ACTA UNIVERSITATIS AGRICULTURAE ET SILVICULTURAE MENDELIANAE BRUNENSIS
SBORNÍK MENDELOVY ZEMĚDĚLSKÉ A LESNICKÉ UNIVERZITY V BRNĚ

Ročník LII 2 Číslo 3, 2004

ANALYSIS OF THE DEVELOPMENT AND PREDICTION OF THE POPULATION MOVEMENT INDICATORS IN THE CZECH REPUBLIC

M. Palát, E. Maca

Received: December 15, 2003

Abstract

PALÁT, M., MACA, E.: *Analysis of the development and prediction of the population movement indicators in the Czech Republic.* Acta univ. agric. et silvic. Mendel. Brun., 2004, LII, No. 3, pp. 17-34

The paper is aimed at the presentation of findings obtained in the study of the development of time series of the population movement in the defined territorial unit and time interval 1993 – 2001. In addition to the exact evaluation of the dynamics and trend, the analysis of selected indicators is also aimed at a short-term extrapolation prediction. Developmental trends are specified of the population composition according to main age groups, live births according to legitimacy and the order of birth, deaths according to the cause of death, the first marriage according to a bridegroom and bride age, selected indicators of the marriage rate and divorce rate, divorce rate according to the number of underage children and foreign migration according to countries.

Czech Republic, demographic dynamics, population movement, development analysis, extrapolation prediction

Specific position of demographic analysis represented by the achieved level of characteristics of the population movement and its reproduction as one of the important material conditions of social and economic development requires not only exact evaluation of the main developmental trends of the given phenomena in the past but also prediction of their future probabilistic development.

The conception of the presented study oriented to the quantification of changes in the development of natality, mortality, marriage rate, divorce rate, abortion rate, interruption induced abortion and foreign migration in the Czech Republic in the period 1993 to 2001 is also based on the aspect. Within the reference period, time series were also analysed of the population number structure according to main age groups, live births according to legitimacy, selected indicators of the death rate (mortality), numbers of deaths according to the cause of death, numbers of the first marriages according to age, numbers of divorces according to the number of underage children, foreign migration and its differentiation according to countries.

Theoretical aspects and interpretation of the results of analytical activities in the sphere of the study of demographic events and processes 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: DUFEK (1999), KRETSCHMEROVÁ (2001), SRB (2001), FIALA (2002) and KAŇÁKOVÁ (2002).

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) and MINAŘÍK (2000).

MATERIAL AND 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. In addition to the population movement presented by values of:

Year	Live births	Deaths total	Marriages	Divorces	Abortions	Induced abortions
1993	121 025	118 145	66 033	30 227	85 445	70 634
1994	106 579	117 373	58 440	30 939	67 434	54 836
1995	96 097	117 913	54 956	31 135	61 590	49 531
1996	90 446	112 782	53 896	33 113	59 962	48 086
1997	90 657	112 744	57 804	32 465	56 973	45 022
1998	90 535	109 527	55 027	32 363	55 654	42 959
1999	89 471	109 768	53 523	23 657	52 103	39 382
2000	90 910	109 001	55 321	29 704	47 370	34 623
2001	90 715	107 755	52 374	31 586	45 057	32 527

Year	Immigrants	Emigrants	Natural increase/decrease	Net migration	Immigration total	Mid-year population[1)]
1993	12 900	7 424	2 840	5 476	8 316	10 331
1994	10 207	265	−10 794	9 942	−852	10 336
1995	10 540	541	−21 816	9 999	−11 817	10 331
1996	10 857	728	−22 336	10 129	−12 207	10 315
1997	12 880	805	−22 087	12 075	−10 012	10 304
1998	10 729	1 241	−18 992	9 488	−9 504	10 295
1999	9 910	1 136	−20 297	8 834	−11 552	10 283
2000	7 802	1 263	−18 091	6 539	−11 552	10 273
2001	12 918	21 469	−17 040	8 551	−25 591	10 224

[1)] thousand persons

they also include its specification presented in tabular summaries on results of analytical activities.

Methodical procedures of processing and evaluating the studied indicators of demographic dynamics were aimed according to set objectives of the analysis (in addition to the description of the average level and variability) at the evaluation of dynamics and trends of assessed phenomena including their short-term extrapolation prediction.

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 most marked feature of the population development was the enormous decrease of marriages and born children and subsequently also intensity of the processes. Based on the data presented above on the population movement expressed in absolute terms it is possible to observe decrease in the number of live births and marriages by 24.05 and 8.83%, respectively in the final year 2001 as compared with 1993. Thus, significant (significance level $P = 0.05$) average annual decrease of the first and of the second indicator by 3.59 and 2.11%, respectively is not negligible. We cannot omit that the marked decrease in both characteristics of the population movement was not even affected by the extraordinarily favourable age structure of the population. Considering the changing attitudes of particularly young generation to marriage and often also preferring unmarried coexistence and extramarital children, decrease in the marriage rate dos not need be serious. Nevertheless, the relationship between motherhood and marriage remains important. The problem of considerable decrease in natality and its extrapolation prediction in the degree of decrease in 2005 as compared with its absolute level in 2001 by 20.24% will show consequences in the creation of other irregularities in the age structure of population. Together with the further development of mortality and migration it will manifest itself in the number of population and its ageing. An overall quantification of the development of time series of the absolute number of selected indicators of the population movement

provide parameters of analytical trend functions of live births (y_1), deaths (y_2), marriages (y_3), divorces (y_4), abortions (y_5), induced abortions (y_6), immigrants (y_7), emigrants (y_8) and mid-year population (y_9). Results of this stage of analytical activities are given in Table I and Fig. 1.

I: *Parameters of models of developmental trends of selected parameters of the population movement in the Czech Republic in the period 1993 to 2001*

