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RELATION OF SOCIO-ECONOMIC AND DEMOGRAPHIC FACTORS IN RURAL DEVELOPMENT OF SERBIA

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INTRODUCTION

The existing interaction between the demographic and socio-economic factors has been the subject of many theoretical and empirical researches.

These researches date back as far as 16th century and have attracted a greater attention at the end of 20th and the beginning of 21st century.

Nowadays many undeveloped countries as well as the developing countries face the problems of social development, by finding the solution to their developmental problems in the coordination of the economic and demographic development (Hadživuković, 1987).

A number of authors have considered and studied the issues relating to the explanation of the interdependence between the economic and demographic growth (Miyazawa, 2006, Hadživuković, 1991, Truly, 2004).

The population development which, in most cases, is manifested through various phases of demographic transition can be analysed by constructing and analysing the demo-economic models.

The demographic variables in models can be exogenous or endogenous depending on the phase of the demographic transition in question. Generally, in the first phase of the demographic transition the demographic variables i.e. birth rate and death rate are exogenous. In the other phases of the demographic transition the demographic variables become endogenous (Hadzivukovic, 1991). According to Hadzivukovic the demographic-economic models make the quantification of various demographic and economic policies possible. Therefore, it should be taken into account that the economic influences are of short-term or medium-term affect whereas the demographic influences are long-term.

The paper deals with the empirical analysis which contributes to the explanation of the population development process and of the rural development of Serbia. The dynamic interaction between the demographic changes and the economic growth

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has been studied in order to explore the process of the economic growth and demographic changes.

The rural development of Serbia is a part of the general socio-economic development. The indicators of the rural development as well as the endogenous and exogenous variables have been analysed in the paper. In addition, there are the findings of some authors which indicate that in the analysis of the demo-economic development it is possible to assume that the less developed countries are based on the agrarian technological progress to a great extent (Strulik, 2004). The same author points out that with the undeveloped or developing countries the alternative models depicting the demo-economic development level can be considered (Strulik, 2004).

Many countries are undergoing the intensive demographic changes. One of the important changes is the transition from a phase of rapid population growth to the low one (Hondroyiannis, G., Papapetrou, E, 2002). According to the same authors the development of dynamic models treats the population growth through endogenous variables, rather than as the separate outcomes of different economic systems.

The data from the statistical publications of the Republic Bureau of Statistics of Serbia have been used in the paper. The studied indicators have been based on the time series of 36 years (1970-2005).

The basic aim of the paper has been the empirical analysis of the influence of the demo-economic factors on the realized gross domestic product, GDP (in total) as well as on the gross domestic product from agriculture. The analysis has been based on the regression models with various combinations of the analysed indicators.

The data source about the total population, the birth rate, death rate and natural increase rate, the number of employees and the number of active citizens and the data of the gross domestic product have been the Statistical Yearbooks of Yugoslavia, Statistical Yearbooks of Serbia, the publications of the municipalities in Serbia for particular years in the observed period and other publications (Agriculture of Serbia 1947-2006).

The gross domestic product has been presented in constant prices of 1994, based on the activities themselves.

The active population comprises the persons of 15 or more years of age who do specific jobs in order to obtain the means of subsistence as well as the unemployed people looking for work. The active agricultural population comprises the persons who do jobs related to agriculture, fishery, water management regardless of the fact whether they produce for the market or for their own needs.

The number of the employees has been presented at an annual average and has been obtained on the basis of semi-annual reports in which these data for the socially-owned enterprises, joint enterprises and cooperatives for the months March and September are regularly gathered each year.

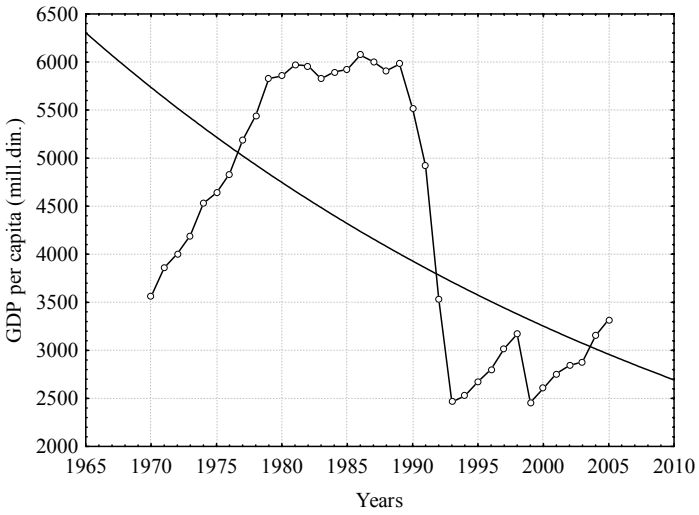
The relationship between economic and demographic variables was established by means of multiple linear regressions. The exploratory variables (regressors) in regression models are grouped as economic (X_1-gross domestic product of agriculture, X_2-gross domestic product of agriculture per economically active in agriculture, X_3- share of GDP of agriculture in total GDP, X_4-total number of employed persons, X_5-number of employed persons in social sector, X_6-number of employed persons in social sector of agriculture X_7 number of economically active, X_8 - number of economically active in agriculture, X_9 -activity rate) and demographic variables (X_{10}-total population, X_{11}-live births, X_{12}-deaths, X_{13}- natural increase, X_{14} -birth rates, X_{15} -death rates, X_{16}- natural increase rates, X_{17} - population density). Dependant variables were total GDP (Y_1) and total GDP per capita (Y_2). The variables in model were selected by application of stepwise procedure (forward and backward) using STATISTICA 7.1 program.

