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ANALYSIS OF THE DEVELOPMENT OF SELECTED INDICATORS OF THE DEMOGRAPHIC STATICS AND DYNAMICS OF THE CZECH REPUBLIC IN 1993–2003

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Abstract

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The paper is aimed at the presentation of findings obtained in the study of the average level, variability, dynamics, developmental trends and a short-time point extrapolation prediction of the population in the Czech Republic and their structure according to gender and scale of the economic generation. In addition to the exact evaluation of the selected indicators, the analysis is also aimed to general rates of natural reproduction of population and their movement in the defined territorial unit and time interval 1993–2003. There are also presented relative rates of marriages, divorces, live births and deaths to mid-year population.

population, sex and economic generation, movement, dynamics, trend, short-time prediction, Czech Republic

The period that started in the Czech Republic at the turn of the 80's and 90's is the period of transformation from the central planned economy to the market economy and is very complicated from both social and economic aspects. The conception of the presented study oriented to the quantification of changes in the development of natality, mortality, marriages and divorces in the Czech Republic in the period 1993 to 2003. Within the reference period, time series were also analysed of the population number structure according to main age groups, live births and indicator of the death rate (mortality). The changes in the natality rate, mortality and age structure of the populations as quantitative and qualitative changes of the characteristics of the population reproduction becomes more and more a social process and not only biological process.

Theoretical aspects and interpretation of the results of analytical activities in the sphere of the study of demographic statics and dynamics have been dealt with by the number of authors. The following papers can be considered to be fundamental from the aspect of the conception of examination proper: ROUBÍČEK (1996, 1997), Dufek (1999), KOBZÍKOVÁ (2000), SRB (2002), PALÁT and MACA (2004, 2005).

MATERIAL A METHODS

Basic materials necessary for the implementation of determined objectives of the analysis of time series of studied events were obtained from the database of the Czech Statistical Office. Methodical procedures of processing and evaluating the studied indicators of demographic statics were aimed according to set objectives of the analysis (the description of the average level and variability). Methodical procedures of processing and evaluating the studied indicators of demographic dynamics were aimed according to set objectives of the analysis at the evaluation of dynamics

and trends of assessed phenomena including their short-term extrapolation prediction. Basic indices (i_b) are calculated by the expression

$$\frac{q_k}{q_0} = \frac{q_1}{q_0} \cdot \frac{q_2}{q_0}, \ldots, \cdot \frac{q_{k-1}}{q_{k-2}} \cdot \frac{q_k}{q_{k-1}}$$

the chain indices (i_{ch}) by the expression

$$\frac{q_k}{q_{k-1}} = \frac{\frac{q_k}{q_0}}{\frac{q_{k-1}}{q_0}}.$$

For the calculation of mean growth and following characteristics of selected indicators was used formula

$$\bar{k} = \sqrt[n-1]{\frac{q_k}{q_0}}.$$

Analysis of the trend of assessed time series is based on the application of models of developmental tendencies of the following type:

$$y' = a_{yt} + b_{yt} \cdot t \quad (1)$$

$$y' = a_{yt} + b_{yt} \cdot t + c_{yt} \cdot t^2 \quad (2)$$

$$y' = a_{yt} \cdot e^{b_{yt} \cdot t} \quad (3)$$

$$y' = a_{yt} + b_{yt} \cdot \ln t \quad (4)$$

$$y' = a_{yt} \cdot t^{b_{yt}} \quad (5)$$

$$y' = a_{yt} + b_{yt} \cdot \frac{1}{t} \quad (6)$$

Informative abilities and accuracy of applied analytical functions were tested by means of correlation indices I_{yt}. The statistical significance of correlation indices was tested on the significance level P = 0.05 and P = 0.01. Determination indices I_{yt}^2 were used for verification of the indicators developmental trend models and their short-term point extrapolation prediction.

Methodical procedures of processing the factual data of analysed time series are based on the methods of descriptive statistics presented in papers of CYHELSKÝ, KAŇOKOVÁ and NOVÁK (1979), BAKYTOVÁ, HÁTLE, NOVÁK and URGON (1986), KOVAČKA and KONTŠEKOVÁ (1962), SEGER, HINDLS and HRONOVÁ (1998) and MINAŘÍK (2000).

RESULTS AND DISCUSSION

The population development which occurred in the assessed territorial unit and defined time interval confirmed and intensified marked qualitative changes in the demographic behaviour of population appearing after the transition of centrally directed economy to market economy after 1989. The findings obtained in the study of the average level, variability, dynamics, developmental trends and a short-time point extrapolation prediction of the population in the Czech Republic and their structure according to gender and scale of the economic generation. Characteristics of selected indicators of population and its movement of the Czech Republic in the period 1993–2003 are presented in Tab. I and in graphical form in Figs. 1 and 2.

I: *Characteristics of selected indicators of population and its movement in the Czech Republic in the period 1993–2003*

Indicator		Measured unit	Variation domain		Mean in 1993–2003 $\bar{y}$	Variation coefficient V_y (%)
			y_{min}	y_{max}		
Mid-year population		thousands of person	10 201 2002	10 336 1994	10 281.2	0.49
of this	males		4 965 2002	5 021 1994	5 000.5	0.41
	females		5 233 2003	5 315 1994	5 280.7	0.58
Mid-year population at an age	0–14		1 605 2002	2 037 1993	1 784.4	8.66
	15–64		6 957 1993	7 211 2003	7 103.4	1.11
	65 and over		1 337 1993	1 422 2000	1 393.4	2.15