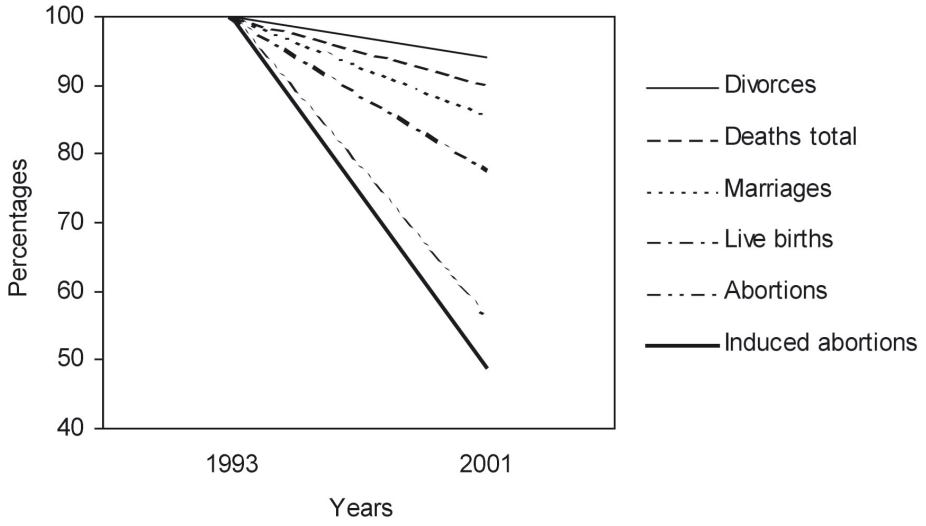
Variable	Model parameters $y'_{yt} = a_{yt} + b_{yt}\, t$		Relative growth b_{yt} (%)	Correlation coefficient r_{yt}	Point estimate for 2005
	a_{yt}	b_{yt}			
y_1	111 388.8	−3 023.5	−5.59	−0.7707^{+}	72 082.6
y_2	119 981.5	−1 439.7	−1.34	−0.9568^{++}	101 263.6
y_3	61 852.2	−1 095.5	−2.11	−0.7808^{+}	51 993.0
y_4	31 741.1	−232.9	−0.78	−0.2265	28 713.2
y_5	79 484.2	−4 083.8	−9.56	−0.9245^{++}	26 395.2
y_6	66 274.3	−3 974.9	−13.03	−0.9433^{++}	14 601.1
y_7	11 682.4	−142.2	−1.37	0.2288	9 834.0
y_8	−1 198.4	1 014.6	12.78	0.3996	11 991.6
y_9	10 360.2	−12.2	−0.12	−0.9337	10 201.4

Correlation coefficient is significant on the significance level P = 0.05 (+), P = 0.01 (++)

Based on the extrapolation estimate of the number of live born and dead it is possible to expect a natural decrease amounting to 29 183 inhabitants, increase through migration amounting to 2 158 inhabitants and a total decrease amounting to 31 341 inhabitants.

If we start from an aspect that the extrapolation of time series based on the description of the past development of studied indicators applied by analytical functions of time lead to good estimates of the future development under conditions of observing relatively stable conditions it is possible to expect marked decrease in the number of live births in 2003 as compared with 2001 by 20.5%, of the number of deaths by 6.0%, of the marriage rate by 0.7%, abortion rate by 4.4%, induced abortions by 55.1%. Fig. 1 depicts the development of indicators of the natural reproduction of population.

Quantification of the dynamics of the general rate of population reproduction (per 1 000 of the mid-year population) in the examined period and territorial unit is made possible by statistics given in Table II. Based on the tables it is possible to rate not only changes in studied events as against the basic period but also their annual changes.



1: *The development of indicators of the natural reproduction of population of the Czech Republic in the period 1993 to 2001*

II: *The development of selected indicators of the population movement in the Czech Republic in the period 1993 to 2001*

Indicator	Basic indices	Year								
		1993	1994	1995	1996	1997	1998	1999	2000	2001
Live births		11.71	10.31	9.30	8.77	8.80	8.79	8.70	8.85	8.87
	i_b	100.00	88.00	79.40	74.90	75.10	75.10	74.30	75.60	75.70
	i_{ch}	-	-	90.20	94.30	100.30	99.90	99.00	101.70	100.20
Deaths		11.44	11.43	11.41	10.94	10.94	10.66	10.67	10.61	10.54
	i_b	100.00	99.90	99.70	95.60	95.60	93.20	93.30	92.70	92.10
	i_{ch}	-	-	99.80	95.90	100.00	97.40	100.10	99.40	99.30
Abortions total		8.27	6.52	5.95	5.80	5.53	5.40	5.07	4.61	4.41
	i_b	100.00	78.80	71.90	70.10	66.90	65.30	61.30	55.70	53.30
	i_{ch}	-	-	91.20	97.50	95.30	97.60	93.90	90.90	95.70
Induced abortions		6.84	5.30	4.79	4.66	4.37	4.17	3.87	3.37	3.18
	i_b	100.00	77.50	70.00	68.10	63.90	61.00	56.00	49.30	46.50
	i_{ch}	-	-	90.40	97.30	93.80	95.40	91.80	88.00	94.40
Marriages		6.39	5.65	5.32	5.22	5.61	5.34	5.20	5.38	5.12
	i_b	100.00	88.40	83.20	81.70	87.80	83.60	81.40	84.20	80.10
	i_{ch}	-	-	94.10	98.10	107.50	95.20	97.40	103.50	95.20
Divorces		2.92	2.99	3.01	3.21	3.15	3.14	2.30	2.89	3.09
	i_b	100.00	102.40	103.10	107.30	105.30	107.50	78.80	99.00	105.80
	i_{ch}	-	-	100.70	106.60	98.10	99.70	73.20	125.60	106.90

Our calculations; i_b - basic indices, i_{ch} - chain indices

According to data included in the tabular overview, the most marked decrease is obvious in the frequency of the induced abortions per 1 000 of the mid-year population (as at 1 July) in 2001 as against 1993, by 53.5%. In the subsequent ascending order, it is total abortion rate (−45.7%), natality (−24.3%), marriage rate (−19.9%) and mortality (−7.9%). An increase amounting to 5.8% occurred only in the divorce rate.

In the comparison of annual changes derived through chain indices, their highest level was demonstrated in 1994, viz. in the total abortion rate (−21.2%) and induced abortions (−22.5%), natality (−12.0%) and marriage rate (−11.6%). In mortality, the highest inter-year decrease amounting to −4.9% was recorded in 1996. As for the divorce rate, the highest inter-year change amounting to 25.6% occurred in 2000.

The long-term development of characteristics of the general rate of natural reproduction of population in the territory under study in the five-year intervals of the post-war period until 1999 and the period 2000 to 2001 is presented in Table III.

III: *General rates of the natural reproduction of the Czech Republic population in the reference period 1945 to 2001*

Period	Indicator per 1 000 population					
	Births		Abortions		Deaths	Natural
	Live births	Still-births	Total	Induced abortions		Increase/decrease
1945-49	21.39	0.33	.	.	13.32	8.07
1950-54	19.65	0.29	2.75	.	11.02	8.63
1955-59	15.89	0.17	4.73	5.78	11.03	5.87
1960-64	14.43	0.13	8.26	6.36	10.26	4.17
1965-69	14.37	0.10	8.66	6.92	11.28	3.09
1970-74	17.02	0.11	8.42	6.45	12.47	4.55
1975-79	17.91	0.11	7.92	5.93	12.39	5.53
1980-84	13.84	0.07	8.84	7.16	12.86	0.99
1985-89	12.78	0.05	11.23	9.69	12.46	0.31
1990-94	11.80	0.04	9.51	8.25	11.80	0.00
1995-99	8.89	0.02	5.56	4.36	10.91	−0.02
2000-01	8.84	0.02	4.51	3.28	10.54	−1.70

Source: Period 1945 - 1989, Roubíček (1997); period 1990 - 2001, our calculations

Based on the data in the tabular overview there are a marked decrease live births and also deaths per 1000 of the mid-year population from period 1945–1959 to the final period.

