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INFLUENCE OF LATVIAN GDP ON THE MAIN INDICATORS OF INHABITANT LIFE QUALITY

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Annotation
The main indicator in the System of National Accounts is the Gross Domestic Product (GDP). However, GDP is not the direct characteristic of the welfare of the community. Nevertheless, there is an opinion that there should be positive correlation between GDP and social welfare: the larger is GDP, the higher is the life quality of the society. Indicators of economic welfare of the society in general are described by the total income. Such income makes the fundament for a certain life quality level. The most important and determinative one for life quality level is the GDP indicator per head of population. In the period of crisis 2008-2010, according to data available to *Eurostat*, Latvia was among the EU countries with the largest decrease of economics and population welfare. Austerity policy conducted by the Latvian government firstly aggravated the heavy condition of the majority of the population, and then, from 2011, started giving positive results. The World Bank, which forms annual rating of states in respect to gross national income per one person, according to the data of the year 2012, placed Latvia in the group of countries with large income. The high mean income itself is not the indicator of high level of living. The originality of the paper is that for the first time mathematical models for statistical data were used for analysis of how interdependence on GDP per one inhabitant of Latvia influences the main indicators of life level and quality. Object of the research: the main indicators, which influence the level and quality of life of the population in Latvia. Goal of the research –to analyze how GDP per one inhabitant in Latvia influences the main basic indicators of the population level of living. Methods of the research are – analysis of Latvian statistics data, mathematical modelling, correlation and regression analysis. For computation and further analysis statistical data about Latvia starting from the year 1995 were used in this work. All the regression models acquired by computations using statistical data are statistically important and quite well explain the significant shares of variance of the effective attributes. Analysis of regression equations showed that the largest direct influence of GDP per one inhabitant of Latvia is done on the mean annual income of equivalent consumer. Without crisis in economy the least influence of GDP is done on the level of employment. The mean annual income of the equivalent consumer directly and largely depends on the mean salary in the country. The mean salary in Latvia to the large extent is directly proportional to the level of employment of the population. For the rise of the life level it is necessary to create favourable conditions for development of industry.
KEY WORDS: GDP, regression model, mean annual income, level of employment.

Introduction

The main indicator in the System of National Accounts is the Gross Domestic Product (GDP), which is determined as cumulative market value of all the volumes of final production of commodities and services in state economics for a period of one year. It is generally accepted that GDP is the best indicator of Economic health. However, GDP is not the direct characteristic of the welfare of the community (Okun 1971). The drawbacks of GDP as a measure of the volume of the public production are the following: the production created within black/invisible economy is not taken into account as well as possible negative effects on the society evoked by realisation of certain goods (alcohol, cigarettes etc.). In Latvia, according to the opinion of some economists, black/invisible economy takes up to one third of all the volume of production, in developed countries it is 5-15% of the official GDP value (McConnell, Brue 1990). Nevertheless, there is an opinion that there should be positive correlation between GDP and social welfare: the larger is GDP, the higher is the life quality of the society (McConnell, Brue 1990). There are two approaches for measuring GDP. The first approach – calculation according to the volumes of production or according to the total expenses induced in the process of production of services or goods. The second approach – calculations according to the total income induced by the process of production of services and goods. In both cases the result will be the same.

Life quality of people is evaluated as their provision with life welfares of certain quality and quantity. Indicators of economic welfare of the society in general are described by the total income. Such income makes the fundament for a certain life quality level. Life welfares can be quite various. Besides the income of inhabitants, their life quality is also influenced by the conditions of living. For estimation of the life quality level UNO recommends using a system of indicators consisting of 12 groups, which cover various characteristics of living conditions. The main categories include, for example, the following: mean income of inhabitants, level of employment, education, ecology, housing conditions, age of life and other demographic characteristics. Apart from the main indicators, a series of information data is used that are not the direct characteristics of life quality level. The most important and determinative one for life quality level is the GDP indicator per head of population. However, this indicator is not used as generalizing one, though, there were several efforts for this. According to experts' opinion, the common unified index of life quality level at macroeconomic level is not desirable.

Subject and relevance. The concept "life quality" is determined as a function of objective conditions and

subjective relations, which determines individual feeling of welfare or happiness, satisfaction and dissatisfaction (Gigch 1978). At first, the system of people life quality indicators started to appear in social researches in the USA in the 1970-ies. Such system included several tens of various factors, which influenced people's life quality. The concept "life quality" is a wider social characteristic than "life level" of people and it depends on large amount of factors. However, the "core", the essence of the both characteristics is formed by the same indicators. In the social-economic literature there is no unanimous and generally accepted definition of these two concepts.

