average Values',** by *Niek van Leeuwen* from the Statistics Netherlands, presented a calculation, results and conditions of the application of primary and secondary disclosure control of average values of dwellings in 100 m and 500 m square grids. The last paper, by *Ignacio Duque* from the Spanish National Statistical Institute, discussed **'Small Statistical Units in Spain: Enumeration Districts, Nomenclátor and Grid',** describing the Spanish system of small statistical units and the final results of a pilot project to produce grid statistics of buildings using the bottom-up method on selected test areas based on 2011 census data.

The last day of the conference began with papers from the second sub-section, which was devoted to the application of grids in land use statistics and modelling. *Tobias Krüger* from the Leibniz Institute of Ecological Urban and Regional Development presented **'High Resolution Land Use Information by Combined Analysis of Digital Landscape Models and Statistical Data Sets'** describing the free online information system IOER-Monitor, which

monitors the state and development of land use and cover across Germany using statistical indicators, which are visualised in high resolution maps not just in basic administrative units but also in 1 km^2, 5 km^2, and 10 km^2 grids. *Francisco Goerlich* from Valencia University spoke about **'Urban Morphological Zones for Spain: Urban Indicators from an Object Oriented Land Cover Data Base and a Population Grid'** describing an information system on land cover in Spain (SIOSE), which was used as an auxiliary source to produce a 1 x 1 km population grid of Spain using the top-down method and based on population data of districts from the 2006 census. Population grid data subsequently integrated with urban morphological zones produced various statistical urban indicators. *Jerker Moström* from the Statistics Sweden closed the sub-section with **'What´s Going on out There? – Gridded Data for Detection of Pressure on Land Use',** which drew on statistical data on changes in population numbers, assessed tax, and real estate at the level of a 1 km^2 grid to construct an index of land-use pressure in Sweden and he summarised its main strengths and weaknesses.

The third theme of the national session focused on the dissemination of findings from the last round of population and housing censuses. It opened with **'Population Census and European Neonatal Health Statistics'** by *Vilni H. Bloch* from the Statistics Norway, which was accompanied by a poster and report from the NEOGEO project focusing on the problem of the absence of current and comparable statistics on preterm births and on access to neonatal health care in Europe, and as a possible solution proposed combining harmonised georeferenced population data from censuses with a European-wide geodatabase of neonatal stations. *Dermot Corcoran* from the Central Statistics Office of Ireland presented **'Exploiting the Potential for GeoStatistics in the Republic of Ireland'** describing the main facts and milestones of the last Irish census in 2011, which is held once every five years in Ireland, and two geostatistical outcomes – the first of which was a map and a dataset of the density of the usually resident population in 1 x 1 km grids, and a POWSCAR dataset on job commute and job commuter characteristics for presentation in 250 x 250 m grids. *Amelia Wardzińska-Sharif* from the Central Statistical Office of Poland discussed the preparation, organisation, and the implementation of the field stage of the 2011 population and housing census in Poland, which was based on the unprecedented use of modern technology and registers, and introduced the emerging geostatistics portal for spatial presentation of census results in her paper **'Geostatistics Portal in Poland'.** The use of geovisualisations and GIS technology in different stages of the 2011 population and housing census in Kosovo and the method of constructing and parameters of a 1 km^2 grids on population density were the subjects of **'A Population Grid for the Republic of Kosovo'** by *Idriz Shala* from the Kosovo Agency of Statistics. In **'GIS in Croatian Bureau of Statistics'** *Branko Crkvenčić* described the scope and areas of GIS applications in his institution and also discussed the emerging statistical register of spatial units and buildings with house numbers, which is intended to serve as a publicly accessible web application for the presentation of orthophotomaps and statistical reports for all spatial units.

The Closing Session of the conference hosted a panel discussion of the drafts of the two official documents from the EFGS conference: **'The EFGS 2012 Prague Declaration'** and **'In Search of the Way Forward'**. The first-named document contained a proposal to establish a taskforce to advise the GISCO working group to advance the integration of geography and statistics and to develop a work programme for GISCO focused on the 2020 population and housing census and on attaining the maximum possible degree of georeference therein. The second document contained a proposal for the EFGS's long-term programme over the next five years and defined three key projects, emphasising the need to create a shared 'point-based foundation' of spatially localised statistical microdata for the European Statistical System. Participants in the panel approved both documents with minor comments.

All the conference presentations can be freely downloaded from the conference website of the Czech Statistical Office (http://www.czso.cz/efgs/efgs2012.nsf/i/presentations) or from the website of the EFGS (http://www.efgs.info/front-page/workshops/efgs-2012-prague-czech-republic).

Štěpán Moravec

CHANGES IN CODING PRACTICE BETWEEN 2010 AND 2011 IN THE CZECH REPUBLIC

Magdaléna Poppová

INTRODUCTION

When evaluating the differences in mortality by causes of death between 2010 and 2011, it is necessary to take into account the changes that were made to the coding practice. Also, IRIS 4.0 software for automated coding[1)] and updates of the tenth revision of the International Classification of Diseases (ICD-10) valid since 2010 were introduced into data processing in 2011.

SELECTING THE UNDERLYING CAUSE OF DEATH – METHODOLOGY

To understand the changes in coding practice, it is first necessary to be familiar with the methodology used to process of cause-of-death statistics. Statistics on causes of death are based on a concept of the underlying cause of death, which is defined by the World Health Organization (WHO) as 'a) the disease or injury which initiated the train of morbid events leading directly to death, or b) the circumstances of the accident or violence which produced the fatal injury' (*WHO*, 2011: 31). The underlying cause of death (UC) is selected from diagnoses reported by a physician in a death certificate. The rules for selecting the UC are defined in the Instruction Manual of the ICD-10. The continuous updating process applied to the ICD-10, which was started by WHO in 1996, applies to all three volumes[2)] of the classification.

The UC is selected from diseases and injuries, which, together with the approximate intervals between the onset of the disease and death, are recorded by a physician in Part I and Part II of the death certificate. 'Part I of the form is for disease related to the train of events leading directly to death and Part II is for unrelated but contributory conditions' (*WHO,* 2011: 32). The selection of the UC begins examination whether or not the conditions entered in the certificate are in causal sequence, and this is done on the basis of a General Principle and three selection rules. First, the ***General Principle*** is applied in order to check whether the condition alone on the lowest used line of Part I could have given rise to all the conditions entered above it. Then the condition entered on the lowest used line is selected as the UC. If the General Principle is not possible to apply, e.g. more than one condition is entered on the lowest line, then ***Rule 1*** is used. When 'there is a reported sequence terminating in the condition first entered on the certificate, select the originating cause of this sequence'(*WHO,* 2011: 35). If there is no reported sequence terminating in the condition first entered on the certificate, the first-mentioned condition is selected as the UC (***Rule 2***). Finally, a check is made of whether the UC is not a direct consequence of another condition reported in either Part I or Part II (***Rule 3***) or whether it is not possible to apply the Modification Rules.

The Modification Rules apply to conditions that are not very useful or informative enough to tabulate causes of death for cause-of-death statistics (e.g. if some generalized disease such as hypertension or atherosclerosis is selected as the UC, this is less informative than if a manifestation or result of the disease is chosen). There are six modification rules:

1. Rule A – Senility and other ill-defined conditions includes a list of conditions, in which

1) For more details about IRIS, see: Poppová Magdaléna. IRIS language independent coding software – Implementation in the Czech Republic. *Demografie*, 53, p. 392–396.

2) The classification comprises a tabular list, an Instruction Manual and an alphabetical index.

the selection of the UC has to be done again and the condition from the list has to be considered as though it was not reported in the death certificate.

2. Rule B – Trivial condition, which eliminates a trivial condition as the UC on a principle similar to that of Rule A.

3. Rule C – Linkage prefers as the UC causes in linkage or modifies the selected UC. A list of modification linkages is included in Volume II of the ICD-10 (e.g. if chronic ischemic heart disease – I25 is selected as the UC based on the General Principle and if acute myocardial infarction – I21 is mentioned in the certificate, I21 should be selected as the UC).

4. Rule D – Specificity, if the selected cause describes a condition in general terms and if the term providing more information about the site or nature of this condition is reported in the certificate, the more informative term is preferred.

5. Rule E – Early and late stages of disease, if the selected cause is an early stage of a disease and a more advanced stage of the same disease is reported in the death certificate, the more advanced stage is coded as the UC.

6. Rule F – Sequelae is applied if there is evidence that death occurred from residual effects of the condition rather than from the effects of its active phase.

The Instruction Manual includes also special rules for selecting neoplasms and other causes, a list of ICD codes that should not be selected as the UC, and a list of improbable sequences of ICD codes. Unfortunately, the manual does not provide a complete list of all conditions. The software for automated coding in combination with a validation tool[3] tries to solve this deficiency.

BRIDGE-CODING STUDY

The process of selecting the UC is becoming more and more demanding as a result of rising life expectancy and the related increased occurrence of chronic diseases. The implementation of the software for automated coding is one way of improving the quality of the selection of the UC. According to the recommendations, the implementation of automated coding software or important ICD updates in the country should be accompanied by a 'bridge-coding study', a study to investigate the impact of these changes on death statistics. The study involves processing the same data sample using the old and the new coding practice.