Marriages		number	48 943 2003	66 033 1993	55 368	7.92
Divorces			23 657 1999	33 113 1996	30 888	8.49
Live births			89 471 1999	121 025 1993	95 719	10.12
Deaths			107 775 2001	118 185 1993	112 234	3.51
Live expectancy	males	years	69.2 1993	72.1 2001 2002	70.9	1.48
	females		76.4 1993	78.5 2002 2003	77.1	3.00
Live firths per 1000 population		‰	8.7 1999	11.7 1993	9.31	9.80
Deaths per 1000 population			10.5 2001	11.4 1993 1994 1995	10.92	3.20
Marriages per 1000 population			4.8 2003	6.4 1993	5.38	7.70
Divorces per 1000 population			2.30 1999	3.22 2003	3.00	8.56
Divorces per 100 marriages		%	44.2 1999	67.1 2003	55.79	12.01

Values of percentage proportions of variation ranges and arithmetic means ($\frac{R}{\overline{y}} \cdot 100$) arranged in ascending order as simple rates of variability and characteristics of the informative potential of indicators of the average level of analysed events reached 1.20% in the mid-year population of males; 1.31% in the mid-year population in total; 1.55% in females of the mid-year population; 2.72% in the live expectancy of females; 3.57% in the mid-year number of population at an age of 15–64 years; 4.09 % in the live expectancy of males; 6.10% in the mid-year number of population at an age 65 and over; 8.24 % in the number of marriages per 1000 inhabitants; 9.27% in the number of dead; 24.21% in the number of the mid-year population at an age under 15; 29.79% in the number of marriages per 1000 inhabitants; 30.61% in the number of divorces; 30.67% in the number of divorces per 1000 inhabitants; 30.87% in the number of marriages; 32.22% in the number of life-born children per 1000 inhabitants; 32.96% in the number of life-born children and 41.04% in the number of divorces per 100 marriages.

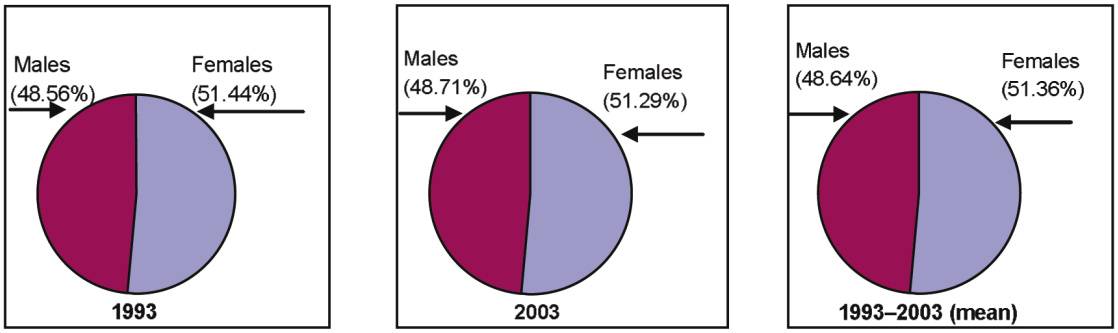
Variation coefficients (V_y) as values of percentage proportions of standard deviations (s_y) and arithmetic means ($\overline{y}$) arranged in ascending order as suitable rates of variability of indicators of analysed events reached 0.41% in the mid-year population of males; 0.49% in the mid-year population; 0.58% in the mid-year population of females; 1.11% in the mid-year population at an age of 15–64 years; 1.48% in the live expectancy of males; 2.15% in the mid-year population at an age over 65 and over; 3.00 % in the live expectancy of females; 3.51 % in the number of dead; 3.20% in the number of dead per 1000 population; 7.70 % in the number of marriages per 1000 population; 7.92% in the number of marriages; 8.49% in the number of divorces; 8.56% in the number of divorces per 1000 population; 8.66% in the number of the mid-year population at an age under 15; 9.80% in the number of life-born children per 1000 inhabitants; 10.12 % in the number of life-born children and 12,01% in the number of divorces per 100 marriages.

Here, we can note a high although markedly differentiated informative potential of the average level

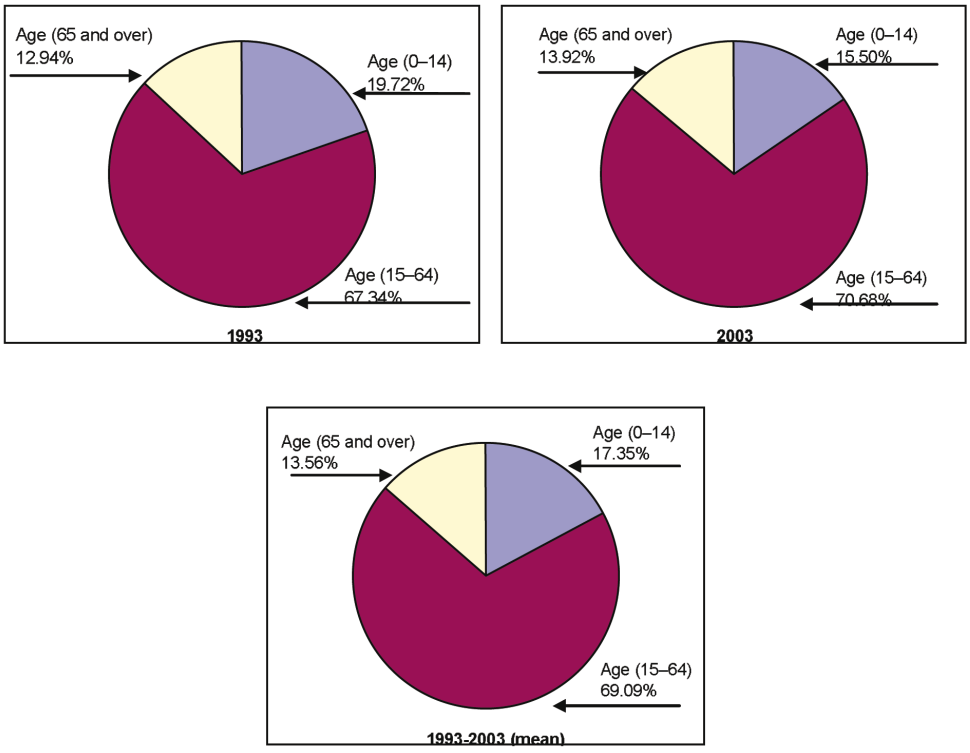
of indicators under consideration in the assessed reference period.