One of the quantitative indicators, determining the level and quality of life, is income. Satisfaction of economic and other people's needs depend on the volume of expendable income. Firstly, people should satisfy the main vital need for food. According to the statistical data available for the Bureau of Labor Statistics and the Bureau of the Census (USA) during the period of time from the beginning of the XX-th century until the beginning of the XXI-st century, all the expenses for food and clothes decreased percentagewise in average by 2,5-3 times. During the same period the expenses for accommodation increased by more than 2 times (Engel, Blackwell 1995). All the other expenses are now more than 50% of all the expendable income (expenses for education, medical services, recreation, entertainment, etc.). In the budget of private households in Latvia the expenses for food take one third of expendable goods and this is by 2 times larger in comparison to the developed western countries (Kochetkov 2001). The share of food in the total composition of expendable income, which depends on real expendable income, largely describes the level and quality of life.

To satisfy their vitally important need in food, each human being, first of all, by using their knowledge, skills and experience, should work and receive money reward. Therefore, the great significance is given to the possibility to work, that is, to the level of employment in the country. In Latvia people often have to work in two or more places simultaneously due to underemployment or low salaries. This decreases the time people spend on recreation and refreshment, it has a bad effect on health and length of life. As the result, life quality, despite quite larger expendable income, decreases. Life quality of any state population is significantly influenced by health situation and medical costs. This to a large extent is determined by the state medical financial support in the country. Unfortunately, for medicine in Latvia the government gives only a half of the funding averagely assigned by EU countries – less than 3% GDP (Circene 2013).

In the period of crisis 2008-2010, according to data available to Eurostat, Latvia was among the EU countries with the largest decrease of economics and population welfare, and the purchase power of people decreased by two times under the average level in the EU. In 2011 GDP and population income started growing. Austerity policy conducted by the Latvian government firstly aggravated the heavy condition of the majority of the population, and then, from 2011, started giving positive results: increase of foreign investments into economy, growth of salaries. The World Bank, which forms annual rating of states in respect to gross national income per one person, according to the data of the year 2012, placed Latvia in the group of countries with large income (World Bank 2013). Such classification is used by this bank in order to determine possibilities of granting loans to states. According to the classification of WB, in the countries with high income the income indicator per one person per year should be 12616 $ or more. In Latvia in 2012 the income per person was 14180 $ and it places Latvia to the 66-th place in the rating. Latvia is followed by Lithuania with 13850 $. Estonia has the 62-th place (15830 $).

High gross national income per one inhabitant of Latvia still does not mean that the population automatically reaches high level of living. Foreign companies, which invest their funds in Latvia, particularly use low-cost local labour force. Manufactured goods of such investors as well as the income, generally goes abroad. The high mean income itself is not the indicator of high level of living. For example, the organisation for economic cooperation and development (OECD), when composing the rating of countries with the highest level of living, takes into account 11 categories. The main ones are: mean income of inhabitants, living conditions, level of employment, education, ecological condition and duration of life. In the top-list of 15 countries with the highest level of living in 2013 the first place was given by OECD to Australia, where mean household income is $ 28884 (Top-list… 2013). Canada, having average household income $ 38194, which is the largest in the top-list, was put in the third place. The USA, with the mean income $ 38001 has the sixth position. In another top-list - Prosperity Index of the most prosperous countries that is annually composed by the British organisation Legatum Institute, for the year 2013 the 1st place is taken by Norway, Canada has the 3rd place, Australia – the 7th, the USA has the 11th place (Latvia… 2013). When composing this ranking 90 indicators were taken into account (the main ones: economics, education, Healthcare Services, safety, condition for business etc.). Estonia take the 36th place in this list, Lithuania – the 43rd and Latvia – 48th among 142 counties. The worst values Latvian indicators have in the field of economical situation – 73rd position, personal freedom – 96th position and public capital – 93rd position.

It is necessary to pay attention to significant inequality in distribution of income of various groups of the population of Latvia (Kochetkov 2000). Quantitatively, the degree of inequality in distribution of income is expressed by the Gini coefficient. The less is the value of this coefficient the less is the degree inequality. In the first years after restoration of independence of Latvia Gini coefficient and the degree of inequality in the field of income distribution were respectively low: in 1996, 1997 and 1999 K_G=31% (Central… 2013). After the year 2000 Gini coefficient increases: the largest value is K_G=38,9% (2005), K_G=35,7% (2011). For comparison, in Russia the situation with inequality in the field of income changed more rapidly to the negative side: K_G=25,6% (1991) and K_G=37,2% (1995) (Ivashkovsky 2004).

The tasks of the paper are estimations of direct and indirect influence of Latvian GDP on inhabitant life quality. *The originality of the paper* is that for the first

time mathematical models for statistical data were used for analysis of how interdependence on GDP per one inhabitant of Latvia influences the main indicators of life level and quality, and grounded conclusions are made. *Object of the research:* the main indicators, which influence the level and quality of life of the population in Latvia. *Goal of the research* –to analyze how GDP per one inhabitant in Latvia influences the main basic indicators of the population level of living. *Methods of the research* are – analysis of Latvian statistics data, mathematical modelling, correlation and regression analysis.