A data sample for the bridge-coding study for evaluation differences between 2010 and 2011 was prepared as part of a grant project of the European Commission titled 'Quality Improvement of Causes of Death Statistics by Automated Coding', during which the 4.0 version of IRIS was implemented in the Czech Republic. The data sample comprised 25,000 statistical notifications of death with the date of event occurring between January and March 2010 (they accounted for 23.4% of all deaths in 2010). The manual selection of UCs based on the second revision of the ICD-10, including updates from 2004–2008, is considered as the old coding practice. UCs were selected with the help of the ACME decision tables in paper form. The ACME decision tables contain the list of acceptable causal relationships between a pair of causes of death and the list of linkages described in Rule 3 and the Modification Rules. The ACME decision tables are part of the software for automated coding. Introduction of the ACME decision tables increased the overall quality of the statistics. Nevertheless, there were persistent differences in the coding skills of coders. In addition, the ACME decision tables in paper form are an extensive document and thus are not very flexible for the introduction of the ICD-10 updates. The new coding practice involves the automated selection of the UC by IRIS according to ICD-10 updates valid from 2010. IRIS was developed partly with the intention of facilitating the effortless implementation of ICD-10 updates. As a result, IRIS is able to transform codes that were

3) The Czech validation tool was prepared by experts of the Institute of Health Information and Statistics of the CR. The tool was based on a validation tool produced by the Eurostat Task Force on Quality Control. Although IRIS has been implemented, the tool is still used to detect of poorly completed certificates and to verify manually selected UCs. At present, it includes only checks on ICD codes that should not be selected as the UC.

excluded from the latest version of the ICD-10 into valid codes in case codes that have been removed are still reported in the death certificate. Software for automated coding at first assesses all the conditions reported in the death certificate (e.g. manner of death, time interval between the onset of disease and death, the position of chronic disease in recorded sequence) that have to be taken into account and then the selection of the UC begins. WHO rules for selection are strictly applied and IRIS respects their hierarchy. The process of selecting the UC using both practices was ultimately verified using the corresponding version of the national validation tool.

The comparison rate of the two methods can be expressed as the number of deaths from a given cause according to the new coding practice divided by the number of deaths from the given cause according to the old coding practice.

$$CR_i = \frac{D_i^N}{D_i^O}$$

CR – comparison rate
D^N – number of deaths coded using the new coding practice
D^O – number of deaths coded using the old coding practice
i – cause of death

The statistical notifications presented in bridge-coding study contained 71,886 diagnoses (i.e. on average 2.9 diagnoses per a notification). A total of 85.6% of notifications contained more than one diagnosis. The time intervals between the onset of disease and death were reported in 4.3% of the notifications. The most diagnoses in one death certificate was 14 (for more details, see Table 1). The structure (in the breakdown of ICD chapters) of the data sample for the manually selected UCs differed from the structure of the 2010 data in the range of –1.3 to 1.0 percentage points. The most frequent diagnoses selected as a UC in the data sample were diseases of the circulatory system (51.5%), neoplasms (25.7%), diseases of the respiratory system (6.2%), and external causes of death (5.1%). These four groups represented 92.8% of all deaths in data sample. The implementation of IRIS and ICD-10 updates influenced the mortality structure at every level of the classification, not only on the most detailed level (the four-digit code) but also on an aggregated level (chapters). Shifts among chapters resulted, first of all, from the use of the automated evaluation of causal sequences (General Principle, Rule 1) and from the application of Rule 3, A, B. Shifts were also caused by the introduction of more precise checks on the causes that can be used as a UC and applied using the national validation tool, which were updated according to ICD-10 updates and based on the results of European projects focusing on the improvement of cause-of-death statistics (e.g. Anamort[4], *CépiDC et al.*, 2008). The biggest relative increase in the number of deaths was recorded among chapters, of which share on the total number of deaths was not significant. These chapters included causes, which on the base of new possible causal sequences and modification linkages were allowed as the UC (e.g. vascular dementia F01 and Alzheimer's disease G30). The biggest decrease in the number of deaths occurred in chapter XVIII: Symptoms, signs, abnormal findings, ill-defined causes (R00–R99, see Table 2).

The mortality trends for malignant neoplasms were affected by the ICD-10 updates valid since 2010.

Table 1 Structure of the data sample for the bridge-coding study

No. of items in the death notification	Total	%
1 diagnosis	3,607	14.4
2 diagnoses	7,254	29.0
3 diagnoses	7,127	28.5
4 diagnoses	4,209	16.8
5 or more diagnoses	2,803	11.2
Time intervals reported in the notification (at least one for one cause)	1,064	4.3
Maximum diagnoses per line	7	x
Maximum diagnoses per notification	14	x
Total number of diagnoses in all the notifications	71,886	x
Average number of diagnoses per a notification	2.9	x

4) For more details about the Anamort project, see: http://www.invs.sante.fr/surveillance/acvc/anamort.htm.

Table 2 **Results of the bridge-coding study: chapters of the ICD-10**

Chapter	ICD-10 code	Selected UC		Comparison	
		Manual 2010	IRIS 2011	Gain/loss	Rate
Infectious and parasitic diseases	A00–B99	258	294	36	1.14
Neoplasms	C00–D48	6,430	6,260	–170	0.97
Diseases of the blood(-forming organs), immunol. disorders	D50–D89	28	34	6	1.21
Endocrine, nutritional and metabolic diseases	E00–E90	513	608	95	1.19
Mental and behavioural disorders	F00–F99	38	160	122	4.21
Diseases of the nervous system and the sense organs	G00–H95	246	431	185	1.75
Diseases of the circulatory system	I00–I99	12,869	12,833	–36	1.00
Diseases of the respiratory system	J00–J99	1,548	1,351	–197	0.87
Diseases of the digestive system	K00–K93	1,068	1,037	–31	0.97
Diseases of the skin and subcutaneous tissue	L00–L99	31	42	11	1.35
Diseases of the musculoskeletal system/ connective tissue	M00–M99	15	35	20	2.33
Diseases of the genitourinary system	N00–N99	339	327	–12	0.96
Complications of pregnancy, childbirth and puerperium	O00–O99	1	2	1	2.00
Certain conditions originating in the perinatal period	P00–P96	47	53	6	1.13
Congenital malformations and chromosomal abnormalities	Q00–Q99	38	52	14	1.37
Symptoms, signs, abnormal findings, ill-defined causes	R00–R99	248	164	–84	0.66
External causes of injury and poisoning	V01–Y89	1,283	1,317	34	1.03
All causes of death	A00–Y89	25,000	25,000	x	x

Besides the reorganisation of the category 'malignant neoplasms of lymphoid/haematopoietic tissue', a new rule was introduced to not use secondary malignant neoplasms (C78–C79) as the UC. This update contributed to a 60% increase in the total number of deaths from 'malignant neoplasms without specification of site' (C80); this cause is chosen as the UC if the primary site cannot be identified. The instruction that a malignant neoplasm of independent (primary) multiple sites (C97) should be selected as the UC in the case where more than one primary site is mentioned in Part I of the DC was cancelled in the ICD-10 updates. At present, only the General Principle and the selection rules are used in these cases.

The total number of deaths assigned to chapter IV: Endocrine, nutritional and metabolic diseases (E00–E90) increased after the introduction of IRIS. 90% of the gain in chapter IV resulted from the increasing number of deaths from diabetes mellitus (E10–E14). The increase was a consequence of the general revision of diabetes mellitus linkages in the ACME decision tables following the introduction of new instructions in the ICD-10 Manual. The selection of the UC in general was influenced mainly by the updates to Rule 3 on direct consequence (e.g. for 'atherosclerosis of arteries of extremities' (I70.2) and renal disease and ureter disorders (from chapter N00–N99), see Table 3).

Only the inner structure of the chapter IX: Diseases of the circulatory system (I00–I99) was affected by changes in coding practice. When diagnoses from chapter IX are selected as UCs, Modification Rules have to be often applied. This characteristic and high frequency of diseases of the circulatory system in population make possible easy detection of changes in mortality trends caused by introducing new linkages between diagnoses. The most significant decrease occurred in the number of deaths from cardiac arrest

Table 3 **Results of the bridge-coding study: selected diseases or groups of diseases**

Chapter: group of diseases or disease	ICD-10 code	Selected UC		Comparison	
		Manual 2010	IRIS 2011	Gain/loss	Rate
C00–D48: Malignant neoplasm without specification of site	C80	184	222	38	1.21
E00–E90: Diabetes mellitus	E10–E14	455	529	74	1.16
F00–F99: Vascular dementia	F01	5	99	94	19.80
G00–G99: Alzheimer disease	G30	82	191	109	2.33
I00–I99: Ischaemic heart diseases	I20–I25	6,022	6,392	370	1.06
Acute myocardial infarction	I21	1,497	1,614	117	1.08
Chronic ischaemic heart disease	I25	4,450	4,654	204	1.05
Pulmonary embolism	I26	495	342	–153	0.69
Cardiac arrest	I46	256	103	–153	0.40
Heart failure	I50	505	923	418	1.83
Cerebrovascular diseases	I60–I69	2,836	2,853	17	1.01
Other cerebrovascular diseases	I67	798	702	–96	0.88
Sequelae of a cerebrovascular disease	I69	113	195	82	1.73
Atherosclerosis	I70	1,573	960	–613	0.61
J00–J99: Pneumonia	J12–J18	789	531	–258	0.67
V01–Y98: Unspecified fall	W19	273	179	–94	0.66
Exposure to an unspecified factor	X59	28	166	138	5.93

(I46), which declined by 60%. This change is connected with the application of Rule A, i.e. the extension of the list of ill-defined conditions according to ICD-10 updates ('sudden cardiac death so described'– the subcategory of I46 was included in the list). A decrease in mortality from atherosclerosis (I70) was caused by several factors: 1) The more consistent application of modification linkages in the automated coding software (linkages can be multiplicative and this is difficult to deal with using manual selection); 2) IRIS includes checks on the selection of heart failure (I50) as a UC (I50 is regarded as a terminal disease), which was previously a part of the national validation tool, so it is now possible to fully apply a linkage between I70 and I50; 3) The introduction of the new linkage with vascular dementia (F01) and diabetes mellitus (E10–E14) from ICD-10 updates.