RESULTS

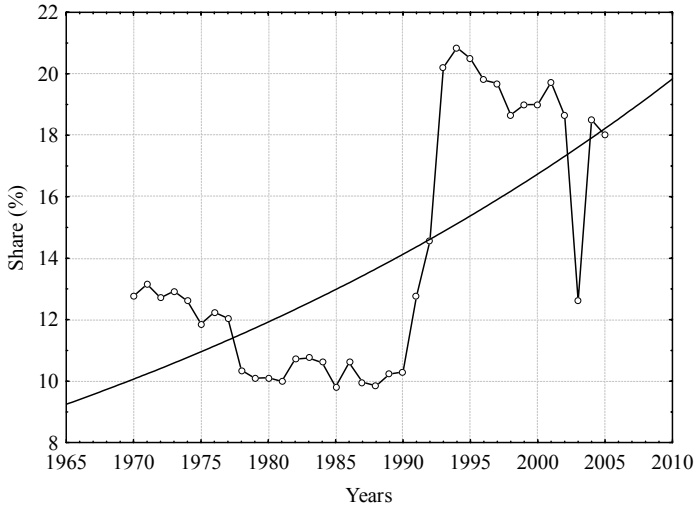
The total population of Serbia (Central Serbia and Vojvodina) changed in the analysed period of 36 years by increasing (to the end of the eighties) and then decreasing till the end of the observed period. The average yearly exponential rate of the change was 0.10%. The population density (the number of inhabitants per km^2) showed similar tendency like the total population. For this indicator the average exponential rate of the yearly change was 0.13%. The birth rates were characterised by falling tendency at the average rate of yearly change of –1.37%. The death rates had an increasing tendency with the average rate of yearly change of 1.31%. In the same period the natural increase rates had a falling tendency with negative values since the 1991 year. The values of average yearly rates of change of the total employed population (0.71%) and the number of the employed in agriculture of the social sector (-0.0017%) are not significant.

The total gross domestic product of Serbia was characterised by the sub-periods of increase (3.27%) in the period 1970-1989 and significant decrease (-2.48%) in the period 1990-2005, which is illustrated by the average yearly rate of change of (-1.77%). The similar tendency was noticed in GDP per capita (Graph 1).

The gross domestic product in agriculture in the same period showed significantly lower variability comparing with the total social product. The average annual rate of change for the whole period was -0.09%.



Graph 1 Tendency of GDP per capita (1994 prices), mill. din.



Graph 2 Share of agricultural GDP in total GDP (%)

The gross domestic product in agriculture in the sub-period (1970-1989) showed the increasing tendency with the rate 1.67% that is smaller than in the case of total gross domestic product. In the sub-period (1990-2005) the decline was evident but

slighter (-1.50%) than in the case of the total gross domestic product. The tendency of share of agricultural GDP in total GDP is opposite, it is characterized by the decrease in the first sub-period (-1.55%) and the increase in the second (1.47%) (Graph 2). The average rate of the share for whole period was 1.71%.

Results of regression analysis are given in Tables 1-5. The Tables present values of standardized regression coefficients b_i^* and corresponding standard errors $s_{b_i^*}$, ordinary least squares coefficients b_i, standard errors s_{b_i}, t values and corresponding p-values. Also Tables 1-5 contain values of adjusted coefficients of determination and F-values. On the base of F-values it may be concluded that estimated regression models are highly significant. Values of p-level indicate that in all models all regressors have highly significant influence on dependent variable.