In the first evaluated indicator by 58.67%, in still-born children the decrease amounted to 93.94%. A decrease in mortality by 20.87% is also remarkable as well as in induced abortions roughly by 66% in the period 2000 to 2001 as against the reference period 1985 to 1989. On the other hand, an enormous decrease in the natural growth of population within the whole period is unsatisfactory from the viewpoint of reproduction.

Deeper and more versatile views of the developmental trends of indictors of the population movement (converted to 1 000 inhabitants) in the Czech Republic for the period 1993 to 2001 provide results of research aimed at the study of trends by means of models of developmental tendencies. With respect to the distribution of empirical values in the co-ordinate network and the analysis of examined events linear regression functions were used in the selection of a suitable type. Values of parameters of selected regression functions on the basis of which values of relative changes, degrees of the dependence of phenomena on a time variable and extrapolation point predictions were calculated.

Results of this stage of analytical activities are quantified by the following data:

Live births	$y' = 10.75 - 0.2820\ t$	$r_{yt} = -0.7560^{+}$	$b'_{yt} = -3.43\%$
	point estimate for 2005 = 7.09		
Deaths	$y' = 11.60 - 0.132\ t$	$r_{yt} = -0.9401^{++}$	$b'_{yt} = -1.27\%$
	point estimate for 2005 = 9.88		
Marriages	$y' = 5.97 - 0.100\ t$	$r_{yt} = -0.7072^{+}$	$b'_{yt} = -1.97\%$
	point estimate for 2005 = 9.88		
Divorces	$y' = 3.06 - 0.018\ t$	$r_{yt} = -0.1861$	$b'_{yt} = -0.63\%$
	point estimate for 2005 = 2.82		
Abortions	$y' = 7.67 - 0.333\ t$	$r_{yt} = -0.9203^{++}$	$b'_{yt} = -9.31\%$
	point estimate for 2005 = 2.62		
Induced abortions	$y' = 6.40 - 0.381\ t$	$r_{yt} = -0.9410^{++}$	$b'_{yt} = -12.78\%$
	point estimate for 2001 = 1.45		
Immigrants	$y' = 0.37 + 0.097\ t$	$r_{yt} = -0.6431$	$b'_{yt} = 7.77\%$
	point estimate for 2001 = 1.63		
Emigrants	$y' = -0.12 + 0.099\ t$	$r_{yt} = 0.4016$	$b'_{yt} = 12.86\%$
	point estimate for 2005 = 1.17		

If we start from an analysis of the past development and extrapolation of values of time series of assessed indicators of the population movement it is possible (providing relatively stable conditions of periodicity and regularity found in the period of observation hold true even in the future) to expect increase in immigrants by 29.6% in 2005 as compared with 2001. On the other hand, decrease in other indicators can be expected. The highest decrease amounting to 54.4% can be expected in the induced abortions. The decreasing order is as follows: emigrants (−47.6%), abortion rate (−40.6%), live births (−20.1%), marriage rate (−8.79%), divorce rate (−8.74%) and deaths (−6.26%).

The applied method of the prediction of births, deaths, immigrants and emigrants converted to 1 000 inhabitants of the mid-year population and the year 2005 makes also possible to realize point estimates of the natural increase and increase through immigration including the total increase. Their values in the same order of indicators should amount to −2.79, 0.46 and −2.33 according to the estimate of the future development. The natural decrease of population would be increased by 67.06% in the predicted year as compared with the actual state achieved in 2001 while its total decrease would be diminished by 7.17% in consequence of immigrants.

When interpreting the significant average annual relative decrease in the mid-year population in the studied period 1993 to 2001 amounting to 0.12% ($r_{yt} = 0.9337^{++}$) it is not possible to omit that its formation was not caused only by decreases through natural changes but also through migration. Due to the decrease in the annual number of births and deaths, the average age of population was simultaneously increased. The absolute increase in final year 2000 to the basic year 1993 is 2 years (5.43%) by mean year increment 0.75% ($r_{yt} = 0.9992$).Under unchanged conditions of the development it is possible to expect according to extrapolation estimate for 42.2 years (i.e. increase as against 2000 by 3.61%)

Age structure of population is characterized by market decrease of annual births. In this consequence structure of persons in the age under 14 decrease from 1993 to 2001 by 3.5% (from 19.4 to 15.9%).

Slightly increasing number of persons older 60 up to year 1999 and slight increase to 2001 by 0.4% (from 18.2 to 18.6%) is in consequence of weak population years in thirtieth of the last century. Following information are given in Table IV.

IV: *Population structure by main age groups at 31 December 1993 to 2001*

Year	Absolute number (in thousands)			Age structure (in %)			Age index	Economical load index
	0 - 14	15 - 59	60 +	0 - 14	15 - 59	60 +		
1993	2010	6466	1858	19.4	62.6	18.0	92.5	59.8
1994	1948	6526	1859	18.9	63.2	18.0	95.4	58.3
1995	1893	6571	1857	18.3	63.7	18.0	98.1	57.1
1996	1843	6609	1857	17.9	64.1	18.0	100.8	56.0
1997	1795	6647	1857	17.4	64.5	18.0	103.5	55.0
1998	1751	6674	1864	17.0	64.9	18.1	106.4	54.2
1999	1707	6698	1873	16.6	65.2	18.2	109.7	53.5
2000	1664	6707	1895	16.2	65.3	18.5	113.9	53.1
2001	1632	6226	1912	15.9	65.5	18.6	117.2	52.7

From characteristics of average level of age groups, the before productive population reached in the whole reference period 1 805 thousand persons (variation coefficient V_y = 17.5 %) and productive population 6 625 thousand persons (V_y = 21.34%).

In a productive population 6 625 thousand persons (V_y = 21.34%) and in a post-productive population 1 870 thousand persons (V_y = 1.07%), the average structure of population was derived. In the same order of age categories, it reached 17.5, 64.3 and 18.2%, respectively for the whole reference period.

Description of the developmental tendencies of analysed time series of the population structure by main age groups and on the basis of derived age structure indices (Sauvy's index of the total dependence) is made possible by statistics presented in Table V. In addition to the absolute and relative growth of phenomena, they also quantify informative potential of applied models of developmental trends and their statistical significance.

Significant decrease of population of the age group under 15 years in the assessed time interval can be

V: *Characteristics of the trend of the Czech Republic population structure by main age groups and age structure indices as at 31 December 1993 to 2001*

Indicator		Growth		Correlation coefficient
		Absolute b_{yt}	Relative b'_{yt} (%)	r_{yt}
Absolute number of inhabitants (thousands)	0-14	−47.13	−2.91	-0.9970^{++}
	15-59	−1.63	−0.02	−0.0294
	60 +	6.05	0.32	0.8277^{++}
Age structure (in %)	0-14	−0.44	−2.79	-0.9968^{++}
	15-59	0.36	0.55	0.9819^{++}
	60 +	0.07	0.40	0.8542^{++}
Age structure index[1)]		3.05	2.63	0.9973^{++}
Economical load index[2)]		−0.88	−1.70	-0.9807^{++}

[1)] Number of persons aged 60 and more years per 100 persons aged 0–14 years

[2)] Number of persons aged 0–14 years and persons over 60 years per 100 persons aged 15–59 years

considered to be the result of a marked decrease in natality which reached 30 310 live births in the final year as compared with the basic period (−25.05%) under conditions of the favourable age structure of women - potential expectant mothers.