The application of the selection rules in IRIS caused a more than 90% of the decrease in the number of deaths from pulmonary embolism (I26). The implementation of IRIS also caused a decline in mortality from other cerebral diseases (I67). The transformation of cerebral diseases of long lasting duration into sequelae in IRIS was one reason for the increase in the total number of deaths from sequelae of cerebral disease (I69).

An important factor behind the decrease in the number of deaths from diagnoses in Chapter X: Respiratory disease (J00–J99) was the change in the total number of deaths due to pneumonia (J12–J18). Pneumonia is considered to be a terminal complication of other diseases, so the extension of the list of diseases that can be selected as the UC significantly influenced the number of death from pneumonia. The number of deaths from an unspecified fall (W19) decreased between 2010 and 2011 owing to the concurrent implementation of automated coding and the ICD-10 updates, when the category 'exposure to other unspecified factors' (X59) was extended to two subcategories (X590: 'exposure to unspecified factor causing fracture' and X599: 'exposure to unspecified factor causing other and unspecified injury'). IRIS chooses an ICD code from category X59, when the code for the external cause of death is not reported in the death certificate. By contrast, W19 was frequently

chosen in the Czech Republic as the code for an external cause in these cases.

CONCLUSION

The changes in coding practice introduced between 2010 and 2011 involved the implementation of software IRIS for automated coding and ICD-10 updates valid since 2010. They caused the highest relative gains in chapters, of which share on the total number of deaths was not significant, such as mental and behavioural disorders and diseases of the nervous system. The biggest relative decrease was in the number of deaths from chapters 'Diseases of the respiratory system' and 'Symptoms, signs and abnormal clinical and laboratory findings not elsewhere classified'. The inner structure of deaths from diseases of the circulatory system was significantly influenced by these changes, in particular in the cases of atherosclerosis, cardiac arrest and pulmonary embolism, which decreased in frequency, and heart failure, which increased.

IRIS automatically processed 90% of notifications of death received in 2011, so the target to harmonize selection of UCs was met. Owing to the use of IRIS, the WHO rules for selecting the UC are being strictly applied and the ICD-10 updates can be implemented more efficiently.

The year 2013 will see new changes to the data collection system and the implementation of the ICD-10 updates valid since 2013.

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Annex 1 **Results of the bridge-coding study: cross-tabulation of the ICD chapters**

UC chapter coded using IRIS according to ICD-10 version valid in 2011	UC chapter manually coded according to the ICD-10 version valid in 2010																		Comparison	
	Total	I (A00–B99)	II (C00–D48)	III (D50–D89)	IV (E00–E90)	V (F00–F99)	VI (G00–G99)	IX (I00–I99)	X (J00–J99)	XI (K00–K93)	XII (L00–L99)	XIII (M00–M99)	XIV (N00–N99)	XV (O00–O99)	XVI (P00–P96)	XVII (Q00–Q99)	XVIII (R00–R99)	XX (V01–Y89)	Gain/loss	Rate
I (A00–B99)	294	190	9	0	4	0	2	33	17	30	1	0	5	0	0	0	1	2	36	1.14
II (C00–D48)	6,260	1	6,193	1	2	0	0	35	8	10	0	0	3	0	0	0	1	6	–170	0.97
III (D50–D89)	34	1	1	21	1	0	0	4	2	2	0	0	0	0	0	0	2	0	6	1.21
IV (E00–E90)	608	4	6	0	432	0	1	117	17	5	1	0	20	0	0	0	4	1	95	1.19
V (F00–F99)	160	0	0	0	1	31	0	84	29	0	0	0	7	0	0	0	7	1	122	4.21
VI (G00–G99)	431	6	6	1	6	1	229	87	72	7	2	0	4	0	0	0	5	5	185	1.75
IX (I00–I99)	12,833	22	181	5	47	1	10	12,207	194	47	7	1	34	0	0	2	50	25	–36	1.00
X (J00–J99)	1,351	10	17	0	8	0	2	129	1,156	7	0	0	3	0	0	0	13	6	–197	0.87
XI (K00–K93)	1,037	3	12	0	3	5	0	49	8	950	0	0	3	0	0	0	1	3	–31	0.97
XII (L00–L99)	42	6	1	0	1	0	0	9	3	0	20	0	0	0	0	0	2	0	11	1.35
XIII (M00–M99)	35	3	1	0	2	0	0	6	7	1	0	14	0	0	0	0	1	0	20	2.33
XIV (N00–N99)	327	9	1	0	3	0	1	41	8	6	0	0	255	0	0	0	1	2	–12	0.96
XV (O00–O99)	2	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	2.00
XVI (P00–P96)	53	0	0	0	0	0	0	0	6	0	0	0	0	0	47	0	0	0	6	1.13
XVII (Q00–Q99)	52	0	1	0	1	0	0	7	2	1	0	0	4	0	0	36	0	0	14	1.37
XVIII (R00–R99)	164	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	159	0	–84	0.66
XX (V01–Y89)	1,317	3	1	0	2	0	1	55	19	2	0	0	1	0	0	0	1	1,232	34	1.03
Total	**25,000**	**258**	**6,430**	**28**	**513**	**38**	**246**	**12,869**	**1,548**	**1,068**	**31**	**15**	**339**	**1**	**47**	**38**	**248**	**1,283**	**X**	**X**

THE SOCIO-ECONOMIC DETERMINANTS OF SEX RATIO IN INDIA – AN EMPIRICAL PERSPECTIVE

Sonu Madan[1)]

1. INTRODUCTION

Indian society is a patriarchal society where gender inequality prevails in every sphere of life, despite the assurance of equality, justice, liberty and fraternity in the Indian constitution. The sex ratio[2)] is an important social indicator for measuring the extent of the prevailing inequalities between males and females in a society at a given point in time. Provisional population census data from 2011 have once again raised the hotly debated issue of the low sex ratio (SR) in general and the child sex ratio[3)] (CSR) specifically. As per the 2011 census, among Indian states, the overall sex ratio ranged from 877 in Haryana to 1084 in Kerala. The imbalance in the number of males and females is not a new issue, as indicated by the uneven and diverged gender composition of the population across the world and in the neighbouring countries of India as well. It is evident from Table 1, that the number of males exceed the number of females in the world in 2001 and 2011.Out of nine neighbouring countries of India, only in Myanmar, Sri Lanka and Nepal did females outnumber males in both time periods, but in the other six countries the balance is tilted towards males. Thus, a female-negative gender composition is a specific feature not just of the Indian population, but also of those of its neighbouring countries. Here the reasons for this need to be explored.

Table 1 **The sex ratio in India and neighbouring countries 2001–2011selected diseases or groups of diseases**

Countries	2001	2011
World	986	984
India	933	940
China	944	926
Pakistan	938	943
Bangladesh	958	978
Sri Lanka	1,010	1,034
Nepal	1,005	1,014
Afghanistan	930	931
Bhutan	919	897
Myanmar	1,011	1,048

Source: Provisional Population Totals. Paper 1 of 2011 India, Series 1, Chapter 5, p. 80.

There are 28 states and 7 UT's (Union Territories) in India and wide-ranging variations in the sex ratio have been found across Indian states. Recent data on the sex ratio from the 2011 census states that although the overall sex ratio has improved in India, going from 933 in 2001 to 940 in 2011, on average this cannot be conceived as a qualitative change,

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2) The census of India measures the sex ratio as the number of females per thousand males as opposed to the standard international norm of the number of males per thousand females. In this study, the sex ratio denotes the ratio of females to males to confirm to the Indian practice and is calculated as (females/males)*1000.

3) The sex ratio in the age group of 0–6 years.

as the sex ratio in all the states and the UT's except Kerala (1,084) and Puducherry (1,038) has remained unfavourable to females. One more revealing point is that, in spite of the quantitative improvement in the sex ratio, the low-performing states of Haryana, Punjab, Rajasthan and Utter Pradesh are still in the same group of states with a low sex ratio among the major Indian states (population wise). Punjab and Haryana also have witnessed an increase in the sex ratio from 876 to 893 and from 861 to 877 respectively, thereby giving an increase of 17 and 16 points respectively, but they have still remained in the lowest positions in terms of the sex ratio.

The worst case is the child sex ratio (CSR), as nowhere is it recorded as favourable to females in all of India. Again Punjab and Haryana have emerged with a very low CSR. Among major Indian states, as per 1991 census data, the lowest performing states were Punjab (875), Haryana (879), Rajasthan (916), Utter Pradesh (927), Gujarat (928) and Madhya Pradesh (941). All these states had a very low CSR, even lower than the national average of 945. A similar picture was reflected in the census of 2001. The CSR was not only observed to be the lowest in Haryana and Punjab, but deteriorated badly in both these states, declining from 879 to 819 in Haryana and from 875 to 798 in Punjab between 1991 and 2001.

Though a reverse trend has been witnessed for the first time in both states as the CSR in both states has shown an improvement during 2001–2011 (an improvement of 11 points, from 819 to 830, in Haryana and of 48 points, from 798 to 846, in Punjab), but Haryana still remains in the lowest position, preceded by Punjab among major Indian states.