Computations and analysis

For computation and further analysis statistical data about Latvia starting from the year 1995 were used in this work (Central… 2013). When carrying out econometric analyses and constructing models statistical data were re-computed according to the inflation, which took place in the economy of the country. The data about GDP were used in re-computation per one inhabitant of Latvia. All the equations of linear regression acquired by mathematical modelling and reflecting interdependence of various factors, are statistically important: the computed observable Fisher LSDs (F-tests) F act. are actually larger than the critical values F crit. (Table 1).

The significance level in computations was assumed to be α=0,05 (confidence is 95%). Almost in all cases the *Durbin-Watson* test for autocorrelation of residuals of the first order showed that DW statistics falls into the zone of uncertainty and into the domain of weak positive autocorrelation. The computed autocorrelation coefficients r_e in time for residuals show the insufficiently large power of correlation relationship of factors, but graphical tests showed almost chaotic placement of residuals. Therefore, correction of the acquired equations of linear regression according to the results of residual analysis was not performed.

The mean annual income per one equivalent consumer has been computed in Latvia since 2004. It directly depends on the mean salary of people working in the country. The results for computation of dependence of the mean annual income of equivalent consumer on the mean salary of people working in the country are shown in Figure 1 and in Table 1.

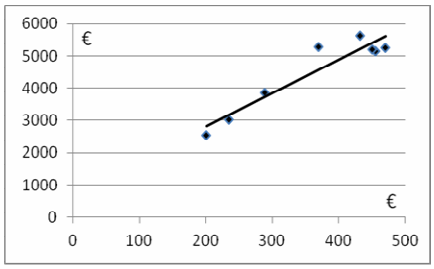

Fig.1. Dependence of the mean annual income (y) of equivalent consumer on the mean salary (x) in the country, 2004 – 2011

The share of variance, which can be explained by the acquired regression equation, in the total variance of the mean income of equivalent consumer, is almost 90% (R^2=0,892). The computed correlation coefficient r=0,944 is close to one and shows large power of correlation relationship between the mean salary in the country and the mean income of inhabitants. It is possible to say that within the considered time interval the acquired model of linear regression quite precisely reflects the existing direct proportion between the mentioned factors.

In conditions of consistently functioning economy the level of unemployment is usually low. Economists believe that natural level of unemployment, speaking about full-time occupation is about 6% (McConnell, Brue 1990). In Latvia in 2006 and 2007 the level of unemployment was close to 6% (6,8% and 6,1% respectfully). However, in the period of crisis, starting from 2009, it rapidly increased and became larger than 16% (2009 – 17,5%; 2010 – 19,5%). Only starting from the year 2012 the level of unemployment in Latvia started to decrease. When finding the dependence of the mean salary in the country on the level of employment, the years of crisis starting from 2009 were not considered due to within this period economy was unstable. In conditions of stable development employment of population grows, as well as the amount of produced goods and the mean salary (Fig. 2, Table 1).

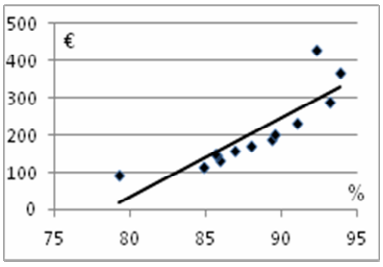

Fig. 2. Change of the mean salary (y) of workers depending on the level of employment (x) of the population, 1996 – 2008

Table 1. The results of computation of factor dependence

No	Dependence, years	Regression equation y=f(x)	R-squared	Correlation coefficient r	Fisher Statistics		Residual analysis	
					F act.	F crit.	DW statistics	Auto-correlation coefficient r_e
1.	Mean annual income of equivalent consumer (y) depending on the mean salary (x), Fig. 1. (2004-2011)	y=10,325x+753,82	0,892	0,944	49,6	5,99	1,066	0,414
2.	Mean salary (y) depending on the level of employment (x), Fig. 2. (1996-2008)	y=21,182x-1660,3	0,723	0,849	28,5	4,84	0,72	0,279
3.	Level of employment (y) depending on GDP (x), Fig. 3. (1996-2008)	y=0,0014x+81,99	0,779	0,882	38,7	4,84	0,859	0,205
4.	Mean salary (y) depending on GDP (x), Fig. 4. (1995-2012)	y=0,0448x+22,51	0,968	0,984	480,4	4,49	0,886	0,535
5.	Mean annual income of equivalent consumer (y) depending on GDP (x), Fig. 5. (2004-2011)	y=0,6125x-159,07	0,965	0,982	166,3	5,99	0,949	0,26

The coefficient of determination R^2=0,723 shows that the acquired regression equation explains more than 72% of variation of the mean salary when there are changes in the level of employment in the country. The coefficient of correlation r=0,849 shows quite strong correlation relationship between the mean salary and the level of employment of the population. The mean salary of the workers is increased in direct proportion to the growth of employment in the country.