On the one hand, there was a decreasing trend in natality and, on the other hand, increase in the number of births out of marriage continued. Exact analysis of the development of the phenomena by legitimacy is made possible by factual data presented in Tab. VI. Based on the data, characteristics of the dynamics and trend were derived. While applied index series of the basic period (of the year 1993) provide possibilities to compare the studied indices in all subsequent periods of examined time series, the quantification of inter-annual changes is conditioned by the comparison of examined indices with values of previous periods. Exact evaluation of the development of analysed time series is represented by their one-dimensional models of trend functions.

VI: *Dynamics of live births in the Czech Republic by legitimacy*

Year	Births							
	in marriage				out of marriage			
	Number	%			Number	%		
1993	105 702	87.3	100.00	-	15 323	12.7	100.00	-
1994	91 072	85.4	86.16		15 507	14.6	101.20	
1995	81 150	84.4	76.77	89.10	14 947	15.6	97.55	96.39
1996	75 158	83.1	71.10	87.69	15 288	16.9	99.77	102.28
1997	74 532	81.2	70.51	99.17	16 125	18.8	105.23	105.47
1998	73 326	81.0	69.37	98.38	17 309	19.0	112.96	107.34
1999	71 045	79.4	67.21	96.89	18 426	20.6	120.25	106.45
2000	71 118	78.2	67.28	100.10	19 792	21.8	129.16	107.41
2001	69 439	76.5	65.69	97.64	21 276	23.5	138.85	107.50

Through the applied methodical procedure of the examination of dynamics, not only decrease in the proportion of live births in marriage was proved in their total number of 87.3% reached in 1993 to 76.5% in 2001 but also in their total number. Based on derived values of chain indices it is possible to state that the highest inter-annual percentage decrease in live births in marriage as against a previous period occurred in 1996.

The proportion of live births out of marriage by the order of birth is specified by the following values:

Order of birth		Year								
		1993	1994	1995	1996	1997	1998	1999	2000	2001
1.	%	60.9	59.4	57.8	56.6	57.8	57.1	58.1	59.1	58.6
2.		20.5	21.0	22.9	23.7	23.2	24.1	24.0	24.0	24.4
3. +		18.6	19.6	19.3	19.7	19.0	18.8	17.9	16.9	17.0

Based on percentage values included in the overview quantifying the proportion of live births out of marriage in the total number there is an evident decrease in births in the 1st order between 1993 and 2001 by 2.3% (from 60.9 to 58.6%), in the 2nd order of birth increase by 3.9% (from 20.5 to 24.4%) and in the 3rd and higher orders of birth decrease by 1.6% (from 18.6 to 17.0%). In evaluating inter-annual changes, the highest decrease by 1.6% in the 1st order of birth was proved in 1995, in the 2nd order increase by 1.9% in 1993 as against 1994 (from 21.0 to 22.9%) and in the 3rd and higher orders of birth decrease by 1.0% (from 17.9% to 16.9%) in 2000 as against 1999.

Interpretation of results obtained in the study of trends of time series of live births by legitimacy and order of birth is made possible by parameters of models of developmental trends presented in Table VII. On the basis of them, it is possible to evaluate, in addition to average annual absolute and relative changes in studied phenomena, also informative potentials of applied models and, last but not least, to use them for the implementation of extrapolation prediction.

VII: *Parameters of models of developmental trends of live births by legitimacy and order of birth in the Czech Republic in 1993 to 2001*

Indicator				Model parameters $y'_{yt} = a_{yt} + b_{yt} t$		Relative growth b'_{yt} (%)	Correlation coefficient r_{yt}
				a_{yt}	b_{yt}		
Births	Inside marriage	Total (%)		98 084.3	−3 782.6	−5.91	-0.8652^{++}
				88.35	−1.28166	−1.67	-0.9974^{++}
		Order of Birth %	1.	45.73	−1.10833	−0.24	−0.3867
			2.	39.71	0.23500	0.56	0.7059^{+}
			3. +	14.55	−0.12666	−0.94	-0.7817^{+}
	Outside marriage	Total (%)		13 306.5	760.7	3.77	0.9197^{++}
				11.48	1.11500	5.18	0.6591
		Order of Birth %	1.	66.63	−2.85000	−6.95	−0.4391
			2.	20.82	0.45300	1.82	0.8809^{++}
			3. +	20.05	−0.30333	−1.75	-0.7920^{+}

Based on the results of the study of developmental trends of live births in the analysed region and time interval it is possible to conclude a marked and statistically significant ($r_{yt} = -0.8652^{++}$) mean annual relative decrease in the number of live births in marriage (−5.91%) on the one hand and, on the other hand, its substantial increase out of marriage amounting to 3.77% ($r_{yt} = 0.9197^{++}$). A mean annual decrease in the proportion of life births from their total number in marriage (−0.94%) was significant in the 3rd and higher orders of birth.

In live births out of marriage, an enormous and statistically significant average decrease occurred in live births in both marginal groups (in the 1st order $b'_{yt} = -6.95\%$ and in the 3rd and higher orders $b'_{yt} = -1.75\%$). Results obtained in processing selected indicators of both events from the viewpoint of achieved mean level, variability and trends for the period 1993 to 2001 belong to important findings in the field of the study of fertility and reproduction. The results are presented by the following values:

Statistics	Indicator			
	Total fertility	Average age of mothers by birth of		Net rate of reproduction
		child	1. child	
Mean	1.54	26.330	23.970	0.600
Coefficient of variation (%)	14.59	3.220	3.830	14.280
Index 2001/1993	0.683	1.104	1.119	0.687
Relative growth (%)	−5.40	1.120	1.320	−5.150
Point prediction of indicator for 2005	1.03	28.800	26.650	0.400

A predicted value of aggregate fertility for 2005 would be decreased by 9.65% as against its reality achieved in 2001 and by 38.32% as against 1993. The average age of mothers at the birth of a child would be increased by 4.35% in the first compared variant and by 15.20% in the second variant.

The average age of mothers would be increased by 5.33% at the birth of the 1st child as against 2001 and as against 1993 by 17.92%. As for the net rate of reproduction, decrease compared with 2001 amounted to 27.27% and as against l993 even 50.00%. It is evident that the shift of fertility with the shift of births towards higher age of mothers shows also in the increase of their average age at the birth of a child and in longer inter-birth intervals.