A district-wise study of 15 major Indian states (see Table 2) shows that the child sex ratio in all 20 districts of Punjab is less than 900 females per 1,000 males and this is not the worst level as it is even less than 850 in 11 districts. The case is almost the same for Haryana state as the sex ratio in all the districts except one, i.e. 20 districts, has been at a level in the range of 850–900 females per 1,000 males. Thus, the picture is quite dismal in both states. Similarly, the adjoining districts, e.g. Rajasthan, on both sides of the border between Haryana and Punjab, have a very similar male-female composition in their child population, which indicates a shared social, cultural and economic feature of female discrimination

Table 2 **Classification of major states by the district-level child sex ratio, 2011**

Sr. No	India / States	Number and percentage of districts in major states				
		Total no. of districts	Districts with CSR > 900	Districts with CSR < 900	Districts with CSR 850–900	Districts with CSR < 850
1	Andhra Pradesh	23	23 (100)	–	–	–
2	Assam	27	27 (100)	–	–	–
3	Bihar	38	36 (95)	2 (5)	2 (5)	–
4	Gujarat	26	10 (38)	16 (62)		
5	Haryana	21	01 (5)	20 (95)		
6	Karnataka	30	30 (100)	–	–	–
7	Kerala	14	14 (100)	–	–	–
8	Madhya Pradesh	50	41 (82)	9 (18)	7 (14)	2 (4)
9	Maharashtra	35	15 (43)	20 (57)	13 (37)	7 (20)
10	Orissa	30	28 (93)	2 (7)	2 (7)	–
11	Punjab	20	0 (0)	20 (100)	9 (45)	11 (55)
12	Rajasthan	33	9 (27)	24 (73)	21 (64)	3 (9)
13	Tamil Nadu	32	30 (94)	2 (6)	2 (6)	–
14	Uttar Pradesh	71	40 (56)	31 (44)	27 (38)	4 (6)
15	West Bengal	19	19 (100)	–	–	–

Source: Compiled from Provisional Population Totals. Paper 2 of 2011 India, Series 1.

Note: Figures in parenthesis show the percentage of districts.

beyond the confines of administrative boundaries *(Nanda – Veron, 2005; Madan, 2010)*.

2. LITERATURE REVIEW

The decreasing child sex ratio has been an important concern in India's demography in recent times *(Agnihotri, 1996; Mahendra, 2001; Bhat, 2002)*. The low and declining sex ratio is an indicator of the low status of females in society and a reflection of gender bias. *Visaria (2003)*, in her recently completed study undertaken with the support of the Health Watch Trust in Mehsana district in Gujarat and Kurukshetra district in Haryana, observed that there was a stronger preference for boys with the last birth than all the other births. In her study, 240 males for every 100 girls (416 females per thousand males) in the last births were reported born to women who belonged to the literate, upper castes and landed families. The preference for a son was evident from the behaviour of the couples.

Numerous studies have been conducted to identify the causes behind the observed patterns of a low sex ratio *(Bhat, 2002a; Bhat, 2002b)*. The declining sex ratio is also due to an undercounting of females in different censuses. *Irudaya et al. (1991)* found that double counting of migrating males both at their points of departure and the destination is the reason for the declining sex ratio. In this line, *Srinivasan (1994)* observed that the decline in the sex ratio is due to the increasing incidence of female foeticide in the country through the use of modern techniques of ultra sonography and amniocentesis that help to identify the sex of the baby at a very early stage of pregnancy. *Lingam (1991)* pointed out that the availability of the sex detection test creates a situation where females are forced to undergo the test either by external pressure or by family members or by internalized values and to prepare for female foeticide. Increasing economic pressures and the success of family planning programmes make families follow the two-child norm and sex-selective abortions then become a way to meet the conflicting demands of having a small family and the desire for sons *(Ganatra, 2001; Gangopadhyay, 1996)*.

Thus, sex-selective abortions and the preference for sons are identified as the main determinants of the declining sex ratio in certain studies related to Asian countries *(D'Souza – Chen, 1980; Sen, 1983; Gupta, 1987 and Park – Cho, 1995)*. It has been well documented in the economics and sociological literature that parents exhibit a preference for sons across geographical, economic and social boundaries. Adult sons are expected to provide economic support and thus having more sons is always desirable *(ORG, 1983; Lahiri, 1984; Miller, 1987; Gupta, 1987)*. On the other hand, daughters are supposed to create an economic burden for the parents in terms of a dowry, etc. As a consequence, parents prefer to have more sons in their family composition. Ethnographic evidence also suggests that boys and girls are expected to exhibit different behaviours, undertake different physical and emotional tasks and participate in and perform different practical and ritual activities within families and kinship groups. Cultural differences in the level of contact between a married daughter and her natal kin also lead to differences in the values attached to sons. Village and kin exogamy lead to the severance of ties with a married daughter *(Raheja – Gold, 1994)*. Parents thus become more dependent on a son and consequently the son preference becomes stronger. In India, the birth of a boy is thus a time for celebration, while the birth of a girl – especially a second or subsequent daughter – is often viewed as a crisis *(Bumiller, 1991)*.

A study by *Miller (1989)*, among many others, confirmed the prevalence of the son preference all over India. Logically, the preference for sons coexists with discrimination against daughters. The stronger the son preference, the more intense the daughter discrimination would be. This, in its most extreme form, results in the death of daughters even before their birth through sex-selective abortions *(Karkal, 1991; Chhabra – Nuna, 1994; Jessani – Iyer, 1995; Chhabra, 1996)*. The strong preference for sons is well documented not only in India but also in many Asian countries *(Ramanamma – Bambawale, 1980; Machlachlan, 1982; Jeffery – Jeffery, 1984; Miller, 1981; Freed – Freed, 1989)*.

According to *Arnold et al., (2002),* financial support, old age security, property inheritance, dowry, family lineage, prestige and power, birth and death rituals and beliefs about religious duties and salvation are the main reasons for the son preference

in India. Several studies *(Basu, 1993; Kishor, 1993; Bardhan, 1988; Karki, 1988; Das, 1987; Gupta, 1987; Rose, 1999; Dutta – Panda, 2000; Chakrabarty, 2000; Gill, 2011; Madan, 2012)* have supported these viewpoints.

3.

3.1 OBJECTIVES OF THE STUDY:

- To underline the trends and level of the sex ratio in India in general and specifically in Haryana state.
- To review the role of the son preference in the deterioration of the sex ratio in Haryana.
- To analyse the impact of socio-economic factors on the mindset of society towards the status of female children.

3.2 RESEARCH METHODOLOGY:

In order to underline the trends and levels of the sex ratio at the global, national and district levels, various editions of the Indian population census, the statistical abstracts of Haryana and provisional population census data from 2011 were consulted. In addition, information was also obtained from a primary survey to analyse the socio-economic determinants of the sex ratio in Haryana. For this purpose, a survey was conducted in 2010 and the required information was collected with the help of a specially designed questionnaire administered to 200 married females in the age group of 15–49 years. To make the data representative, districts of Haryana were ranked according to their human development index in 2001 and four districts were selected. In this line, one of the most developed, one of the least developed and two moderately developed districts were selected. Using a specific methodology,[4] the following districts were selected: Ambala (which ranks in first place, with an HDI of 0.6735), Kaithal (which ranks 18th with an HDI of 0.4994), Yamuna Nagar (ranking 8th with an HDI of 0.5833) and Karnal (ranking 9th with an HDI of 0.5636). An equal number of married female respondents were selected using the stratified random technique and they were interviewed to complete the questionnaire. In order to examine the effect of socio-economic factors on the sex ratio, the respondents from selected districts were divided into four groups on the basis of their monthly per-capita income i.e. a low-income group with a per-capita income of 1,000 Rs. or less (54 respondents); a low moderate-income group with a per-capita income of 1,001–2,000 Rs. (46 respondents); an upper moderate-income group with a per-capita income of 2,001–4,000 Rs. (45 respondents); and a high-income group with a per-capita income of 4,001 Rs. or more (55 respondents). The information on social aspects, such as educational level, family type, i.e. joint or nuclear, age at marriage and son preference, as well as economic aspects such as per-capita income, employment status and mother's occupation, etc. were collected and compiled to analyse their impact on the sex ratio.

4.

4.1 THE SEX COMPOSITION OF THE POPULATION IN HARYANA

It is surprising that the sex ratio in all the districts of Haryana is below the national average (940). It is notable that the sex ratio in Haryana had been declining continuously up to 2001. Recent data on the sex composition of the population has shown an improvement of about 16 points per thousand in the sex ratio.

The data (see Table 3) show that the sex ratio in eleven districts, namely Mahendragarh (894), Rewari (898), Fatehabad (903), Sirsa (896), Bhiwani (884), Ambala (882), Kurukshetra (889), Karnal (886), Rohtak (898), Mewat (906), Palwal (879) and Rewari (898), is above the state average. The sex ratio is below the state average in the remaining ten districts. Gurgaon and Sonipat have the lowest sex ratio (853) of all the districts, followed by Panipat (861) and Jhajjar (861). Special attention should go to Mahendragarh, Gurgaon and Faridabad, where the sex ratio has deteriorated badly over the past decade.

4) At the time of the 2001 census, there were 19 districts in Haryana which were ranked according to their human development index in ascending order. Districts in ranks 1–6 were categorised as highly developed districts, districts ranking 7–13 were categorized as moderately developed districts and the remaining districts ranking 14–19 were categorized as less developed districts.

