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Economic Modeling of Demographic Processes in Conditons of Economic Growth (on the example of Ajara Autonomous Republic)

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Abstract

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Actuality of the topic: in conditions of modern globalization, population of Georgia has become the part of world community requiring the Economy of Georgia to be relevant to its demographic processes. In order to determine the interrelation between our country's economy and growing structure of population we should develop methodological basics of the pertinent research. In particular, it is necessary to elaborate models of determining population quantity, which will allow the government of Georgia to activate economic potential existing within the country, as well as attract additional foreign resources to strengthen country's position not only in the domestic market but also, actively get engaged in the global market.

Development of Georgian Economic Fields is not in correspondence with growing population requirements yet, however, if the government uses existing potential rationally it is absolutaly possible for Georgian enterprises to satisfy requirements of local population not only with industrial products from Georgian traditional fields but develop export areas too and contribute to the balancing of import-export processes in the country, which is definitely one of the most important basics for country's economic and demographic development. Countries, which have already reached highly-developed economy were using regulating measurement system of population growth and own product output for a long time (public, organizational, economic), in which elaboration of population exponential model takes significant place.

In terms of participation and expansion stimulation of products made in our country and economically active population of Georgia in trade-economic relations, country faces the same problem of carrying out measurements aiming at enhancing local people's employment and export activities of national enterprises. As the improvement of relation regulatory mechanisms between economy and population growing structure should be the long-term strategic determinant for Georgia's politics, relation between population growing structure and economy requires special research of methodological basics, rapid changes of economic globalization events, as well as strengthening relations between population growing system and economy should be envisaged in it. Consequently, there will be objective neccessity in the country to permanently improve motivational

events of economic activities and correspond them to ongoing processes. Above mentioned statements express deep interest in registration stable model of Georgian population, exactly this became the determinant of our topic choice.

Aims and objectives of the study: Research aim of the work is to analyses methodological basics of Economy and population growing structure relationship, also, to propose what mechanisms might be used in order to enhance economic-demographic processes which will not contradict international methodology.

We have developed following goals:

1. Classification numerical methods of definition number of population on the example Georgia:
   - Exponential method;
   - Stability Method/extrapolation
   - Statistical-quantities evaluation
2. Economic-demographic tendecies are determined on the basis of comperative analysis and labor system of statistical-quantitative models of Georgian population reproduction;
3. Quantitative characteristics such as: population employment and unemployment index indicators, as well as balanced indicators of population employment and employed population prediction indicators are estimated as one of the main factors of labor production;
4. Population economic activity and employment problems are classified on the basis of analysis of population employment index and age-sex structure in the country
5. Optimal quantitative characteristics of population reproduction, as well as age-economic pyramids are evaluated for the first time in the reality of Georgia and on their basis, in terms of demographic policy formulation, appropriate recommendations have been developed.

Subject and object of the study: the subject of the research is to determine interdependence between population growing structure and economy, analyse modern approaches of population quantity determining concept, historical overview of population exponential model; as for the

objects of the research, they are modern models of population statistical estimation.

Theoretical and methodological basics of the study: Methodic recommendations are used in gained results. Therefore, the topic is very relevant in methodological-theoretical and application aspects. Researches on population demographic processes, regulation mechanisms of market behaviour of Georgian ecnomic units in national and foreign markets and especially its practical aspects have not attracted modern Georgian economists' proper attention yet, that is detemrined by various reasons including less participation of enterprises in international market.

Methodological basics of the thesis represent- scientific works, books, pubications, brochures, monographes pubished by Georgian and foreign scientist-economists, for example: L. Baltserovich, T. Besley, R. Burges, A. Granberg. P. Krugman, P.Lindert, G. Mankiw, F. Binshtok, N. Gavrilko, N. Volgina, V. Nazarenko, A. Papov, I. Salimjanov, E. Serova. Also, Georgian researchers' publications such as: N. Chitanava, M. Khmaladze, D. Dznelaze, R. Kharebava, K. Eradze, G. Todua, M. Kvaratskhelia, T. Kunchulia, I. Meskhia, V. Papava,, N. Treashvili, G. Uridia, O. Kelashvili etc. played a great role in the researches concerning population demographic structure deeformation and agricultural enterpreneurial-commodity activities.