At the mutual comparison of the ascending order of variability of studied events by means of applied methodical procedures a congruence was demonstrated in 47.06% of assessed demographic indicators: mid-year population of the male gender; total mid-year population; mid-year population of the female gender, number of divorces, number of divorces per 1000 inhabitants, number of life-born children per 1000 inhabitants, number of life-born children and number of divorces per 100 marriages.

Figure 1 depicts the structure of a mid-year population according to a gender in selected reference periods of the assessed territorial unit.



1: *Demographic structure of mid-year population of the Czech Republic in the period 1993–2003*



2: *Age structure of mid-year population of the Czech Republic in selected periods*

Demonstrated indistinctive changes in the percentage proportion of genders in the total number of mid-year population in the assessed reference period on the one hand document a prevailing female population over males on the other hand.

An objective evaluation of the demographic structure of population according to the pre-productive, productive and post-productive age enables its numerical and graphic expression in Fig. 2.

Evaluating relative and absolute changes in the development of a population with differentiation according to economic generations it is possible to note an enormous decrease (by 4.22 percent points; 466 thousand persons) in a population under 15 years in 2003 as against 1993 and a marked increase (by 3.34 percent points; 254 thousand persons) in a population at an age of 15 to 64 years and (by 0.98 percent points; 83 thousand persons) in a population over 65 ears.

A more detailed view of the dynamics of the mid-year population according to the scale of economic generations and selected years of the examined reference period is presented in Tab. II.

II: *Dynamics of the mid-year population according to the scale of economic generations and selected years of the examined reference period (in thousands of persons)*

Indicator		Year			
Mid-year population		1990	1993	1997	2003
at an age	pre-productive	2 223	2 037	1 818	1 571
	productive	6 844	6 967	7 089	7 211
	post-productive	1 296	1 337	1 397	1 420

Empirical data make possible the description of dynamics of time series of indicators of the population movement in selected years of the transformation period of Czech economy (Tab. III).

III: *Dynamics of time series of indicators of the population movement in selected years of the transformation period of Czech economy*

Indicator	Year			
	1990	1993	1997	2003
Marriages	90 953	66 033	57 804	48 943
Divorces	32 055	30 227	32 465	32 824
Live births	130 564	121 025	90 657	93 685
Deaths	129 166	118 185	112 744	111 288
Natural increase/decrease	1 398	2 840	–22 087	–17 603
Migration increase/decrease	624	5 476	12 075	25 789

Thus, it is possible to observe a decrease in the number of marriages in 2003 as against 1990 by 46.2%, in the number of life-born children by 28.3% and in the number of dead by 13.9%.

On the other hand, an increase by 2.4% occurred in the number of divorces as against the basic period in the final year. At the mutual comparison of the natural increase/decrease of population its increase is evident in 1993 as against 1990 by 103.1% on the one hand and decrease in its drop in 2003 as against 1997 by 20.3%. An enormous increase as against the basic period can be noted in the increase of population by migration (index = 4 132.8%).

Findings obtained in the statistical examination of the dynamics of index series of assessed events can be considered to be significant from the viewpoint of main intentions of the study of selected demographic indicators of population, its structure according to sex, age and movement and according to the conception of the presented paper. Results of this stage of processing factual data for a defined reference period are included in Table IV.

IV: *Population dynamics of the Czech Republic and its movement in the period 1993–2003*

Year	Mid-year population		of this			
			males		females	
	thousands of person					
1993	10 331		5 017		5 314	
Index (%)	i_b	i_{ch}	i_b	i_{ch}	i_b	i_{ch}
1994	100.04		100.08		100.02	
1995	100.00	99.95	100.06	99.98	99.94	99.92
1996	99.84	99.84	99.94	99.88	99.75	99.81
1997	99.74	99.89	99.88	99.94	99.60	99.85
1998	99.65	99.91	99.82	99.94	99.49	99.89
1999	99.53	99.88	99.72	99.90	99.36	99.87
2000	99.43	99.89	99.64	99.92	99.23	99.87
2001	98.96	99.53	99.24	99.60	98.70	99.47
2002	98.74	99.77	98.96	99.72	98.53	99.83
2003	98.75	100.00	99.04	100.08	98.47	99.94

Year	Mid-year population at an age					
	0–14		15–65		65 and over	
	thousands of person					
1993	2 037		6 957		1 337	
Index (%)	i_b	i_{ch}	i_b	i_{ch}	i_b	i_{ch}
1994	97.15		100.70		101.05	
1995	94.30	97.07	101.25	100.54	102.17	101.11
1996	91.65	97.19	101.57	100.31	103.36	101.17
1997	89.25	97.37	101.90	100.32	104.49	101.08
1998	87.17	97.52	102.26	100.35	105.31	100.78
1999	84.88	97.52	102.60	100.34	105.91	100.57
2000	82.72	97.45	102.99	100.38	106.36	100.42
2001	80.66	97.51	103.03	100.04	105.68	99.36
2002	78.79	98.69	103.20	100.17	105.91	100.21
2003	77.12	97.88	103.65	100.43	106.21	100.28