Table 3 **The district-wise sex ratio in Haryana (1991–2001)**

Sr. No	State/Districts	Sex ratio			Rank in 2011	Decadal change	
		1991	2001	2011		1991–2001	2001–11
	Haryana	**865**	**861**	**877**		**– 4**	**16**
1	Ambala	903	869	882	9	–34	13
2	Bhiwani	878	880	884	8	2	4
3	Faridabad	877	886	871	13	9	–15
4	Fatehabad	828	830	903	2	–	73
5	Gurgaon	871	874	853	20	3	–21
6	Hisar	853	852	871	13	–1	19
7	Jhajjar	864	848	861	18	–	13
8	Jind	838	853	870	15	15	17
9	Kaithal	853	854	880	10	1	26
10	Karnal	864	864	886	7	0	22
11	Kurukshetra	979	866	889	6	–13	23
12	Mahendragarh	910	919	894	5	9	–25
13	Mewat	–	899	906	1	–	7
14	Palwal	–	862	879	11	–	17
15	Panchkula	839	823	870	15	–	47
16	Panipat	852	830	861	18	–22	31
17	Rewari	927	901	898	3	–26	–3
18	Rohtak	849	847	868	17	–2	21
19	Sirsa	885	882	896	4	–3	14
20	Sonipat	840	839	853	20	–1	14
21	Yamuna Nagar	883	863	877	12	–20	14

Source: 1. Statistical Abstract of Haryana (2004-5). Economic and Statistical Adviser, Planning Department, Government of Haryana.
2. Statistical Abstract of Haryana (2011-12). Economic and Statistical Adviser, Planning Department, Government of Haryana.

4.2 THE CHILD SEX RATIO IN THE 0–6 AGE GROUP

The sex ratio in the 0–6 age group reveals the recent change in the attitudes and outlook of society towards female children. The low sex ratio in the 0–6 age group indicates the prevalence of the son preference in society. According to the data from the 2011 census (Table 4), the sex ratio is below the state average in eleven districts of Haryana, where the lowest ratios were in Jhajjar (774) followed by Mahendragarh (778). These figures underline the need to explore the factors determining the level of sex ratio. Moreover, the change in the CSR highlights the need for a special campaign in Gurgaon, Mahendragarh, Jhajjar, Rewari, Faridabad and Bhiwani, where the sex ratios have deteriorated badly.

A detailed study of the SR and the CSR shows that the situation with respect to this issue has started to show a reverse trend (improvement) in most districts. Of course, government efforts in the form of various programmes and schemes aimed at social and legislative security, in particular the Pre-Conception and Pre-natal Diagnostic Technique (Prohibition of Sex- selection Act) 1994 and the PC-PNDT (Regulation and Prevention of Misuse) Amendment Act 2002 are remarkable. But the above-mentioned districts, i.e. Gurgaon, Mahendragarh, Jhajjar, Rewari, Faridabad, have been unable to shed their sick mentality and have not shown any progress so far on this issue. The use of sex-selective techniques, at the cost of violating the PNDT act, might be leading to the elimination of the fe-

Table 4 **The child sex ratio; Haryana and districts (1991–2011)**

Sr. No	Haryana/Districts	Child sex ratio			Rank in 2011	Decadal change	
		1991	2001	2011		1991–2001	2001–11
	Haryana	**879**	**820**	**830**		**– 59**	**10**
1	Ambala	888	784	807	16	–104	23
2	Bhiwani	886	838	831	10	–48	–7
3	Faridabad	884	856	842	7	–28	–14
4	Fatehabad	–	830	845	6	–	15
5	Gurgaon	895	863	826	11	–32	–37
6	Hisar	867	830	849	5	–37	19
7	Jhajjar	–	805	774	21	–	–31
8	Jind	858	818	835	8	–40	17
9	Kaithal	854	789	821	13	–65	32
10	Karnal	875	808	820	14	–67	12
11	Kurukshetra	868	770	817	15	–98	47
12	Mahendragarh	892	814	778	20	–78	–36
13	Mewat	–	893	903	1	–	10
14	Palwal	–	854	862	2	–	8
15	Panchkula	–	837	850	4	–	13
16	Panipat	881	807	833	9	–74	26
17	Rewari	894	814	784	19	–80	–30
18	Rohtak	876	796	807	16	– 80	11
19	Sirsa	883	818	852	3	–65	34
20	Sonipat	879	783	790	18	–96	7
21	Yamuna Nagar	889	807	825	12	–82	18

Source: 1. Statistical Abstract of Haryana (2004-5). Economic and Statistical Adviser, Planning Department, Government of Haryana.
2. Statistical Abstract of Haryana (2011-12). Economic and Statistical Adviser, Planning Department, Government of Haryana.

male foetus. A careful inspection of medical clinics and centres is of urgent need to tackle the problem.

4.3 DATA ANALYSIS AND FINDINGS OF THE STUDY

The information compiled from the field survey of the sex ratio of children ever born shows that out of 505 children ever born 264 are male and 241 are female children, indicating 912 females per thousand males, a sex ratio unfavourable to females (Table 5). Economic prosperity seems to affect negatively the sex ratio, which is 1,109 and 1,037 in the low and low-moderate income group respectively, favourable to females, and is 847 and 637 in the upper-moderate and high income group respectively, unfavourable to females. This shows the access/acceptance of economically prosperous couples to/of the use of sex-selective techniques to ensure they have male child/children in their family composition.

Table 5 also presents information on the number of children ever born by gender and birth order. It is generally an accepted fact that the gender selection of unborn children starts with the second-order birth or thereafter, so the sex ratio measured at first birth is always better than at later-order births. The same fact is also revealed on overlooking the sex ratio up to the fifth-order birth. The sex ratio has been found to be favourable to females up to the second-order birth and it becomes unfavourable to females thereafter. The sex ratio is observed to be 1,129 and 1,049 at the birth of the first and the second child, respectively. The ratio declines drastically from the third birth and thereafter, indicating human

Table 5 **The observed sex ratio by per-capita income of the household and by birth order**

Per-capita household income	Gender of 1st child		Sex ratio	Gender of 2nd child		Sex ratio	Gender of 3rd child		Sex ratio	Gender of 4th child		Sex ratio	Gender of 5th child		Sex ratio	Gender of children ever born		Sex ratio
	M	F		M	F		M	F		M	F		M	F		M	F	
1,000 Rs. or less	20	34	**1,700**	25	28	**1,120**	17	25	**1,470**	16	3	**187**	4	1	**250**	82	91	**1,109**
1,001–2,000 Rs.	15	30	**2,000**	19	16	**842**	17	9	**529**	3	1	**333**	0	0	–	54	56	**1,037**
2,001–4,000 Rs.	22	22	**1,000**	19	22	**1,157**	15	5	**333**	3	1	**333**	0	0	–	59	50	**847**
4,000 Rs. or more	36	19	**527**	18	19	**1,055**	13	5	**384**	2	1	**500**	0	0	–	69	44	**637**
Total	93	105	**1,129**	81	85	**1,049**	62	44	**709**	24	6	**250**	4	1	**250**	264	241	**912**

Source: Compiled from the data obtained from field survey.
Note: M = males; F = females.

intervention in this through the use of sex-selective techniques; the ratio is observed to be 709 at third birth, and it falls to 250 at the fourth and fifth birth.

4.3.1 THE SON PREFERENCE AND THE SEX RATIO

Analysis of the observed sex ratio in Haryana (Table 5) shows that the sex ratio, at 912, is unfavourable to females and ranges widely from 1,109 among low-income couples to 637 among high-income couples. It is clear that the sex ratio declines with increasing economic prosperity.

The observed reason for this is that an increase in per-capita income raises the standard of living and grants access to resources that can be used to limit family size so there is at least one son, which may include the use of sex-selective techniques. Almost every parent wishes to have at least one son, not only to continue the family line and ensure economic and social security, but also as a source of psychological strength. According to the survey, the son preference among mothers is found to be stronger than among fathers, as they expect more support from their son/sons, particularly in old age. For mothers, the importance of sons is also associated with their social and emotional well-being and is logically very strong. Moreover, son are considered to be less of a liability than daughters. The son preference should be analysed bearing the following points in mind:

4.3.2 THE DESIRE FOR AN ADDITIONAL CHILD AND EXISTING FAMILY SIZE AND COMPOSITION

The gender composition of existing children strongly affects the desire for another child. In the case of son preference, parents will have a strong desire for another child in the absence of a son in their family composition. In the present study, out of 200 respondents 159 did not desire to have another child (see Table 6). When the gender composition of their live children is analysed, all the women except three have at least one male child. Thus, it is quite clear that the parents desire to have other child/children in the absence of any male child. Among all 200 women, 24 women had no male child and 21 of them (87.5% females with no male child) revealed their desire for a male child, while three of them seemed to limit the family size and did not want to expand the family size despite their desire for a son. These three women belonged to a high-income group, literate and were working in the service sector. Although they did not express a desire for another child, they strongly revealed their preference for a family composition with at least one male child. But in order to limit the family size at two children, they had decided not to opt for an additional, i.e. third, child. In total, 98 women (49%) had one male child in their family, composition and 81 of them (82.70%) did not desire any more children, while 17 women (17.30%) wanted to have another child. Out of 69 women (34.3) with two male children, only three

Table 6 **The desire to have another child and the number of live male children in the family**

Desire for another child	Number of male children					Total
	0	1	2	3	4	
Yes	21 (87.50) (51.2*)	17 (17.30) (41.5*)	3 (4.30) (7.3*)	0 (0.00) (0.0*)	0 (0.00) (0.0*)	41 (20.50) (100.0*)
No	3 (12.50) (1.9*)	81 (82.70) (50.9*)	66 (95.70) (41.5*)	8 (100.00) (5.0*)	1 (100.00) (.6*)	159 (79.50) (100.0*)
Total	24 (100.00)	98 (100.00)	69 (100.00)	8 (100.00)	1 (100.00)	200 (100.00)

Note: 1. The figures indicate the number of women who wish to have another child with respect to the existing number of male children in the family.
2. The figures in the parenthesis indicate the percentage of the total column-wise.
3. The figures in the parenthesis with the * sign show the percentage of the total row-wise.

desired more children and the remaining 66 women (95.70%) expressed no such desire. No woman with three or more sons in her family expressed the desire to have any more children.