It is necessary to separately mentioned work of Georgian Demograps: G.Tsuladze, A. Sulaberidze, LChikava, M.Khmaladze, M. Tukhashvili, M. Shelia, N.Homelauri, and athers.

Methods used in the research are the following: Scientific abstraction, historical, logical, analitical, synthetic and statistical data collection and classification methods. In the working process we used the literature from Batumi public and Shota Suratveli State University libraries, university computer classes and internet-technologies, different materials from Employment Agency of Georgia and the Autonomous Republic of Ajara, Ministry of Economy and Sustainable Development of Georgia and National Statistics Office of Georgia.

Scientific novelty of the research:
- Theoretical and methodological aspects of population structure and economy interdependence methods' improvement are generalized

on the basis of existing quantitative-demographic methods of population reproduction.

- Social-economic dynamics of Ajara Autonomous Republic population structure is studied, demographic situation of Ajara Autonomous Republic is analysed. Demographic optimum as the goal of demographic policy is defined, demographic policy of the country is evaluated, criterias of demographic process optimality are developed and finally, parameters of Georgia's population optimal reproduction are determined

Theoretical and practical value of the work. It is impossible for existing models of Georgian population statistical-quatitative estimation to function effectively without certain corrections in today's market conjecture conditions. It is connected with complicated and diverse statistical-quantitative registration processes and their regulation is impossible without optimal integration of economic and demographic processes. Resolving of these problems require deep analysis based on modern methodology. Scientific novelties and issues discussed in the research can be used:

- As the theoretical material in the field of economic modeling of demographic processes when preparing the curriculum.
- To resolve methodological problems of registration of demographic processes;
- To analyse age-sex structure and population employment index;
- To evaluate quantitative features of population reproduction ;

Approbation of the work. Basic provisions and findings of the research in the form of 5 articles are published in the materials of international conference and in the form of international reviewing in magazines. Main theses and recommendations of dissertation were introduced to the department of Economics.

Structure of the work. Goals and objectives of the study determined the structure of the work itself, it is coherent and logical, where interrelation among specific topics is very clear and research problems are profoundly analysed. It is composed of 203 printed pages, introductory part, 3 chapters, 11 sub-chapters, 16 tables, 16 diagrams, 5 figures, conclusions, statements, references (ucluding foreign) and appendixes.

Basic content of the work

The first chapter of the dissertation **"Methodological basics of interdependence between population structure and economy"** overviews the essence of economic demography, population quantity determining models, characterises exponential model of population, studies modern models of statistical-quantitive estimation of population.

On the modern stage, labor force of the population is determined according to economic, social and demographic features in the society, which are undertaken in the frame of existing labor relations and community activities. Basing on this, labor force might be determined by three interconnected (eonomic, social-psychological and demographic) subsystems.

Demographic subsystem encompasses: strucrture of population which provides constant renew of generations having economic relations in every social context; Population work activity takes the central place in **social-economic subsystem** which is represented in population employment and economic activity.

Social-psychological subsystem offers to solve the problems in the process of person's formation as a working asset, it implies: bringing up, education, professional preparation. Also, it enables us to review the level of person's religiosity within this subsystem.

Changes in the natural movement of population are determined by correspondence between employable and unemployable (children, old people) population. **If there are more employable people in the country, more economic load is required from them to feed unemployable part of the population.** Proper study of unemployabe population is also very important. If the share of older individuals increases, population is getting older gradually. In case of discussing this problem from this angle, we should conclude that main function of the government is to create all essential conditions to renew generations. As the economy is devoid of momentary transformation ability, government reforms should be conducted in certain periods of time. Reformation process should take into account the existance of specific periods and how to develop important models of planning and prediction. Fulfillment of these tasks is possible through the prediction which represents indirect way of impacting on the economy.

Pace of the population growth (coefficient of the growth) of Georgia in 2007-2016 is characterised by the tendency of decrease. Specivifally, if the coefficient of growth is 1.2 by 2007, in 2012 it is – 1,15 and in 2016 1,11.

The keystone to develop complex demographic policy for Georgia is to increase current reproduction rate and birth rate. However, aspects related to the existing demographic birth problems do not encompass child birth, these aspects are also connected to the lifelong period of the child- from his/her birth to his/her adulthood still he/she does not become the active member of the community. It is undoubted that demographic policy shuld be related to social policy programs.