Year	Marriages		Divorces		Live births	
1993	66 033		30 227		121 025	
Index (%)	i_b	i_{ch}	i_b	i_{ch}	i_b	i_{ch}
1994	88.50		102.35		88.06	
1995	83.22	94.04	103.00	100.63	79.40	90.16
1996	81.62	98.07	109.54	106.35	74.73	94.12
1997	87.54	107.25	107.40	98.04	74.91	100.23
1998	83.33	95.20	107.07	99.68	74.81	99.86
1999	81.05	97.27	78.26	73.10	73.93	98.82
2000	83.78	103.36	98.27	125.56	75.12	101.61
2001	79.31	94.67	104.49	106.33	74.95	99.78
2002	79.86	100.68	105.06	100.54	76.66	102.28
2003	74.12	92.81	108.59	103.36	77.41	100.97

Year	Deaths		Live expectancy (years)			
			males		females	
1993	118 185		69.2		76.4	
Index (%)	i_b	i_{ch}	i_b	i_{ch}	i_b	i_{ch}
1994	99.31		100.43		100.26	
1995	99.77	100.46	101.16	100.72	100.65	100.39
1996	95.43	95.65	101.73	100.57	101.18	100.52
1997	95.40	99.97	101.88	100.14	101.44	100.26
1998	92.67	97.15	102.74	100.85	102.22	100.77
1999	92.88	100.22	103.18	100.42	102.22	100.00
2000	92.23	99.30	103.61	100.42	102.62	100.38
2001	91.17	98.86	104.19	100.55	102.62	100.00
2002	91.59	100.45	104.19	100.00	102.75	100.13
2003	94.16	102.81	104.05	99.86	102.75	100.00

Year	Marriages		Divorces		Divorces per 100 marriages (%)	
	per 1000 population (‰)					
1993	6.4		2.93		45.8	
Index (%)	i_b	i_{ch}	i_b	i_{ch}	i_b	i_{ch}
1994	89.06		102.04		115.50	
1995	82.81	92.98	102.73	100.67	123.80	107.18
1996	81.25	98.11	109.56	106.64	134.06	108.29
1997	87.50	107.69	107.51	98.13	122.70	91.53
1998	82.81	94.64	107.17	99.68	128.38	104.63
1999	81.25	98.11	78.50	73.25	96.51	75.17
2000	84.37	103.85	98.63	125.65	117.25	121.49
2001	79.69	94.44	105.46	106.92	131.66	112.29
2002	81.25	101.96	106.14	100.65	131.44	99.83
2003	75.00	92.31	109.90	103.54	146.51	111.46

Year	Live births		Deaths	
	per 1000 population (‰)			
1993	11.7		11.4	
Index (%)	i_b	i_{ch}	i_b	i_{ch}
1994	88.03		100.00	
1995	79.49	90.29	100.00	100.00
1996	75.21	94.62	95.61	95.61
1997	75.21	100.00	95.61	100.00
1998	75.21	100.00	92.98	97.25
1999	74.36	98.86	93.86	100.94
2000	75.21	101.15	92.98	99.06
2001	76.07	101.14	92.10	99.06
2002	77.78	102.24	92.98	100.95
2003	78.63	101.09	95.61	102.83

i_b – basic indices, i_{ch} – chain indices

In the interpretation of series of indices with a constant basis (series of basic indices) of studied events according to the ascending order, their relative increase reached 2.75% in the mid-year life span of females until 2003 as against 1993, in a productive population 3.65%, in the mid-year life span of males 4.05%, in a post-productive population 6.21%, in the number of divorces 8.59%, in the number of divorces per 100 inhabitants 9.90%, in the number of divorces per 100 marriages 46.51%.

A descending order in the decrease of studied indices in the final year 2003 as against 1993 is quantified by the following values: 25.68% in the number of marriages, –25.00% in the number of marriages per 100 inhabitants of mid-year population, –22.88% in a pre-productive population, –22.59% in the number of life-born children, –21.37% in the number of life-born children per 1000 inhabitants of mid-year population, –5.84% in the number of dead, –4.39% in the number of dead per 1000 inhabitants of mid-year population, –1.53% in the mid-year population of females, –1.25% in the mid-year population and –0.96% in the mid-year population of males.

The highest decrease between particular years amounting to –11.97% occurred in the number of life-born children per 1000 inhabitants in 1994, –11.94% in the number of life-born children, –11.50% in the number of marriages and –10.94% in the number of marriages per 1000 inhabitants. In the subsequent year 1995, a decrease between particular years of the mid-year population of the pre-productive age persons reached –2.93%. A decrease in the number of dead persons per 1000 inhabitants between particular years amounted to –4.39 % and –4.35% in the number of dead persons. The decrease occurred also in 2001, viz by –0.40% in males of the mid-year population, by –0.47% in the total number of inhabitants of mid-year population and by –0.53% in the number of females of mid-year population.

The highest increase between particular years by 9.70% occurred in the productive population in 1994, in the post-productive population by 1.17% in 1996, in the number of divorces by 25.56% in 1997, in the mid-year population of males and females by 0.85 and 0.77%, respectively, in 1998. In the number of divorces per 1000 inhabitants and divorces corresponding to 100 marriages, the highest increase between particular years was reached in 2000 (25.65% or 21.49%).

Data on the level of average rates of increases/decreases for the assessed reference period can be considered to be significant findings derived from the description of dynamics of selected demographic indicators of population and its movement. Their ascending order expressed in percentages reached a positive value of 0.27 in the life expectancy of females; 0.36 in the mid-year productive population; 0.40 in the mid-year life span of males; 0.60 in the mid-year post-productive population; 0.82 in the number of divorces; 0.95 in the number of divorces per 1000 inhabitants and 3.89 in the number of divorces per 100 marriages. Average rates of decrease arranged in an ascending order reached –0.10% in the mid-year population of a male sex, in the mid-year population –0.13%, in the mid-year population of a female sex –0.16%, in death per 1000 inhabitants –0.45%, in de-

ath –0.60%, in the number of live-born –2.38%, in the number of life-born –2.53%, in the pre-productive population –2.57%, in the number of marriages –2.95% and in the number of marriages per 1000 inhabitants –8.28%.