It is clear that parents with two or more male children in their family do not have any desire to have another child. It shows that the desire for another child strongly depends upon the number of male children in the family and decreases considerably with an increase in the male children in the family. However, a detailed study of family size and composition by gender provides a deep insight into parents' desire for male children.

Table 7 provides information on the gender preference of additional child in accordance with the existing gender composition of families. If we study the preferred gender of other child of the 41 women who desired to have another child, 29 women (70%) desired a male child, while 12 (30%) left it up to God. None of the women expressed the desire to have a female child. Every woman wanted to have at least one male child. An overview of the gender composition of the family shows that the desire for a male child is quite strong in the case of no male child in the existing family.

Among those who desired to have another child, i.e. 41 parents, the maximum number, i.e. 25 parents (60.9%), had either no child or only one child (two with no child, eight with only one male child and 15 with only one female child). It shows that the one-child norm has not yet been accepted. If we analyse the gender composition of live children in the family and the desire for another child, one out of two women with no children expressed the desire for a male child and the other one left it up to God. The study of women with only one child underlines the son mania in Haryana state, as none of the women desired to have a daughter as her next child. Those who had only a daughter strongly expressed the desire for a son and the others left it up to God. Out of 23 females with one child, 8 had only a son and only 1 of them expressed the desire for a male child, and 7 left it up to God. There were 15 women who had only one daughter and 11 of them wanted to be blessed with a son as their next child. It is also clear that if the first-born child is a son, then the gender preference for the next child is not as strong as when the first-born is a daughter. What is important for every parent is to have at least one son. Mothers feel that a son/sons would provide them with social and economic security in old age, carry on the family name and give them status in society.

The table also shows that among parents with two or more sons in their family, only three desired to have another child that would be male (Table 7, Col. VI). This shows that among those who want to increase their family size beyond two children, the wish is only for male children, even if they already have sons and no daughter in their existing family. Here the point to be noted is that families following the two-child norm want to have at least one male child, but those who want to expand their family size beyond two children desired to do so only for male children. Thus, the analysis makes it clear that one son is considered as a cause for joy, but two or more sons are seen as a life-time celebration in Haryana. This provides the insight that parents with at least one male child feel themselves to be secure in their existing social

Table 7 **Existing family composition and the desire for another child**

No. of parents who	0 children	One child		Two children		Three children			Four or more children		Total respondents
		1 S	1 D	2 S	1S+ 1 D	2S+ 1 D	1S+ 2 D	3 D	Up to 2 sons	1 S + Ds	
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
Desire for a male child	1	1	11	0	3	3	5	3	0	2	**29**
Desire for a female child	0	0	0	0	0	0	0	0	0	0	**0**
Left it up to God	1	7	4	0	0	0	0	0	0	0	**12**
Total respondents	**2**	**8**	**15**	**0**	**3**	**3**	**5**	**3**	**0**	**2**	**41**

Note: S = son, D = daughter.

and religious environment. This is the main reason that parents with just a daughter desire to have a son as their next child. Thus, the above analysis underlines the importance of male children in the family. It clearly shows the attitude of society towards the female child, which indirectly is a reflection of the low status of women. The strong son preference motivates people to use sex-selective techniques and is a reason for the low sex ratio.

4.4 ECONOMIC DEVELOPMENT AND THE SEX RATIO

Economic development has a significant effect on the level of per-capita income, the level of educational attainment, employment status and the mother's occupation, which can further affect the family composition of a household in particular and the sex ratio in general. It is clear from Table 8 that the observed sex ratio is negatively related to the level of income, the educational attainment of mothers and their economic participation. Type of occupation, family structure and age at marriage are also found to affect the sex composition in the family.

4.4.1 LEVEL OF INCOME

As far as the current study is concerned, an increase in the level of per-capita income, which may be considered as a measure of standard of living, leads to a deterioration of the sex ratio. The observed sex ratio in low-income families, i.e. per-capita income of 1,000 or less, is not only the highest, but is also favourable to females i.e. 1,110. It decreases with an increase in income level and is found to be lowest, i.e. 638, among families with high per-capita income, i.e. above 4,000 per month. The reason is quite easy to understand in that economically prosperous families attempt to maintain the higher standard of living they have attained, so they wish to limit their family size, as indicated by the fertility rate. The total fertility rate, which is found to be 3.2 children among respondents in the low-income group, is estimated to be 2.1 children among respondents in the high-income group. Thus, to limit the family size while having at least one son, they prefer to adopt sex-selective techniques. They also have easy access to better infrastructure, more sex-selective techniques and more doctors to perform the tests, which are easily followed by sex-selective abortions. Thus, the analysis demonstrates that in spite of the PNDT act, gender detection and selection techniques are not beyond the reach of rich people. Thus, the declining sex ratio is largely attributed to the relative prosperity that has enabled people to make use of the advanced scientific technology of sex determination to do away with girl children even before their birth.

4.4.2 THE EDUCATIONAL LEVEL OF PARENTS

The present study reveals that an increase in the educational attainment of women adversely affects the sex ratio. It's a popular belief that literate people are less prone to gender bias. But this logic does not hold true in the north-west states, especially in Haryana. According to the field survey, mothers' education up to senior secondary leads

Table 8 **The sex ratio in relation to income level, educational status, occupation, family type and age at** marriage

Indicators	Gender composition		Sex ratio
Income level(Per-Capita Income)	**Male**	**Female**	
1,000 or less	82	91	1,110
1,001–2,000	54	56	1,037
2,000–4,000	59	50	847
Over 4,000	69	44	638
Women's educational level			
Nil	105	103	981
Up to middle	54	51	944
Up to senior secondary	36	37	1,028
Above senior secondary	69	50	725
Women's employment status			
Yes	90	60	667
No	174	181	1,040
Type of occupation			
Primary sector	47	41	872
Secondary or service sector	43	19	441
Family type			
Nuclear	180	158	878
Joint	84	83	988
Age at marriage			
Under age 18	112	114	1,017
Over age 18	152	127	835

Source: Compiled from the date obtained from field survey.

to a sex ratio favourable to females, i.e. 1,028, whereas it is observed to be least 725 when mothers' education is above senior secondary. This is a clear indication that illiterate mothers do better in this. It is a common fact of observation that educated females mainly work in the secondary or service sector, where remunerations are more than the remuneration earned by those engaged in agricultural work, i.e. daily wage workers. Educational level thereby affects the type of work held, which in turn has a significant impact on household income, and the latter is a significant factor determining the sex ratio, as discussed above.

4.4.3 THE EMPLOYMENT STATUS OF WOMEN AND TYPE OF WORK

The sex ratio is observed to be much lower in families where mothers are working (Table 8), observed to be 667 and 1,040 respectively in families with working and non-working mothers. The reason is that working women want to limit their family size at any cost. Not only the work participation rate of women, but the type of work they do affects the sex ratio. Here there is a complementary relationship between educational level, the type of work and the sex ratio. The females engaged in the agricultural field are either illiterate or less educated. Moreover, work on their own farms is unrecognized and they are not paid for doing it. Due to the irregular nature of the work they do not face many problems in rearing their children as expenditures on children are very low and they can afford to have a comparatively large family. On the other hand, women who attain a higher educational level work either in the secondary or the service sectors and are paid handsomely. In order to main-

tain their status and standard of living, they cannot expand their family size and consider it better to go for sex-selective abortions to limit the size of a family with at least one son.

4.4.4 TYPE OF FAMILY

As far as the nature of family is concerned, it also affects sex ratio, as the allocation of resources within the household is one of main factors framing the ground for the son preference. In patriarchal rural society, women do not inherit property and the heads of joint families aim to retain assets within the family lineage for future generations. This provides the ground for discriminating against daughters, as holding assets within a family is possible only when the family has at least one male child. In the study, the observed sex ratio in joint families, i.e. 988, is found to be more than that in nuclear families, i.e. 878. The reason is that joint families are larger in size than nuclear families.

5. CONCLUSION

The trends and the level of the sex ratio in India show that Haryana and Punjab are states with a very low sex ratio. So far as the sex ratio is concerned, it is mostly the social response, decision making and traditional prejudices that work against female children. The declining sex ratio at higher birth orders provides indirect evidences of the spread of sex determination tests followed by sex-selective abortions, which have been playing a key role in the worsening the sex ratio. Almost every parent desires to have a male child for a number of reasons. Some important social reasons for some parents include the wish to pass on the 'Vansh', to keep the property within the family, and to ensure the performance of last rites. All the factors that sustain the son preference are strongly grounded in religion and culture. One of the economic reasons for this preference is the lack of economic security, i.e. the lack of adequate old age pension schemes, so parents want at least one son to take care of them in their old-age. Household economic prosperity does not seem to change the mindset of society in its rejection of female children. Also, economically prosperous families want to maintain their high standard of living and status in society. They strictly adhere to the small-family norm of up to two children and prefer to use sex-selective techniques when still in the stage of lower-order births in order to have at least one male child in their family.

Thus, the analysis clearly points to the collusion of cultural, economic and social norms along with pervasive technology. At the heart of the matter is the low status of women in society and the deep-rooted prejudices they face right through their life. The argument that economic prosperity results in equal treatment of male and female children has proved to be a myth. An increase in female literacy, the work participation rate of women and economic growth measured by per-capita income has not translated effectively into securing gender equality in the society. Moreover, the sex ratio is found to be inversely related to per-capita income, female education, and their engagement in economic activities simply because of the son obsession. It is clear that the economic prosperity of households has not translated itself into establishing equal status and value for male and female children. Low fertility in the high-income group makes them try to ensure a male child at an even lower birth order than the low-income group. Thus, the small-family norm combined with the son preference is the main cause of female foeticide and parents themselves are the main motivators behind this heinous practice. Thus, the study highlights the need to change the mindset of society towards female children. At the same time, a special campaign is also needed to deal with the problem. The strict implementation of PNDT act, punishment of those who violate the act, more raids of medical clinics, the inspection of sealed clinics and scrutiny of the doctors involved, incentives for informers on illegal practices, and importantly the compulsory registration of pregnancy and its follow-up is highly desirable.