The average level, variability, average annual relative increases and informative potentials of applied models of developmental trends of the proportion of age groups on the formation of the aggregate production in the evaluated territorial unit and time period are expressed by the following values:

Characteristics	Age groups				
	-20	20 - 24	25 - 29	30 - 34	35 +
Average level ($\bar{y}$)	11.45	34.45	33.52	14.42	6.14
Relative variability (V_y)	16.51	17.14	12.64	19.05	13.10
Relative growth (b'_{yt} in %)	−7.77	−8.27	3.88	5.41	3.87
Correlation coefficient (r_{yt})	-0.983^{++}	-0.994^{++}	0.998^{++}	0.992^{++}	0.968^{++}
Point prediction for 2005	6.03	17.31	45.87	22.37	8.42

An idea on the development of the proportion of age groups (in %) in the period 1993 - 2001 is given by Fig. 2.

2: *Proportions of age groups in the aggregate fertility (in %) in the period 1993 to 2001*

Dynamics of specified data on departed as a factor of the formation of a natural increase/decrease of population by selected classes of causes of death of the 10th revision of the International statistical classification of diseases and associate health problems per 1000 inhabitants in the period under study is quantified by basic indices given in Tab. VIII.

Results of this stage of analytical activities have proved that as for the assessed causes of death increase occurred only in tumours (group II) and diseases of a respiratory system (group X) in the final year as against the basic period. The group of death caused by diseases of the digestion system has remained unchanged. On the other hand, marked decrease occurred in injuries, poisons and some other consequences of external causes (−18.4%), diseases of urinary and genital organs (−17.8%), diseases of circulatory system (−10.9%) and diseases of endocrine, nutrition and metabolic systems (−8.1%).

Development of the percentage proportion of death causes in its total number (per 100 000 inhabitants) in the interval under study is given in Table IX.

VIII: *Dynamics of departed by causes of death per 100 000 inhabitants of the Czech Republic (1994 = 100%)*

Cause of death			Year						
			1995	1996	1997	1998	1999	2000	2001
II.	Neoplasm		101.1	98.6	99.2	99.3	100.0	101.9	101.5
IV.	Endocrine, nutritional and metabolic diseases		66.7	60.7	76.3	111.1	88.9	106.7	91.9
IX.	Diseases of the	circulatory system	101.3	97.1	97.6	93.1	93.0	89.9	89.1
X.		respiratory system	109.3	100.9	93.3	88.9	100.9	107.6	101.3
XI.		digestive system	97.0	93.0	90.3	93.5	95.6	95.6	100.0
XIV.		genitourinary system	90.5	92.9	78.7	81.1	83.4	84.6	82.2
XIX.	Injury, poisoning and some other consequences of external causes		99.4	91.2	92.0	82.2	81.3	83.1	81.6

Parameters of models of developmental trends of studied events, their informative potential, average annual relative changes in the course of the reference period and point predictions for 2005 are presented by the following values:

$y'_{II} = 200.4036 + 9.5548\ t$;	$b'_{yt} = 3.45\ \%$;	$r_{yt} = 0.2595$;	$y'_{2005} = 315.1$
$y'_{IV} = 9.9569 + 0.4214\ t$;	$b'_{yt} = 3.16\ \%$;	$r_{yt} = 0.4149$;	$y'_{2005} = 15.0$
$y'_{IX} = 650.1678 - 11.2512\ t$;	$b'_{yt} = -2.00\ \%$;	$r_{yt} = -0.9649^{++}$;	$y'_{2005} = 515.1$
$y'_{X} = 45.1214 - 0.0214\ t$;	$b'_{yt} = -0.05\ \%$;	$r_{yt} = -0.0174$;	$y'_{2005} = 44.9$
$y'_{XI} = 41.3044 - 0.0085\ t$;	$b'_{yt} = 0.01\ \%$;	$r_{yt} = 0.0085$;	$y'_{2005} = 41.4$
$y'_{XIV} = 16.2607 - 0.3607\ t$;	$b'_{yt} = -2.70\ \%$;	$r_{yt} = -0.7187^{+}$;	$y'_{2005} = 11.9$
$y'_{XIX} = 84.6428 - 2.4595\ t$;	$b'_{yt} = -3.78\ \%$;	$r_{yt} = -0.9208^{++}$;	$y'_{2005} = 55.1$

The percentage of departed by causes of death in the evaluated territorial unit and the period 1994 – 2001 is presented in Table IX. In assessing the development of death rate by selected causes of death it is not possible to omit the number of dead per 100 000 inhabitants after 1994 considering ageing the population ($b'_{yt} = -1.23\%$, $r_{yt} = -0.93^{++}$).

IX: *The structure of death rate by selected causes of death[1)] (in %) in the period 1994–2001*

Cause of death	Year							
	1994	1995	1996	1997	1998	1999	2000	2001
II.	24.1	24.3	24.7	24.8	25.6	25.7	26.3	26.4
IV.	1.2	0.8	0.7	0.9	1.4	1.1	1.4	1.2
IX.	55.5	55.9	56.0	56.2	55.1	54.9	53.4	53.3
X.	4.0	4.3	4.1	3.8	3.7	4.2	4.6	4.3
XI.	3.8	3.7	3.7	3.6	3.8	3.9	3.9	4.1
XIV.	1.5	1.3	1.4	1.2	1.3	1.3	1.3	1.3
XIX.	7.3	7.2	6.9	7.0	6.4	6.3	6.5	6.4

[1)] Owing to the low level of death rate the development of death by causes of class I is not analysed here. (Certain infectious and parasitic diseases), III. (Diseases of the blood-forming organs and some disorders concerning immune mechanism), V. (Mental and behavioural disorders), VI. (Diseases of the nervous system),VII. (Diseases of the eye and adnexa), VIII. (Diseases of the ear and mastoid process), XII. (Diseases of the skin and subcutaneous tissue), XIII. (Diseases of the musculoskeletal system and connective tissue), XV. (Pregnancy, childbirth and the puerperium), XVI. (Certain conditions originating in the perinatal period), XVII. (Congenital malformations, deformations and chromosomal abnormalities), XVIII. (Symptoms, signs and abnormal clinical and laboratory findings).

Characteristics of the dynamics and trends of the proportion (in %) of causes of death in the total number of departed per 100 000 inhabitants in the time interval under evaluation reached the following values:

Cause of death (International Statistical Classification of Diseases and Related Health Problems, ICD - 10)			2001/1994 (%)	b_{yt}	b'_{yt}	r_{yt}
II.	Neoplasm		109.5	0.3559	1.34	0.9855^{++}
IV.	Endocrine, nutritional and metabolic diseases		100.0	0.0559	4.28	0.5187
IX.	Diseases of the	circulatory system	95.5	−0.3928	−0.73	-0.8342^{++}
X.		respiratory system	107.5	0.0452	1.05	0.3800
XI.		digestive system	107.9	0.0464	1.17	0.7325^{+}
XIV.		genitourinary system	86.6	−0.0190	−1.51	−0.5264
XIX.	Injury, poisoning and some other consequences of external causes		87.7	−0.1452	−2.23	-0.8974^{++}

Marriage rate and divorce rate represent an important component of demographic dynamics in the field of studying the movement of population. Similarly as in the case of the development of birth rate the number of marriages in the period 1993 to 2001 demonstrates changes in the reproduction behaviour of a young generation and of its attitude to marriage and parenthood. Last but not least, it is proved by 20.7% decrease in the number of concluded marriages in the final year as against 1993 (from 66 033 to 52 374) which is the lowest number in the history of the Czech Republic. In this context, it is not possible to omit findings obtained in the study of the trend of the first marriage by a bridegroom (G) and a bride (B) for the period under examination:

$y'_G = 47\,496.661 - 1\,029.97\,t$; $b'_{yt} = -2.69\,\%$; $r_{yt} = -0.7593^{+}$
$y'_B = 47\,594.744 - 1\,013.90\,t$; $b'_{yt} = -2.64\,\%$; $r_{yt} = -0.7545^{+}$

The structure of first marriages by the age of a bridegroom and bride is quantified by data given in Table X.