Analytical functions where time "t" serves as an explanatory (exogenous) variable are a tool of the description of developmental tendencies of analysed time series. Results of this stage of analysis are presented in Tab. V. In addition to parameters of applied models of a linear, quadratic, exponential, logarithmic, power and inverse type they also present the degree of dependence of assessed endogenous variables on a time variable and the informative potential of applied models including their statistical significance on selected levels. Results of this stage of processing and evaluating factual data are documented in Tab. VI.

V: *Parameters of models of developmental trends of selected population indicators and its movement in the Czech Republic in the period 1993–2003*

Indicator		f	Model parameters			Correlation index
			a_{yt}	b_{yt}	c_{yt}	I_{yt}
Mid-year population (thousands of person)		1	10 369.2545	–14.6636	-	0.9559^{++}
		2	10 336.1333	0.6231	–1.2739	0.9569^{++}
		3	10 369.6050	–0.0014	-	0.9556^{++}
		4	10 371.8896	–54.9516	-	0.8341^{++}
		5	10 372.2270	0.0055	-	0.8334^{++}
		6	10 248.7258	118.5531	-	0.6291^{+}
of this	males	1	5 034.6364	–5.68182	-	0.9256^{++}
		2	5 017.1515	2.38811	–0.6725	0.9751^{++}
		3	5 034.7222	–0.00114	-	0.9253^{++}
		4	5 034.6156	–21.41270	-	0.7837^{++}
		5	5 034.7222	–0.00428	-	0.7832^{++}
		6	4 988.7935	42.80664	-	0.5677
	females	1	5 349.1636	–9.89090	-	0.7165^{+}
		2	5 318.9819	1.76500	–0.60140	0.9749^{++}
		3	5 334.8620	–0.00170	-	0.9705^{++}
		4	5 337.2739	–35.53890	-	0.8630^{++}
		5	5 337.5166	–0.00670	-	0.8622^{++}
		6	5 259.9322	75.74650	-	0.6665^{+}
Mid-year population at an age:		1	2 063.2545	–46.48180	-	0.9970^{++}
		2	2 096.4364	–61.79650	–1.27620	0.9973 $^{++}$
		3	2 078.6536	–0.02600	-	0.9991^{++}
0–14		4	2 104.2643	–201.0539	-	0.9688^{++}
		5	2 122.5936	–0.11200	-	0.9599^{++}
		6	1 653.4473	476,8669	-	0. 8327^{++}
15–64		1	6 962.4545	23.5000	-	0.9837^{++}
		2	6 927.7575	39.5140	–1.33450	0.9862^{++}
		3	6 963.2272	0.0033	-	0.9829^{++}
		4	6 936.6593	104.8289	-	0. 9858^{++}
		5	6 937.6751	0.01480	-	0.9866^{++}
		6	7 140.4076	–103.6982	-	0.4440

65 and over		1	1 343.5454	8.3181	-	0.9187^{++}
		2	1 311.9394	22.9056	–1.2156	0. 9983^{++}
		3	1 343.8100	0.0060	-	0.9173^{++}
		4	1 330.9660	39.2733	-	0.9745^{++}
		5	1 331.5209	0.0284	-	0.9751^{++}
		6	1 420.9222	–100.0521	-	0. 8996^{++}
Marriages	number	1	61 774.9454	–1 067.81	-	0.8079^{++}
		2	64 103.0364	–2 142.31	89.5419	0. 8297^{++}
		3	61 844.2739	–0.018884	-	0.8200^{++}
		4	63 621.4388	–5 187.13	-	0.8817^{++}
		5	77 118.2342	–0.341510	-	0.3555
		6	51 347.4773	14 645.2	-	0.9020^{++}
Divorces	number	1	30 779.84	18.072727	-	0.0228
		2	32 403.96	–731.52168	62.466200	0.2218
		3	30 729.79	0.0002362	-	0.0084
		4	30 827.15	38.3578449	-	0.0109
		5	30 829.17	–0.0011385	-	0.0091
		6	30 992.57	–379.92032	-	0.0391
Live births	number	1	107 079.24	–1 893.42	-	0.6481^{+}
		2	125 727.42	10 500.271	717.237762	0.9635^{++}
		3	106 367.05	–0.018277	-	0.6492^{+}
		4	110 661.40	–14 019.3	-	0.3754
		5	112 989.09	–0.1068800	-	0.8529^{++}
		6	86 250.79	34 487.276	-	0.9610^{++}
Deaths	number	1	118 344.47	–1 018.34	-	0.8568^{++}
		2	122 633.77	–2 298.01	164.973193	0.9404^{++}
		3	111 239.40	–0.0245825	-	0.1552
		4	111 079.24	–5 071.480	-	0.1232
		5	122 116.74	–0.1513324	-	0.2147
		6	109 048.08	11 606.454	-	0.7950^{++}
Live expectancy (years)	males	1	69.0564	0.3073	-	0.9779^{++}
		2	68.5830	0.5235	–0.0177	0.9915^{++}
		3	69.0577	0.0044	-	0.9787^{++}
		4	68.7375	1.3648	-	0.9656^{++}
		5	68.7561	0.0193	-	0.9668^{++}
		6	71.8033	0.2571	-	0.8351^{++}
	females	1	76.3145	0.2309	-	0.9633^{++}
		2	75.8054	0.4659	–0.0196	0.9900^{++}
		3	76.3206	0.0030	-	0.9628^{++}
		4	76.0574	1.0323	-	0.9676^{++}
		5	76.0664	0.0133	-	0.9681^{++}
		6	78.3835	–2.4896	-	0.8455^{++}