Table 1 Results of regression model 1

Adjusted R^2=0,72732558 F(3,32)=32,119**						
	b_i^*	$s_{b_i^*}$	b_i	s_{b_i}	t_i	p_i-level
Intercept			-5408,4218	4248,71145	-1,273	0,2122
X_{15}	-1,491	0,2240	-1237,1493	185,91011	-6,655	0,0000
X_{17}	0,481	0,0939	221,3487	43,18144	5,126	0,0000
X_2	0,704	0,2222	0,4900	0,15478	3,166	0,0034

Table 2 Results of regression model 2

Adjusted R^2=0,74457305 F(3,32)=35,008**						
	b_i^*	$s_{b_i^*}$	b_i	s_{b_i}	t_i	p_i-level
Intercept			-23918,9314	4357,995521	-5,489	0,0000
X_{16}	1,4735	0,2096	576,4233	81,983862	7,031	0,0000
X_{17}	0,5678	0,0932	261,0666	42,845101	6,093	0,0000
X_2	0,6444	0,2036	0,4488	0,141801	3,165	0,0034

Table 3 Results of regression model 3

Adjusted R^2= 0,93360782 F(4,31)=124,04 **						
	b_i^*	$s_{b_i^*}$	b_i	s_{b_i}	t_i	p_i-level
Intercept			143583,1383	29023,3021	4,947	0,0000
X_4	1,0479	0,0740	0,0414	0,0029	14,163	0,0000
X_6	0,2230	0,0552	0,4052	0,1004	4,037	0,0003
X_7	-0,4555	0,0589	-0,0727	0,0094	-7,729	0,0000
X_8	1,2090	0,0681	0,0304	0,0017	17,764	0,0000

In regression **model 1** GDP per capita (Y_2) is dependant variable and regressors are selected applying stepwise procedure from set: gross domestic product of agriculture per economically active in agriculture (X_2), birth rates (X_{14}), death rates (X_{15}), natural increase rates (X_{16}), population density (X_{17}) and activity rate (X_9 **).** Regression **model 2** is obtained if the dependent variable is the same and if birth and death rates are excluded from the initial set of independent variables.

Table 4 Results of regression model 4

Adjusted R^2=0 ,93224519 F(4,31)=121,39						
	b_i^*	$s_{b_i^*}$	b_i	s_{b_i}	t_i	p_i-level
Intercept			222161,7166	32087,38043	6,924	0,0000
X_7	-0,5273	0,0622	-0,0842	0,00992	-8,481	0,0000
X_5	0,9554	0,0683	0,0340	0,00243	13,998	0,0000
X_8	0,7275	0,0505	0,0183	0,00127	14,405	0,0000
X_6	0,1800	0,0574	0,3271	0,10425	3,138	0,0037

In regression models 3-5 total GDP (Y_1) is dependent variable. The regressors for **model 3** are selected from the set: gross domestic product of agriculture (X_1), total number of employed persons (X_4), number of employed persons in social sector of agriculture (X_6) total number of economically active (X_7), number of economically active in agriculture (X_8), total population (X_{10}), live births (X_{11}), deaths (X_{12}) and natural increase (X_{13}). The initial set for **model 4** contains X_5 instead of X_4. As

stepwise procedure excludes demographic variables, **model 5** includes X_{13} and the economic variable X_4.

Table 5 Results of regression model 5

Adjusted R^2= 0,83095299 F(2,33)=87,021						
	b_i^*	$s_{b_i^*}$	b_i	s_{b_i}	t_i	p_i-level
Intercept			-27128,0853	6038,225519	-4,493	0,0001
X_{13}	0,8919	0,0748	0,3629	0,030441	11,920	0,0000
X_4	0,7234	0,0748	0,0286	0,002954	9,667	0,0000

CONCLUSION

The paper relates to the analysis of the relevant indicators of demographic and rural development of population of Serbia (Central Serbia and Vojvodina). Also, it presents some demographic-economic models based on the multiple linear regression. The source of the data is the time series of selected economic and demographic variables over the period of 36 years (1970-2005). The dependant variable was gross domestic product (total and per capita) and the regressors were selected by the application of step-wise procedure. The results of the analysis have shown that the most influencing regressors on the dependant variables are some economic variables, like gross domestic product in agriculture, total number of the employed, the number of employed persons in the social sector in agriculture, the number of the economically active in agriculture and some demographic variables, like death rates, natural increase rates, population density.

Similar regression analysis could be made in subperiods with the aim to explore the stability of the regression models. In order to analyse the phases of demographic transition further research of the influence of economic variables on demographic factors would be useful.

The analysis of the tendency of share of agricultural GDP in total GDP and the results of regression analysis confirm that the gross domestic product of agriculture has still an important role in the process of development of Serbia.

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