The long-run aim of demographic policy is to achive the level of population stability in predictable future that will correspond to the requirements of sustainable economic growth and social development. Besides decreasing the birth rate and economic situation, another demographic process such as internal migration also negatively influences the demographic balance of the country. It might be as voluntary as well as coercive. In the first case, people migrate from rural areas to towns because of certain social-economic reasons. As for the second case, people are forced to leave homes because of some conflicts and move inside the country.

According to National Statistics Office of Georgia 43,5 % of population was economically active in 2011, in 2012 – 43,6%, in 2013 – 45,2%, in 2014 – 44,6%, in 2015 – 53,6%, in 2016 – 54,3% (Table 2 in the appendix). Majority of these people used to live in villages, 84% of them was selfemployed and part of them natural farmer. If population moves from villages to towns, participation of economically active generation into output will decrease. Young people, who leave villages, later on find themselves among unemployed and as a result, might be in imigration as well.

From 1996 to 2003 economic growth pace of Georgia amounted only 46,6% but from 2003 to 2008- 66,7 %. Average growth data in 1996-2003 is 6, 65%, in 2003-2008 13,34%. Pace of growth was especially high in 2005, 2006 and 2007. In the light of these processes, we can conclude that till 2008 Georgia had quite high pace of economic growth, but it was not enough for the total growth. In 2008–2016 pace of Georgia's economic

growth was decelerated from 6,2% to 2,7 %. During this period, country's average growth pace of GDP amounted 4,82%.

In order to determine to which type of population reproduction belongs Georgia, we should use models of quantitative analysis of demographic processes. In every field of the science, model serves to analyse the object of the study in accordance with its characteristics, which enables us to reveal and analyse its main factors and inner interlink. However, there are cases when models and theories are very different from each other, i.e. theories express those interconnections of factors which theoretically are not considered valuable.

Seperation of the model from the theory of course makes us suspicious about shortcomings of given theory and its mathematical model of description. Those models of economic dynamics which have reached the high level of development in formal relations, do not take into consideration modern approaches of economic development properly. The aim of the researcher is to develop theoretical models not only unilaterally but reach their dialectical integrity. This makes it possible to develop efficient model.

We have to discuss birth rate and mortality and natural growth coefficient distribution in the whole Georgia and its regions by 2007 and 2016. If the number of population by 2007 is considered as the initial index, for the whole Georgia it will be: $A = N(0) = 4318,30$ thousand persons. $b = 12.9$ ‰, $d = 10.82$ ‰, $k = 2.08$ ‰, for Ajara Autonomous Republic: $A = N(0) = 371,5$ thousand persons. $b = 14.94$‰, $d = 8.32$ ‰, $k = 6.63$ ‰, so, we can calculate the total number of the population, birth rate and mortality coefficients from 2007 to 2016, which is reached as a result of comperative analysis of indices forseen by actual and exponential methods.

Forseen (calculated) data of 2016, given by actual and exponential methods overlap with each other, but during the long-term period the margin of error might increase, so, reliability of this method depends on number of population and calculation period, also, on factors such as: statistics of unemployed people, statistics of standard of living, productivity of labor etc.

„In the stable model of population every index k- indicating the natural growth is changed by the coefficient of calculated natural growth, which is called the **coefficient of reproduction regime**"*[Лотка 1974: 127]*. It responds to certain stable rate of birth rate and mortality. Accordingly, the stable model of population is the only one which unites two mentioned funtions - death and birth rates. In this case, integral image of population reproduction has one real root $k = \rho$, and the rest have-complex.

Modern models of population statistical-quantitative estimation include: Malthusian growth model, stable model of population and making predictions based on statistical characteristics of the dynamics. In **Malthusian growth model** number of population is determined by the exponential law:

$$N(t) = N_0 e^{kt}.$$

That's why, Malthusian growth model is more frequently called exponential model, as it depicts exponential growth of the population with invariable pace. It is worth noting that if the number of population increases by 1%, population will double after 70 years. We can calculate how many years are needed to double the the number of population for example, in case of 2% growth etc"*[Marchetti 1992: 297]*.