Live births per 1000 population	‰	1	10.3236	–0.1691	-	0.6144^{+}
		2	12.1536	–1.0196	0.0712	0.9386^{++}
		3	10.2518	–0.0167	-	0.6120
		4	7.0433	5.9491	-	0.1868
		5	10.8844	–0.1007	-	0.8277^{++}
		6	8.4269	3.2134	-	0.9506^{++}
Deaths per 1000 population		1	11.4018	–0.0836	-	0.7941^{++}
		2	11.8624	–0.2962	0.0177	0.9227^{++}
		3	11.4035	–0.0076	-	0.7930^{++}
		4	11.5375	–0.4006	-	0.8547^{++}
		5	11.5444	–0.0364	-	0.8528^{++}
		6	10.6265	0.9961	-	0.7700^{++}
Marriages per 1000 population	‰	1	5.9600	–0.0964	-	0.7714^{++}
		2	6.2388	–0.2250	0.0107	0.8078^{++}
		3	6.0721	–0.0194	-	0.8479^{++}
		4	6.1458	–0.4802	-	0.8636^{++}
		5	6.1508	–0.0855	-	0.8607^{++}
		6	5.0020	1.3834	-	0.9016^{++}
Divorces per 1000 population		1	2.9665454	0.0061818	-	0.0797
		2	3.1392727	–0.0735384	–0.006643	0.2521
		3	2.9625017	0.0016678	-	0.0587
		4	2.9716845	0.0200814	-	0.0582
		5	2.9724396	0.0041884	-	0.0331
		6	3.0223026	–0.0679926	-	0.0713
Divorces per 100 Marriages	%	1	49.6218182	1.0827273	-	0.5324
		2	51.8309090	0.0631468	0.084965	0.5451
		3	49.6926079	0.0191187	-	0.5083
		4	48.2748555	4.9294407	-	0.5446
		5	48.3797352	0.0889234	-	0.5311
		6	59.9155764	–13.8321313	-	0.5037

Type of the function: (1) – linear, (2) – quadratic, (3) – exponential, (4) – logarithmic, (5) – power, (6) – inverse

Correlation index I_{yt} significant on the level: + α = 0.05; ++ α = 0.01

VI: *Selected indicators of demographic statics and dynamics with used types of functions*

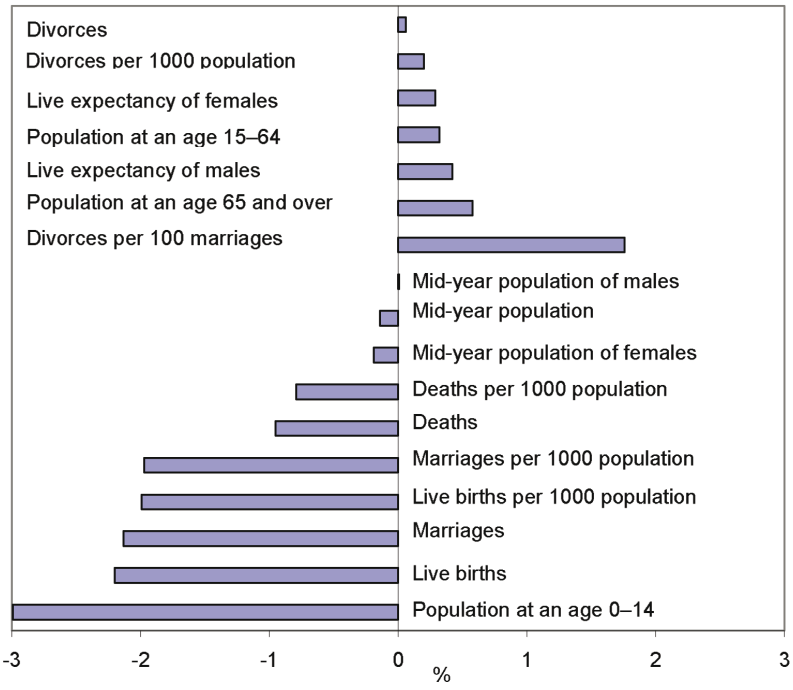
Type of the function	Indicator			
	Mid-year population at an age 65 and over	Live expectancy		Mid-year population males
		males	females	
quadratic	99.66^{++}	98.31^{++}	98.01^{++}	95.08^{++}
linear	84.40^{++}	95.84^{++}	92.79^{++}	85.67^{++}
	Mid-year population of females	Deaths	Live births	Mid-year population
quadratic	95.04^{++}	94.17^{++}	92.83^{++}	91.56^{++}
linear	51.33^{+}	73.41^{++}	42.00^{+}	91.37^{++}
	Deaths per 1000 population	Divorces		
		per 100 marriages	per 1000 population	total
quadratic	85.14^{++}	29.71	6.35	4.92
linear	63.06^{++}	28.34	0.63	0.05
	Mid-year population at an age under 15	Marriages	Mid-year population at an age 15–64	Marriages per 1000 population
exponential	99.82^{++}	-	-	-
linear	99.40^{++}	-	-	-
logarithmic	-	77.74^{++}	-	-
linear	-	65.27^{++}	-	-
power	-	-	97.34^{++}	-
linear	-	-	96.77^{++}	-
inverse	-	-	-	81.29^{++}
linear	-	-	-	59.50^{++}
	Live births per 1000 population			
inverse	90.36^{++}			
linear	37.75^{+}			

The short-term prediction of studied events is also based on trend functions as a tool of the description of the development of analysed time series. Results of the extrapolation point projection for a defined time period together with the quantification of a relative growth of the assessed demographic indicators of population and its movement are given in Tab. VII and Fig. 3.