X: *First marriages: by the age of a bridegroom and bride (%) in the Czech Republic*

Age		Year								
		1993	1994	1995	1996	1997	1998	1999	2000	2001
16 - 20	G	11.3	8.9	15.9	12.0	9.1	7.1	5.8	4.3	3.1
	B	39.1	32.6	42.6	34.9	28.8	23.8	19.1	14.8	12.1
21 - 24	G	55.8	55.4	45.7	45.7	43.8	41.3	36.6	31.9	27.5
	B	48.2	53.3	41.0	46.1	48.8	50.6	48.9	47.4	43.3
25 - 29	G	23.4	25.0	26.5	29.3	32.1	35.9	40.5	45.4	48.3
	B	9.2	10.3	12.2	14.8	17.4	20.5	26.3	31.5	37.2
30 - 34	G	5.7	6.6	7.7	8.6	9.8	10.2	11.2	12.2	14.3
	B	2.0	2.3	2.6	2.8	3.2	3.3	3.8	4.4	5.3
35 - 39	G	2.2	2.3	2.3	2.4	2.8	2.9	3.2	3.8	4.1
	B	0.8	0.8	0.8	0.7	0.9	1.0	1.0	1.1	1.2
40 - 44	G	1.4	1.6	1.7	1.7	2.1	2.3	2.3	2.0	2.3
	B	0.6	0.6	0.7	0.6	0.8	0.7	0.8	0.7	0.7
55 +	G	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4
	B	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2

Source: Czech Statistical Office, our calculations; G = Bridegroom, B = Bride

Quantification of dynamics, average annual percentage changes and the degree of dependence of the studied event on a time variable is presented by the following values:

		Age structure				
		16 - 20	21 - 24	25 - 29	30 - 34	35 +
2001/1993 (%)	G	8.85	49.28	206.41	250.88	178.95
	B	30.95	89.83	404.35	265.00	140.00
b'_{yt} (%)	G	−31.9	−11.90	6.75	6.23	1.95
	B	−21.36	−0.61	10.30	−1.44	3.96
r_{yt}	G	-0.8078^{++}	-0.9798^{++}	0.9857^{++}	0.9525^{++}	0.4782
	B	-0.9303^{++}	−0.2099	0.9726^{++}	−0.1172	0.9131^{++}

Decrease in the marriage rate by 13 659 of concluded marriages in 2001 as against 1993 (−20.7%), of this by 12 477 first-marriage men (−24.3%) and 12 232 (−23.8%) women as a result of the postponement of concluded marriage towards higher age is connected with the increase in the average age to the first marriage in bridegrooms by 15.35% and in brides by 15.95%.

Analysis of the development of selected indicators of marriage rate and divorce rate as the part of demographic examination of the population movement is made possible by factual indicators included in Table XI. Index series with a fixed and floating basis belong to exact tools of description of the dynamic of studied events.

XI: *Selected indicators of marriage rate and divorce rate in the Czech Republic in 1993–2001*

Indicator		Basic indices	Year								
			1993	1994	1995	1996	1997	1998	1999	2000	2001
Tabular first marriages (%)	Men		81.4	76.4	73.2	71.4	73.1	70.8	68.8	69.5	65.4
		i_b	100	93.8	89.9	87.7	89.8	87.0	84.5	85.4	80.8
		i_{ch}	-	-	95.8	97.5	102.4	96.8	97.2	100.3	94.1
	Women		87.7	82.5	79.9	77.1	78.7	75.7	74.1	74.4	72.3
		i_b	100	94.1	91.1	87.9	89.7	86.3	84.5	84.8	82.4
		i_{ch}	-	-	96.8	96.5	102.1	96.2	97.9	100.4	96.8
Average tabular age at the first marriage	Men		25.4	26.1	26.7	27.1	27.6	28.1	28.5	28.8	29.3
		i_b	100	102.7	105.1	106.7	108.7	110.6	112.2	113.4	115.3
		i_{ch}	-	-	102.3	101.5	101.8	101.8	101.4	101.0	101.7
	Women		23.2	23.9	24.6	24.9	25.4	25.7	26.2	26.4	26.9
		i_b	100	103.0	106.0	107.3	109.9	110.8	112.9	113.8	115.9
		i_{ch}	-	-	102.9	101.2	102.0	101.2	101.9	100.8	101.8
Total divorces			0.36	0.38	0.38	0.42	0.42	0.43	0.32	0.41	0.45
		i_b	100	105.6	105.6	116.7	116.7	119.4	88.9	113.9	125.0
		i_{ch}	-	-	100.0	110.5	100.0	102.4	74.4	128.1	109.7
Average duration of marriage (years)			10.3	10.6	10.6	10.7	10.8	10.9	10.9	11.0	11.1
		i_b	100	102.9	102.9	103.9	104.8	105.8	105.8	106.8	107.8
		i_{ch}	-	-	100.0	100.9	100.9	100.9	100.0	100.9	100.9

Based on the basic indices included in the tabular overview it is possible to note marked differentiation in the decrease of tabular first-marriage rate in the final year as against the basic evaluated period between women and men (by 2.1%) on the one hand and lower aberration in the increase of the average tabular age at the first marriage (by 0.6%) on the other hand.

Through the application of models of developmental trends as a tool of the exact evaluation of the trend of studied indicators an average annual decrease amounting to −2.38% ($r_{yt} = -0.9269^{++}$) in men and −2.31% ($r_{yt} = -0.9382^{++}$) in women in the first-marriage was demonstrated in the studied interval. The average annual relative increase in the average tabular age at the first marriage of men amounts to 1.60% ($r_{yt} = 0.9955^{++}$) and 1.62% in women ($r_{yt} = 0.9908^{++}$).

In assessing the divorce rate as one of the characteristic features of demographic behaviour of the studied population the indicator of aggregate divorce rate reached an average annual increase of 0.76% ($r_{yt} = 0.4845$) in the reference period under conditions of the parallel average increase in the mean duration of marriage amounting to 0.78% ($r_{yt} = 0.9690^{++}$). Values presented in Table XII allow to assess changes in absolute, relative and ascending cumulative frequency in the duration of divorced marriages in marginal years of the examined time period.