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CALL FOR SUBMISSIONS TO THE JOURNAL DEMOGRAFIE

Dear Readers,

The Editorial Board of the journal Demografie has decided that the third issue published in 2013, the journal's 55th volume, will be a thematic and the chosen theme for this issue is 'Planned Parenthood'. We are therefore a call for submissions to this issue from our readers and contributors. Preference will be given to papers devoted to analysing demographic statistical data, sample surveys on fertility, sociological research, and information from workshops and conferences on this theme. Of particular interest are the changes that have occurred over the past two decades in the population's attitudes towards planned parenthood and preferred reproductive models of the family.

Submissions and suggested ideas for this thematic issue should be sent by email to the Editorial Office of the journal Demografie no later than 31st May 2013 at the following address: redakce@czso.cz This thematic issue will be published in the middle of October 2013. We will accept submissions in Czech and English; submissions written in English if accepted will be published in English. Authors whose submissions are granted preliminary acceptance for submission will be sent further detailed information.

Marie Průšová
Managing Editor

Population and vital statistics of the Czech Republic 2011: Towns with more than 50 thousands inhabitants

Town	Population 1 July	Population 31 December	Marriages	Divorces	Live births	Abortions	Deaths	Increase (decrease)			Marriages	Divorces	Live births	Deaths	Total increase
								Natural	Net migration	Total	per 1,000 inhabitants				
Praha	1,237,943	1,241,664	5,873	3,220	13,968	4,431	12,092	1,876	5,751	7,627	4.7	2.6	11.3	9.8	6.2
Brno	378,968	378,965	1,667	960	4,401	1,160	3,848	553	-1,459	-906	4.4	2.5	11.6	10.2	-2.4
Ostrava	300,745	299,622	1,250	950	3,017	1,179	3,467	-450	-1,870	-2,320	4.2	3.2	10.0	11.5	-7.7
Plzeň	167,525	167,302	776	495	1,670	782	1,773	-103	-243	-346	4.6	3.0	10.0	10.6	-2.1
Liberec	101,704	102,005	482	319	1,176	455	961	215	183	398	4.7	3.1	11.6	9.4	3.9
Olomouc	99,407	99,529	470	310	1,199	357	998	201	-199	2	4.7	3.1	12.1	10.0	0.0
Ústí nad Labem	94,559	94,258	390	345	1,014	545	968	46	-641	-595	4.1	3.6	10.7	10.2	-6.3
České Budějovice	93,559	93,620	478	283	999	497	925	74	-93	-19	5.1	3.0	10.7	9.9	-0.2
Hradec Králové	93,595	93,490	409	262	923	403	957	-34	-277	-311	4.4	2.8	9.9	10.2	-3.3
Pardubice	89,578	89,552	417	241	922	263	958	-36	-44	-80	4.7	2.7	10.3	10.7	-0.9
Havířov	79,101	78,503	345	247	723	310	890	-167	-1,020	-1,187	4.4	3.1	9.1	11.3	-15.0
Zlín	75,747	75,660	333	240	728	288	811	-83	-132	-215	4.4	3.2	9.6	10.7	-2.8
Kladno	68,831	68,682	330	222	711	361	783	-72	94	22	4.8	3.2	10.3	11.4	0.3
Most	66,907	67,058	271	200	618	364	666	-48	376	328	4.1	3.0	9.2	10.0	4.9
Karviná	59,256	58,833	235	175	515	277	718	-203	-662	-865	4.0	3.0	8.7	12.1	-14.6
Opava	58,490	58,281	262	181	562	240	605	-43	-360	-403	4.5	3.1	9.6	10.3	-6.9
Frýdek-Místek	57,852	57,747	283	174	570	259	566	4	-348	-344	4.9	3.0	9.9	9.8	-5.9
Jihlava	50,675	50,669	219	103	558	201	451	107	-38	69	4.3	2.0	11.0	8.9	1.4
Karlovy Vary	50,690	50,594	209	135	441	186	551	-110	-178	-288	4.1	2.7	8.7	10.9	-5.7
Teplice	50,529	50,384	238	148	519	303	563	-44	-35	-79	4.7	2.9	10.3	11.1	-1.6
Děčín	50,491	50,311	205	125	562	275	527	35	-337	-302	4.1	2.5	11.1	10.4	-6.0

Radek Havel

The figures on population size presented in the tables on population growth for 2011 are calculated from the results of the 2011 Population and Housing Census. To obtain a balance of the population for 2011 the new criteria for determining the permanent resident population were applied to the date of the census and the balance was retrospectively recalculated for 1 January 2011. These data do not follow from the population figures as of 31 December 2010 presented in Demografie 3 in 2011.

Population and vital statistics of the Czech Republic 2011: Areas and regions

Area (NUTS 2), region (NUTS 3)	Population 1 July	Population 31 December	Marriages	Divorces	Live births	Abortions	Deaths			Increase (decrease)			Marriages	Divorces	Live births	Deaths	Total increase
							Total	Within 1 year	Within 28 days	Natural	Net migration	Total	per 1,000 inhabitants				
Česká republika	10,496,672	10,505,445	45,137	28,113	108,673	38,864	106,848	298	186	1,825	16,889	18,714	4.3	2.7	10.4	10.2	1.8
Praha	1,237,943	1,241,664	5,873	3,220	13,968	4,431	12,092	27	18	1,876	5,751	7,627	4.7	2.6	11.3	9.8	6.2
Střední Čechy	1,273,094	1,279,345	5,540	3,615	14,531	4,957	12,621	32	19	1,910	12,449	14,359	4.4	2.8	11.4	9.9	11.3
Jihozápad	1,207,404	1,207,847	5,299	3,437	11,945	4,823	12,262	27	24	–317	1,137	820	4.4	2.8	9.9	10.2	0.7
Severozápad	1,132,114	1,131,191	4,685	3,210	11,659	5,338	11,921	58	39	–262	–799	–1,061	4.1	2.8	10.3	10.5	–0.9
Severovýchod	1,508,442	1,508,867	6,529	4,013	15,403	5,663	15,341	46	22	62	70	132	4.3	2.7	10.2	10.2	0.1
Jihovýchod	1,676,605	1,678,250	7,061	4,050	17,479	5,229	16,497	44	25	982	1,396	2,378	4.2	2.4	10.4	9.8	1.4
Střední Morava	1,228,444	1,227,668	5,009	3,148	11,881	3,968	12,730	35	23	–849	–600	–1,449	4.1	2.6	9.7	10.4	–1.2
Moravskoslezsko	1,232,626	1,230,613	5,141	3,420	11,807	4,455	13,384	29	16	–1,577	–2,515	–4,092	4.2	2.8	9.6	10.9	–3.3
Hl. m. Praha	1,237,943	1,241,664	5,873	3,220	13,968	4,431	12,092	27	18	1,876	5,751	7,627	4.7	2.6	11.3	9.8	6.2
Středočeský kraj	1,273,094	1,279,345	5,540	3,615	14,531	4,957	12,621	32	19	1,910	12,449	14,359	4.4	2.8	11.4	9.9	11.3
Jihočeský kraj	635,907	636,138	2,845	1,807	6,379	2,436	6,374	14	13	5	362	367	4.5	2.8	10.0	10.0	0.6
Plzeňský kraj	571,497	571,709	2,454	1,630	5,566	2,387	5,888	13	11	–322	775	453	4.3	2.9	9.7	10.3	0.8
Karlovarský kraj	303,519	303,165	1,238	891	3,014	1,280	3,080	18	14	–66	–573	–639	4.1	2.9	9.9	10.1	–2.1
Ústecký kraj	828,595	828,026	3,447	2,319	8,645	4,058	8,841	40	25	–196	–226	–422	4.2	2.8	10.4	10.7	–0.5
Liberecký kraj	438,132	438,600	1,954	1,296	4,654	1,962	4,228	16	8	426	254	680	4.5	3.0	10.6	9.7	1.6
Královéhradecký kraj	554,050	553,856	2,347	1,459	5,437	2,079	5,748	14	7	–311	–388	–699	4.2	2.6	9.8	10.4	–1.3
Pardubický kraj	516,260	516,411	2,228	1,258	5,312	1,622	5,365	16	7	–53	204	151	4.3	2.4	10.3	10.4	0.3
Kraj Vysočina	511,972	511,937	2,167	1,105	5,075	1,630	5,031	14	7	44	–352	–308	4.2	2.2	9.9	9.8	–0.6
Jihomoravský kraj	1,164,633	1,166,313	4,894	2,945	12,404	3,599	11,466	30	18	938	1,748	2,686	4.2	2.5	10.7	9.8	2.3
Olomoucký kraj	638,848	638,638	2,605	1,733	6,311	2,135	6,559	17	14	–248	–144	–392	4.1	2.7	9.9	10.3	–0.6
Zlínský kraj	589,596	589,030	2,404	1,415	5,570	1,833	6,171	18	9	–601	–456	–1,057	4.1	2.4	9.4	10.5	–1.8
Moravskoslezský kraj	1,232,626	1,230,613	5,141	3,420	11,807	4,455	13,384	29	16	–1,577	–2,515	–4,092	4.2	2.8	9.6	10.9	–3.3

Radek Havel

Abstracts of Articles Published in the Journal Demografie in 2012 (Nos. 1–3)

Roman Kurkin – Luděk Šídlo

INTERNATIONLA AND REGIONAL DIFFERENTIATION OF FERTILITY OVER TIME IN THE EASTERN PART OF THE EUROPAEN UNION BETWEEN 1991 AND 2008

This article examines differences over time between the total fertility rates of the countries and regions in the eastern part of the European Union in the context of convergence and divergence trends. It aims to analyse and evaluate the basic trends in international and regional fertility differentiation. To this end the authors calculate the basic characteristics of variability and the Spearman´s correlation coefficient for territorial changes. They then decompose the variance in order to evaluate the impact of the state effect and construct a series of cartograms to enable a graphical analysis of the pattern of regional fertility differentiation.