VII: *Mean year increment/decrement of population indicators of the Czech Republic in the period 1993–2003 and their short-time point extrapolation prediction*

Indicator			Relative growth (%)	Prediction for year 2005	Reality in the year	
					1990	2000
Mid-year population (thousands of person)			–0.14	10 161	10 363	10 272
of this		males	–0.00	4 934	5 037	4 999
		females	–0.19	5 227	5 326	5 273
Mid-year population at an age		0–14	–2.99	1 509	2 223	1 685
		15–64	0.32	7 248	6 844	7 165
		65 and more	0.52	1 404	1 296	1 422
Marriages		number	–2.13	52 474	90 953	55 321
Divorces			0.06	33 451	32 055	29 704
Live births			–2.20	110 437	130 564	90 910
Deaths			–0.95	111 540	129 166	112 234
Live expectancy	males	years	0.42	73.05	67.6	71.7
	females		0.29	79.32	75.4	78.4
Live births per 1000 population		‰	–1.99	8.67	12.6	8.8
Deaths per 1000 population			–0.79	10.51	12.5	10.6
Marriages per 1000 population			–1.97	5.10	8.8	5.4
Divorces per 1000 population			0.20	3.31	3.09	2.89
Divorces per 100 marriages		%	1.76	67.01	35.2	53.77

Based on the results of a short-term extrapolation point prediction of the level of evaluated demographic indicators of population and its structure according to sex, international scale of economic generations including the movement of population for 2005 included in Tab. IV and its comparison with an average level achieved in the interval 1993 to 2003, it is possible to expect an increase in the mid-year number of the post-productive population by 0.76%, mid-year life span of females by 2.88% and males by 3.03%, divorces by 8.30%, relative rate of divorces (a ratio of the annual number of divorces to mid-year population in per mille, ie per 1000 inhabitants) by 10.33%, divorces per 100 marriages by 20.11%. On the other hand, a decrease would occur in the predicted year as against the basic period (the average of years 1993 to 2003) in death by –0.62%, in the mid-year population of males by –1.33%, in females by –1.02%, in the total mid-year population by –1.17%, in the productive population (age 15 to 64 years) by –3.65%, in death per 1000 inhabitants, in marriages per 1000 inhabitants of the mid-year population by –5.21%, in the number of marriages by –5.23%, in life-born per 1000 inhabitants of the mid-year population by –6.88% and in the pre-productive population by –15.43%.



3: *Relative growth of selected demographic indicators of population in the Czech Republic in the period 1993–2003*

SUMMARY

The developing transformation process aimed at market economy and started in the Czech Republic since 1990 through fundamental political changes is a complicated period not only from the economic point of view but also from social viewpoints which affect the rate of population reproduction through their economic and social aspects. In evaluating the demographic statics dealing with problems of population from the viewpoint of its number in the reference period 1993– 2003, its marked stability has been demonstrated (V_y = 0.49%) at the average level of 10 281.2 thousand inhabitants with the average yearly decrease of –0.14% for the given time interval.

Comparing presented characteristics with the previous decade it is not possible to omit their differences in both reference periods. In addition to the decrease in the average number of population by 57.5 thousand inhabitants as against the basic period (–0.56%) it is possible to observe decrease in its variability by 0.31%. A demonstrated one-percent proportion in the population increase by migration in the period 1993–2003 (78 950 persons) is also significant. Based on the extrapolation point prediction of the mid-year population in 2005 amounting to 10 161 thousand persons and its comparison with an average level achieved in the period 1993–2003 it is possible to conclude a decrease of the given indicator by 1.17%.

Studying the demographic structure based on classification by age and gender as the result of demographic processes occurring in the population for a number of years and at the same time to a certain extent predetermining the population development in future years, the proportion of pre-productive population amounting to 17.35% with an average annual decrease by –2.99%, productive population amounting to 69.09% with an average increase by 0.32% and post-productive population amounting to 13.56% with an average annual increase by 0.58% appeared to be a total reference interval. According to the point extrapolation prediction, the expected proportion of pre-productive population reached 14.85% (of –2.5% point), that of productive population 71.33% (of +2.24% point) and that of post-productive population 13.82% (of +0.26% point). In the differentiation of mid-year population according to gender the proportion of males reached 48.64% and that of females 51.36 % in the period under study. Predicted differences amounting to +0.04% in the same order can be considered to be negligible.

In basic indices of investigated indicators, their relative increase reached a value of 2.75% in the mid-year life span of females until 2003 as against 1993, in the productive population 3.65%, in the life expectancy of

males 4.05 %, in the post-productive population 6.21%, in the number of divorces 8.59%, in the number of divorces per 1000 inhabitants 9.90% and in the number of divorces per 100 marriages 46.51%. The descending order of decrease is presented by the following values: –25.68% in the number of marriages, –25.00% in the number of marriages per 100 inhabitants of mid-year population, –22.88% in the pre-productive population, –22.59% in the number of life-born children, –21.37% in the number of life-born children per 1000 inhabitants, –5.84% in the number of dead, –4.39% in the number of dead per 100 inhabitants, –1.53% in the mid-year population of females, –1.25% in the mid-year population and –0.96% in the mid-year population of males.

Based on the short-term point extrapolation prediction of the level of investigated demographic indicators of the population and its structure according to gender and the scale of economic generations including the movement of population for 2005, it is possible to expect an increase in the mid-year post-productive population by 0.76% as against the average of 1993 to 2003, mid-year of females by 2.88% and males by 3.03%, number of divorces by 8.30%, number of divorces per 1000 inhabitants by 10.33% and number of divorces per 100 marriages by 20.11%. On the other hand, a decrease in the predicted year should occur in the number of dead by –0.62%, in the mid-year population of males by –1.33% and that in females by –1.02%, in the mid-year population by –1.17%, in the productive population by –3.65%, in the number of dead per 1000 inhabitants and marriages per 1000 inhabitants by –5.21%, in the number of marriages by –5.23%, in the number of life-born per 1000 inhabitants by –6.88% and in the pre-productive population by –15.43%.