Based on data on the ascending aggregate relative frequency of the studied event it is possible to conclude to what extent the duration of marriage was changed due to the increased age in concluding marriages and increased unmarried coexistence of a young population.

XII: *Divorces by duration of marriage in the Czech Republic (1993 to 2001)*

Duration of marriage (years)	Year					
	1993			2001		
		%			%	
0 - 1	1 855	6.1	6.1	1 298	4.1	4.1
2 - 3	5 176	17.1	23.2	3 328	10.5	14.6
4 - 9	10 382	34.1	57.5	9 482	30.0	44.6
10 - 14	4 797	15.9	73.4	6 960	22.1	66.7
15 - 19	3 937	13.0	86.4	4 408	14.0	80.7
20 - 24	2 470	8.2	94.6	3 152	10.0	90.7
25 - 29	1 082	3.6	98.2	1 942	6.1	96.8
30 +	528	1.8	100.0	1 016	3.2	100.0

Evaluation of the trend of divorce rate in the interval 1993 to 2001 by the number of underage children is made possible by factual data given in Table XIII.

XIII: *Divorces: by the number of underage children in the Czech Republic*

Year	Underage children							
	Number				Percent			
	0	1	2	3 +	0	1	2	3 +
1993	8 467	12 415	8 119	1 226	28.0	41.1	26.9	4.0
1994	8 650	12 902	8 124	1 263	28.0	41.7	26.2	4.1
1995	9 027	12 880	8 003	1 225	29.0	41.4	25.7	3.9
1996	9 675	13 690	8 504	1 244	29.2	41.3	25.7	3.8
1997	9 862	13 274	8 144	1 185	30.4	40.9	25.1	3.6
1998	10 727	12 607	7 802	1 177	33.1	39.0	24.1	3.8
1999	9 480	8 199	5 248	730	40.1	34.6	22.2	3.1
2000	10 637	11 084	7 015	968	35.8	37.3	23.6	3.3
2001	11 037	11 940	7 586	1 024	34.9	37.8	24.0	3.3

Description of the trend of absolute values of a time series is made possible by characteristics of models of developmental trends:

$y'_0 = 5\ 323.6389 + 703.3166\ t$; $r_{yt} = 0.6059$; $b'_{yt} = 6.03\%$
$y'_1 = 13\ 593.3611 - 296.6500\ t$; $r_{yt} = -0.4223$; $b'_{yt} = -2.71\%$
$y'_2 = 8\ 588.6944 - 194{,}5166\ t$; $r_{yt} = -0{,}5418$; $b'_{yt} = 6.03\%$
$y'_{3+} = 1\ 344.9444 - 45.8333\ t$; $r_{yt} = -0.7103^{+}$; $b'_{yt} = -4.91\%$

Relative increase in external migration as a factor of forming the total increase in the studied population in the period 1993 to 2001 is quantified by values of variables of annual percentage changes (b'_{yt}):

Country							
Total	Germany	Russia	Slovakia	USA	Ukraine	Viet Nam	Other
Immigrants							
−1.37	−23.20	2.00	−16.44	3.75	10.22	11.99	−2.73
Emigrants							
13.40	11.61	17.46	5.07	14.77	19.96	19.82	15.94

The following values demonstrate the proportion of particular territorial units in the average number of immigrants, emigrants and increase by migration in the reference period:

Country	Immigrants	%	Emigrants	%	Net migration	%
Total	10 971	100.0	3 875	100.0	7 096	100.0
Germany	891	8.1	290	7.5	601	8.5
Russia	578	5.3	121	3.12	457	6.4
Slovakia	3 751	34.2	1 968	50.8	1 783	25.1
USA	330	3.0	62	1.6	268	3.8
Ukraine	1 436	13.1	583	15.0	853	12.0
Viet Nam	937	8.5	102	2.6	835	11.8
Other	3 048	27.8	749	19.4	2 299	32.4

SUMMARY

The paper is aimed at the presentation of findings obtained in the study of the development of time series of the population movement in the defined territorial unit and time interval 1993–2001. In addition to the exact evaluation of the dynamics and trend, the analysis of selected indicators is also aimed at a short-term extrapolation prediction.

The population development in the reference period under study demonstrated increasing qualitative changes in the demographic behaviour of population after 1989. A characteristic feature of this stage of a social development is a transition to the west-European model of reproduction behaviour intensified in part of the population by negative impacts of the social and economic transformation. A decrease in the number of both concluded marriages and birth rate, in spite of an extraordinarily favourable age structure, appears to be a serious and negative feature of the population development.

A marked decrease in the number of live births and its point prediction for 2005 can bring about further irregularities in the age structure of population and together with the development in the number of dead and external migration to affect both the number of population and the indicator of its ageing. In studying the dynamics of live births by legitimacy, not only decrease was demonstrated in the proportion of live births in marriage in relation to their total number of 87.3% achieved in 1993 to 76.5% in 2001 but also of its total number. In studying developmental trends, marked and statistically significant ($r_{yt} = -0.8652^{++}$) mean annual relative decrease was proved in the number of live births in marriage (−5.91%) on the one hand and its massive increase out of marriage (3.77%) at the value of a correlation coefficient $r_{yt} = 0.9197^{++}$ on the other hand. In evaluating the death rate dynamics as an important factor of the formation of a natural increase or decrease of population by the main classes of death causes per 1000 inhabitants, an increase was demonstrated in 2001 as against 1994 only in tumours and diseases of the digestion system. The group of deaths caused by diseases of the respiratory system remained unchanged. A marked decrease occurred in injuries, poisons and some other consequences of outer causes, diseases of the urinary and genital system, diseases of the vascular system, endocrine diseases, diseases of the nutrition and metabolic system. In studying the development of marriage rate and divorce rate as significant com-

ponents of the demographic dynamics, similarly as in case of the birth rate trend, the number of concluded marriages demonstrated a change in the reproduction behaviour of a young population and in its attitude to marriage and parenthood in the studied time interval. Last but not least, it is proved by the decrease in the number of concluded marriages by 20.7% in the final year compared to 1993 (from 66 033 to 52 374) which is the lowest number in the history of the Czech Republic. A decrease in the first marriage of men (by 24.3%) and women (by 23.8%) as a result of the delay of concluding the marriage to a higher age is related to the increase in the average age to the first marriage in bridegrooms by 15.35% and in brides by 15.95%. Based on the results of analytical activities in the field of divorce rate as the characteristic feature of demographic behaviour of the studied population it is possible to conclude on the average annual growth of this indicator of the population movement in the assessed time period amounting to 0.76% under parallel annual increasing the average duration of marriage by 0.78% ($r_{yt} = 0.9690^{++}$).

In studying the mechanical change of population between particular countries affected by social and economic conditions during the reference period marked differences were proved both in turnover and migration balance. The demonstrated facts showed in the percentage level of the index values of migration effectiveness given by the migration balance and migration turnover ratio.