When the state economy is on the rise, volumes of manufactured goods grow as well, new enterprises are opened, and the level of employment also increases but the level of unemployment decreases. With the beginning of the crisis in 2009 the level of unemployment in Latvia increased rapidly – almost by three times, and economy was unstable. Therefore, the research of the dependence between the level of employment and the value of GDP per one inhabitant of Latvia does not cover the crisis period, which is not usual and temporary. Construction of the regression model of the abovementioned dependence showed that it is directly proportional and positive (Fig. 3, Table 1).

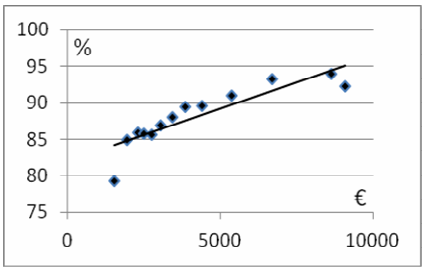

Fig. 3. Dependence of the population employment (y) on the level of GDP per one person in Latvia (x), 1996 – 2008

The determination coefficient R^2=0,779 shows us that the acquired linear regression equation explains almost 80% of variance of employment when GDP per person changes. The correlation coefficient r=0,882 shows quite strong power of correlation relationship between the given factors. Thus, within the period of stable development of economy the level of employment is directly proportional to the value of GDP per one inhabitant of Latvia.

The amount of the mean salary in any country has direct impact on the level and quality of life. The larger is the mean salary the larger is the level of living. The computed linear regression equation explains about 97% (R^2=0,968) of variance of the mean salary depending on the level of GDP per one inhabitant of Latvia (Fig. 4, Table 1).

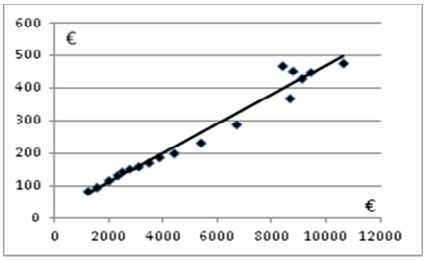

Fig. 4. Dependence of the mean salary (y) on the GDP per one inhabitant of Latvia (x), 1995 – 2012

The correlation coefficient r=0,984 shows the strong correlation relationship between the mean salary and the size of GDP per one inhabitant in Latvia. With the growth of GDP per one inhabitant the mean salary in the country grows in direct proportion.

It was previously determined that the mean annual income of the equivalent consumer is directly proportional to the mean salary in Latvia (Fig. 1, Table 1). The mean salary in its turn is directly proportional to the value of GDP per one inhabitant (Fig. 4, Table 1). It is natural that the mean annual income of the equivalent consumer will depend on the size of GDP per inhabitant and will also be directly proportional to it. This is confirmed by computations according to statistical data of the linear regression equation, the determination

coefficient R^2=0,965 (Fig. 5, Table 1). More than 96% of variation of the dependant factor are explained by this equation, the strength of positive correlation relationship of factors is large (r=0,982).

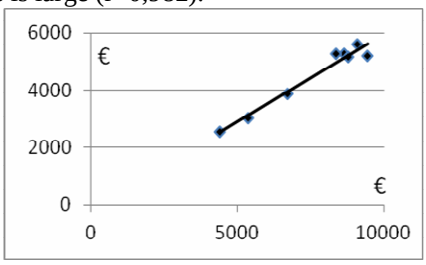

Fig. 5. The dependence of the mean annual income (y) of the equivalent consumer on the size of GDP per inhabitant of Latvia (x), 2004 – 2011

On the basis of the results of computations using mathematical models and analysis, conclusions are made.

Conclusions

All the regression models acquired by computations using statistical data are statistically important and quite well explain the significant shares of variance of the effective attributes. The determination coefficients are acquired within the range from R^2=0,723 to R^2=0,968, the strength of positive correlation relationships of factors is quite large (r=0,849 - 0,984).

Analysis of regression equations showed that the largest direct influence of GDP per one inhabitant of Latvia is done on the mean annual income of equivalent consumer. Without crisis in economy the least influence of GDP is done on the level of employment.

The mean annual income of the equivalent consumer directly and largely depends on the mean salary in the country.

The mean salary in Latvia to the large extent is directly proportional to the level of employment of the population.

The output indicator per one inhabitant of Latvia is quite reasonable characteristic of the economical welfare of the population. For the rise of the life level it is necessary to create favourable conditions for development of industry.

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S u m m a r y

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KEY WORDS: GDP, regression model, mean annual income, level of employment.

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