Keywords: fertility rate, international differentiation of fertility, regional differentiation of fertility, fertility trends in Europe, European Union

Demografie, 2012, **54: 4–13**

Marie Kusovská

THE INFLUENCE OF A NEARBY MILITARY AREA ON POPULATION DEVELOPMENT IN THE TOWN OF MILOVICE

There is no doubt that military areas affect their surroundings in many ways. This article describes the influence of a military area on a municipal population using the concrete example of the municipality of Milovice and the Mladá military area. The first part outlines population development in the municipality while different armies were present in the area between 1904 and 1991. The main part of the article focuses on population development in the town of Milovice, its age-sex structure, and natural movement and migration after the abolition of the military area in 1992.

Keywords: population development, military area, Milovice, suburbanisation

Demografie, 2012, **54: 14–23**

Klára Hulíková Tesárková

FRAILTY MODELS AND THEIN APPLICATION IN DEMOGRAPHY

The article provides a brief introduction to the theory of heterogeneity and to frailty models as a tool with which it is possible to incorporate unobserved heterogeneity into models. First, the article presents some examples that demonstrate the effects of unobserved heterogeneity and its possible use for the effective modelling of relatively complicated patterns of empirical data. Second, discrete and continuous frailty models are defined. The continuous form is then applied to model data in order to illustrate how frailty decreases with age among

survivors as a consequence of the more frequent deaths of frailer individuals at younger ages. It also reveals that females have a longer average survival time than males with the same level of frailty.

Keywords: frailty models, unobserved heterogeneity, mortality, cohort data, proportional hazards models, survival analysis

Demografie, 2012, **54: 24–35**

Branislav Šprocha

COHORT ANALYSIS OF FERTILITY AMONG ROMA WOMEN

The fertility of the Roma population in Slovakia is still higher than the fertility of women in Slovakia. The article focuses on the rate and trend of fertility among Roma women from a generational perspective. The main aim is to describe the changes in reproductive behaviour across generations of Roma women as a result of the gradual spread of the demographic revolution.

Keywords: cohort fertility, childlessness, cohort parity distribution, parity progression ratios, Roma Women, Slovakias

Demografie, 2012, **54: 36–46**

Roman Kurkin – Luděk Šídlo

INTERNATIONLA AND REGIONAL DIFFERENTIATION OF FERTILITY OVER TIME IN THE WESTERN PART OF THE EUROPAEN UNION BETWEEN 1991 AND 2008

This paper examines the differences between total fertility rates in the countries and regions in the western part of the European Union. It focuses mainly on an analysis and evaluation of the international and regional differentiation of total fertility rates in the context of convergence and divergence trends using statistical and cartographic methods. The findings did not confirm the hypothesis of a converging total fertility rate, but they support the assumption of the spatial stability of fertility. At the same time the impact of the 'state effect' on the regional differentiation of fertility has increased.

Keywords: fertility rate, international differentiation of fertility, regional differentiation of fertility, fertility trends in Europe, European Union

Demografie, 2012, **54: 109–119**

Martin Kreidl – Martina Štípková

THE PREVALENCE, INCIDENCE, AND TIMING OF UNMARRIED COHABITATION IN THE CZECH REPUBLIC

The growing incidence of unmarried cohabitation has often been pointed out as one of the most remarkable changes in the behaviour of the Czech population. Surprisingly, there is only indirect or outdated empirical evidence documenting this claim. The authors estimate the prevalence and incidence of cohabitation using four relatively recent surveys. They also use survival analysis to show that, unlike marriage, people have not been postponing co-residential unions after 1989.

Keywords: marriage, cohabitation, co-residential unions, Czech Republic, population change

Demografie, 2012, **54: 120–137**

Šárka Šustová

THE IMPACT OF HIV/AIDS ON NATALITY AND FERTILITY IN SOUTH AFRICA

ABSTRACT

This paper focuses on the impact of HIV/AIDS on natality and fertility in South Africa. The impact of HIV/AIDS is examined by comparing the rates of these two demographic processes among women who are HIV positive and HIV negative and by using decomposition methods. The results of this analysis show the exceptional position of South Africa among other African countries heavily affected by HIV/AIDS.

Keywords: HIV/AIDS, natality, fertility, South Africa

Demografie, 2012, **54: 138–151**

Libor Šebestík

LIFE TABLES AS A TOOL FOR ANALYSING THE FLOW OF STUDENTS THROUGH SECONDARY EDUCATION

The aim of this article is to show how life tables can be used to analyse the flow of students through secondary education. The life table treats new enrolments as births, years spent at school as an individual's age and withdrawals and graduation as deaths. The most important output of the life tables – the expected number of future years of school attendance – is compared among different types of secondary schools. In the article life tables are constructed using the cohort approach.

Keywords: life tables, secondary education, application of demographic methods

Demografie, 2012, **54: 152–161**

Jana Paloncyová – Anna Šťastná

MARRIAGE AND BREAKUP AS TWO POSSIBLE PATHS AWAY FROM COHABITATION

This study analyses the cohabitation of women and men in the Czech Republic and focuses on a comparison of partnership behaviour before and after the politically and socially important watershed of 1989. The authors investigate both the risk of converting cohabitation into marriage and the risk of non-marital unions breaking up and its timing. The data used in the paper are taken from the Generations and Gender Survey carried out in the Czech Republic in 2008. The retrospective character of this data provides information on partnership careers in the context of other significant life events.

Keywords: cohabitation, first partnership, competing risks, marriage, breakup, Czech Republic

Demografie, 2012, **54: 214–232**

Branislav Bleha – Pavol Hurbánek – Boris Vaňo

A DEMOGRAPHIC PROJECTION OF URBAN AND RURAL POPULATIONS IN SLOVAKIA TO THE YEAR 2030

The article presents a two-variant demographic projection of urban and rural populations in Slovakia to the year 2030. It gives a conditional projection, in which the current state of the input parameters is maintained for the whole projection period in one variant, whereas in the second one a gradual equalisation is assumed. The core part of the article offers a theoretical reflection on the delimitation of urban and rural areas in geographical research.

Keywords: urban population, rural population, Slovakia, projection, fertility, mortality, migration, population ageing, equalisation

Demografie, 2012, **54: 233–249**

Jiřina Kocourková – Boris Burcin

DEMOGRAPHIC ASPECTS OF ASSISTED REPRODUCTION IN THE CZECH REPUBLIC IN A EUROPEAN CONTEXT

The ongoing postponement of childbearing in the Czech Republic has resulted in an increase in the share of women who realise their reproduction at an older age. Recently a rise in the share of children born after the use of ART has been registered in the Czech Republic similar to Belgium or Scandinavian countries. The main goal of the article is to examine the relationship between the increasing use of ART and the fertility transition in the Czech Republic. In addition, the significance of the use of ART for recent and future fertility trends is discussed in a European comparison.

Keywords: assisted reproduction, fertility, Czech Republic, European countries

Demografie, 2012, **54: 250–263**

Olga Sivková – Klára Hulíková Tesárková

DECOMPOSITION OF THE MEAN AGE OF MOTHERS AT CHILDBIRTH IN THE CZECH REPUBLIC SINCE THE YEAR 1950

The main goal of the article is to examine changes in the mean age of mothers at childbirth using data available on the Czech Republic for the period 1950–2011 drawn from the Human Fertility Database and the Czech Statistical Office. Therefore, besides describing developmental trends in the average age of women at birth, the article applies the method of decomposition, breaking down the difference between two means into the timing effect and the effect of the fertility structure according to birth order. The article also discusses the issue of tempo-adjusted period measures of fertility, which are constructed to eliminate the distortion caused by the postponement (or timing in general) of childbearing.

Keywords: mean age at birth, total fertility rate, method of decomposition, timing effect, effect of fertility structure, Czech Republic

Demografie, 2012, **54: 264–279**

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- Roubíček, V. 1997. *Úvod do demografie*. Prague: Codex Bohemia.
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- *Potraty*. 2005. Prague: Ústav zdravotnických informací a statistiky.

Articles in periodicals

- Bakalář, E. and Kovařík, J. 2000. 'Fathers, Fatherhood in the Czech Republic.' *Demografie*, 42, pp. 266–272.

For periodicals that use consecutive page numbering within a volume it is not necessary to indicate the issue number.

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Syrovátka, A. 1962a. 'Injuries in the Household.' *Czech Paediatrics*, 17, pp. 750–753.

Syrovátka, A. 1962b. 'Child Mortality from Automobile Accidents in the Czech Lands.' *Czech Medical Journal*, 101, pp. 1513–1517.

In-text references

(*Srb*, 2004); (*Srb*, 2004: pp. 36–37); (*Syrovátka et al.*, 1984).

Table and figure headings

Table 1: Population and vital statistics, 1990–2010

Figure 1: Relative age distribution of foreigners and total population of CR, 31 Dec 2009

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