SOUHRN

Analýza vývoje a predikce indikátorů pohybu obyvatelstva v České republice

Příspěvek je zaměřen na prezentaci poznatků získaných při studiu vývoje indikátorů pohybu obyvatelstva České republiky v období let 1993–2001. Předmětná analýza demografické dynamiky je vedle hodnocení indexních řad zkoumaných jevů a vývojových tendencí směrována i na extrapolační bodovou predikci vybraných ukazatelů. Populační vývoj v posuzovaném referenčním období prokázal prohlubující se kvalitativní změny demografického chování obyvatelstva po roce 1989. Charakteristickým znakem této etapy společenského vývoje je přechod k západoevropskému modelu reprodukčního chování, zintenzivněného u části populace negativními dopady sociální a ekonomické transformace. Závažným a negativním rysem populačního vývoje je pak i pokles počtu jak uzavřených manželství, tak i porodnosti, a to i přes mimořádně příznivou věkovou strukturu.

Výrazný pokles počtu živě narozených a jeho bodová predikce na rok 2005 může vyvolat další nepravidelnosti ve věkové struktuře populace a spolu s vývojem počtu zemřelých a zahraniční migrací ovlivnit jak počet obyvatelstva, tak i indikátor jeho stárnutí. Při zkoumání dynamiky živě narozených podle legitimity byl prokázán nejen pokles podílu živě narozených v manželství na jejich celkovém počtu z 87,3 % dosaženém v roce 1993 na 76,5 % v roce 2001, ale i jeho celkovém počtu. Při studiu vývojových tendencí byl prokázán výrazný a statisticky průkazný ($r_{yt} = -0{,}8652^{++}$) průměrný roční relativní úbytek počtu živě narozených v manželství (−5,91 %) na straně jedné a jeho podstatný nárůst mimo manželství (3,77 %) při hodnotě korelačního koeficientu $r_{yt} = 0{,}9197^{++}$ na straně druhé. Při hodnocení dynamiky úmrtnosti, jako významného faktoru formování přirozeného přírůstku, resp. úbytku obyvatelstva podle stěžejních tříd příčin úmrtí na 1 000 obyvatel bylo prokázáno zvýšení v roce 2001 proti roku 1994 pouze u novotvarů a nemocí trávicí soustavy. Nezměněna zůstala skupina úmrtí na nemoci dýchací soustavy. K výraznému snížení došlo u poranění, otrav a některých jiných následků vnějších příčin, nemocí močové a pohlavní soustavy, nemocí oběhové soustavy a nemocí endokrinních, výživy a přeměny látek. Při studiu vývoje sňatečnosti a rozvodovosti, jako významných složek demografické dynamiky, stejně jako v případě trendu porodnosti, prokázal počet uzavřených sňatků v posuzovaném časovém intervalu změnu v reprodukčním chování mladé populace a jejího postoje k manželství a rodičovství. Prokazuje to v neposlední řadě pokles počtu uzavřených sňatků ve finálním z posuzovaných let proti roku 1993 o 20,7 % (ze 66 033 na 52 374), což je v historii České republiky nejnižší počet. S poklesem prvosňatečnosti mužů (o 24,3 %) a o 23,8 % žen, jako důsledek odkladu uzavírání manželství do vyššího věku, je spojen nárůst průměrného věku do prvního manželství u ženichů o 15,35 % a u nevěst o 15,95 %. Z výsledků analytické činnosti ve sféře rozvodovosti, jako charakteristického rysu demografického chování posuzované populace, lze usuzovat na průměrný roční růst tohoto indikátoru pohybu obyvatelstva v hodnoceném časovém období ve výši 0,76 % při paralelním průměrném ročním zvyšování průměrné délky trvání manželství o 0,78 % ($r_{yt} = 0{,}9690^{++}$).

Při studiu mechanické měny obyvatelstva mezi zeměmi ovlivněné během posuzovaného referenčního období společensko-ekonomickými a společenskými podmínkami byly prokázány výrazné diference jak obratu, tak i migračního salda. Do jaké míry se na obou indikátorech podílely jednotlivé územní celky, prokazují procentuální hodnoty:

Obrat migrace							
	Německo	Rusko	Slovensko	USA	Ukrajina	Vietnam	Ostatní země
Podíl	8.0	4.7	38.5	2.6	13.6	7.0	25.6
pořadí	4	6	1	7	3	5	2
Migrační saldo							
Podíl	8.5	6.4	25.1	3.8	12.0	11.8	32.4
pořadí	5	6	2	7	3	4	1

Ve svých důsledcích se prokázané skutečnosti projevily v procentuální úrovni hodnot indexů efektivnosti migrace, daných poměrem migračního salda a obratu migrace. Ty činily u zemí jako celku 47,70 % a v sestupném pořadí 80,36 % u Vietnamu, 68,3 % u USA, 65,38 % u Ruska, 60,55 % u ostatních zemí, 50,89 % u Německa, 42,25 % u Ukrajiny a 31,18 % u Slovenska.

Česká republika, demografická dynamika, pohyb obyvatelstva, analýza vývoje, extrapolační predikce

ACKNOWLEDGEMENT

The paper was prepared thanks to the support from MSM 431100007.

REFERENCES

CYHELSKÝ, L., KAŇOKOVÁ, J., NOVÁK, I.: Základy teorie statistiky pro ekonomy. Praha: l979, SNTL/ALFA. 356 p.

DUFEK, J.: The reproduction and the migration of he popultion in the South Moravian region of the Czech Republic in 1993-1997. Acta univ. agric. et silvic. Mendel. Brun.(Brno), 1999, XLVII, No. 2, pp. 103-112. ISSN 1211-8516.

FIALA, T.: Tendencies in Marital Fertility of the 2nd and 3rd 0rders in the Czech Republic During Last Fifty Years. Demografie 2003, 44: 81-93 p. ISSN 0011-8265.

KAŇÁKOVÁ, N.: Global aspects of Migration. Demografie 2002, 44: 119-124 p. ISSN 0011-8265.

KRETSCHMEROVÁ, T.: Development of Population of the Czech Republic in 2000. Demografie, 2001, 43: 173-186 p. ISSN 0011-8265.

MINAŘÍK, B.: Statistika I. Brno: MZLU, 2000, 107 p. ISBN 80-7157-427-9.

SRB, V.: Současný stav demografie na Slovensku. Demografie 2001, 43: 56-57 p. ISSN 0011-8265.

STATISTICAL YEARBOOK OF THF CZECH REP'UBLIC. ČSÚ, Scientia. 785 p. ISBN 80/ 7223-760-8.

Address

Prof. Ing. Milan Palát, CSc., Ústav statistiky a operačního výzkumu, Mendelova zemědělská a lesnická univerzita v Brně, Zemědělská 5, 613 00 Brno, Česká republika, Doc. Ing. Erich Maca, CSc., Kotlářská 44, 602 00 Brno, Česká republika