Applied methodical procedures of the treatment, analysis and interpretation of findings obtained in the study of the level, dynamics, trends and prediction of the selected indicators of demographic statics and dynamics in the examined territorial unit and reference period can be considered to be an efficient motivation element for changes in the approach of competent authorities to the population policy of the state downgraded so far.

SOUHRN

Analýza vývoje vybraných ukazatelů demografické statiky a dynamiky České republiky v letech 1993–2003

Probíhající transformační proces, cílený na tržní ekonomiku, zahájený v České republice od roku 1990 zásadními politickými změnami, je obdobím složitým nejen z hlediska ekonomického, ale i sociálního, které svými hospodářskými a sociálními aspekty ovlivňují míru reprodukce obyvatelstva. Při hodnocení demografické statiky, zabývající se problematikou obyvatelstva z hlediska jeho početního stavu v referenčním období let 1993–2003 byla prokázána jeho výrazná stabilita (V_y = 0,49 %) při průměrné úrovni 10 281,2 tis. obyvatel s průměrným ročním poklesem za daný časový interval –0,14 %. Při komparaci prezentovaných charakteristik s předcházejícím desetiletím nelze opomenout jejich diference v obou referenčních obdobích. Konstatovat lze vedle poklesu průměrného počtu obyvatel proti bazickému období o 57,5 tis. obyvatel (–0,56 %) při poklesu jeho variability o 0,31 % bodu. Zanedbatelný není prokázaný jednoprocentní podíl přírůstku obyvatelstva stěhováním při formování jeho úrovně v období let 1993 až 2003 (78 950 osob). Z extrapolační bodové predikce středního stavu obyvatelstva na rok 2005 ve výši 10 161 tis. osob a její komparace s průměrnou úrovní dosaženou v období let 1993 až 2003 lze usuzovat na pokles daného indikátoru o 1,17 %.

Při zkoumání demografické struktury, která se opírá o třídění podle věku a pohlaví jako výsledku demografických procesů probíhajících v populaci po řadu let a zároveň do určité míry předurčuje populační vývoj v budoucích letech, byl za totální referenční interval prokázán podíl předproduktivní populace ve výši 17,35 % s průměrným ročním poklesem –2,99 %, produktivní populace ve výši 69,09 % s průměrným ročním zvýšením 0,32 % a poproduktivní populace ve výši 13,56 % s průměrným ročním zvýšení o 0,58 %. Podle bodové extrapolační predikce by očekávaný podíl předproduktivní populace dosáhl 14,85 % (–2,5 % bodu), u populace produktivní 71,33 % (+2,24 % bodu) a u populace poproduktivní 13,82 % (+0,26 % bodu). Při diferenciaci středního stavu obyvatelstva podle pohlaví dosáhl podíl mužů v hodnoceném období 48,64 %, žen 51,36 %. Predikované diference +0,04 % ve shodném pořadí lze považovat za zanedbatelné.

Z bazických indexů zkoumaných indikátorů dosáhl jejich relativní nárůst do roku 2003 proti roku 1993 u střední délky života žen 2,75 %, u produktivní populace 3,65 %, u střední délky života mužů 4,05 %, u populace poproduktivní 6,21 %, u počtu rozvodů 8,59 %, u rozvodů na 1000 obyvatel 9,90 % a u počtu rozvodů na 100 sňatků 46,51 %. Sestupné pořadí poklesu prezentují hodnoty: –25,68 % u počtu

sňatků, –25,00 % u počtu sňatků na 100 obyvatel středního stavu, –22,88 % u předproduktivní populace, –22,59 % u počtu živě narozených, –21,37 % u počtu živě narozených na 1000 obyvatel, –5,84 % u počtu zemřelých, –4,39 % u počtu zemřelých na 100 obyvatel, –1,53 % u středního stavu žen, –1,25 % u středního stavu obyvatelstva a –0,96 % u středního stavu mužů.

Podle krátkodobé bodové extrapolační predikce úrovně zkoumaných demografických ukazatelů obyvatelstva a jeho struktury podle pohlaví a škály ekonomických generací včetně pohybu obyvatelstva na rok 2005 lze proti průměru let 1993 až 2003 očekávat zvýšení středního počtu obyvatelstva poprodukční populace o 0,76 %, střední délky života žen o 2,88 % a mužů o 3,03 %, rozvodů o 8,30 %, počtu rozvodů na 1000 obyvatel o 10,33 % a rozvodů na 100 sňatků o 20,11 %. Ke snížení v predikovaném roce by naproti tomu došlo u počtu zemřelých o –0,62 %, u středního stavu mužů o –1,33 % a žen o –1,02 %, u středního stavu obyvatelstva o –1,17 %, u produktivní populace o –3,65 %, u zemřelých na 1000 obyvatel a sňatků na 1000 obyvatel o –5,21 %, u počtu sňatků o –5,23 %, u živé narozených na 1000 obyvatel o –6,88 % a u předproduktivní populace o –15,43 %.

Aplikované metodické postupy zpracování, analýzy a interpretace poznatků, získaných při studiu úrovně, dynamiky, trendu a predikce vybraných ukazatelů demografické statiky a dynamiky v posuzovaném územním celku a referenčním období lze považovat za účinný motivační prvek pro změny přístupu kompetentních vládních orgánů k až dosud podceňované populační politice státu.

obyvatelstvo, diferenciace podle pohlaví a ekonomických generací, pohyb, dynamika, trend, krátkodobá predikce, Česká republika

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