Malthusian growth model enables us to determine how the growth of population with invariable pace impacts on economic growth of the country. For instance, if the population increases by 1% what is the percentage of gross domestic product or what is the influence of population growth by 2% on gross domestic product etc.

Stable model of population pertains to the case when the coefficient of birth rate and mortality growth is unchanged in the population during the long time i.e. annual growth rate of population seeks to population constant size. Exactly, this constant coefficient is called the **real coefficient of natural growth**, as for the model of population, in which natural growth coefficients turn into real coefficients gradually, represents the stable model. Stable model of population contributes to sustainable economic development, because the structure of such kind of population becomes unchanged in the course of time i.e.population will have stable growing structure, which is

determined only by birth rate and mortality coeffiecients despite having the initial age structure.

Government should be interested in forming population stable structure. This model is not pertinent to our case, it is more peculiar to modern type demographic countries.

Apart from prediction period, exponential model envisages main characteristic of population - natural growth coefficient. Through this model we can calculate the number of population after t time, establish that if $k > 0$ population increases and if $k<0$ population decreases. We can not establish population age structure, birth rate and mortality rate through this formula. Exponential model is able to determine the time t, after which population reaches certain quantity. We will introduce the example of Georgia's population number change in the last 10 years. „According to National Statistics Office of Georgia, total population of Georgia by 2004 amounted 4 318,3 thousand persons, by 2016 - 3 720,4 thousand persons" *[Statistics of Georgia…2017]* if the number of population will be considered as population's initial index by 2004, then:

$N(0) = 4\ 318,3$ thousand persons, $N(t) = 3\ 720,4$ thousand persons, $t = 12$ years.

Consequently, we can calculate natural decrease coefficient of Georgian population in the last 12 years: $K= 1,8$‰. If we consider that natural growth coefficient is constant value, through the given pace of population decrease, we can mathematically calculate the number of Georgian population in the next 10 years, by 2027: *N(2027) = 3236,4* thousand persons etc. The fact is that population of Georgia is characterized by decreasing tendency. That is why demographic processes should be outlined in the global aspect. In addition, we should emphasize the circumctance that coefficient of population natural growth can not be the costant value, it depends on various factors. Correspondingly, theoretical data received by the calculation of population number might be significantly different from its actual results.

When making predictions through demographic models of population, age structure of population is not changing and population growth has no significant influence on economic development. Accordingly, if load

intensity of existing labor resoursces increases, economic growth pace will accelerate.

Projection of population's future number is possible through the prediction of statistical characteristics of dynamics, in particular, on the basis of those dynamic-statistical parameters such as absolute increment, average pace of growth and average pace of growth of population increment. For instance, if the number of population in Georgia by 2004 was 4,3183 million persons and by 2016 3,720,4 million persons, it means that total absolute decrease during 12 years will be 0,058 million people, correspondingly:

$$\overline{\Delta_t} = \frac{0,1689}{9} \approx 0.019; \quad \overline{T_p} = \sqrt[9]{\frac{4,4872}{4,3183}} = \sqrt[9]{1.03911} \approx 1.008;$$

$$\overline{T_{np}} = 0.008 = 8\,‰$$

It is possible to calculate the population of Georgia after 10 years i.e. according to average absolute increment by 2027 and according to the average pace of growth and increment growth.

Pursuant to the 1st January of 2017, number (apart from people living on occupied areas) of Georgia's population amounted 3 720,4 thousand persons, which in comparison with the previous year indicators is more by 0,18 % (table 1/appendix). International migration balance and natural growth data of 2016 influenced on the growth of population. 57,2 % of country's population (2 128,5 thousand persons) lives in towns and 42,8% (1 591,9 thousand persons)- in rural areas (table 1 / appendix). In comparison with previous year the share of men in the whole population increased by 0,1 % and amounted 1 781,5 thousand persons, as for women share, is was decreased by 0,2 % and amounted 1 936,7 thousand. 47,9% of Georgian population is man and 52,1 % - is woman.

In the second chapter of dissertation "**Population employment index and prediction basics**" employment and economical activity of population is characterized, population employment and unemployment data is outlined, index, graphical and balance models are studied.

If we want to study the standard of living, it is essential to calculate initial incomes received by the residents of country. Total index of initial
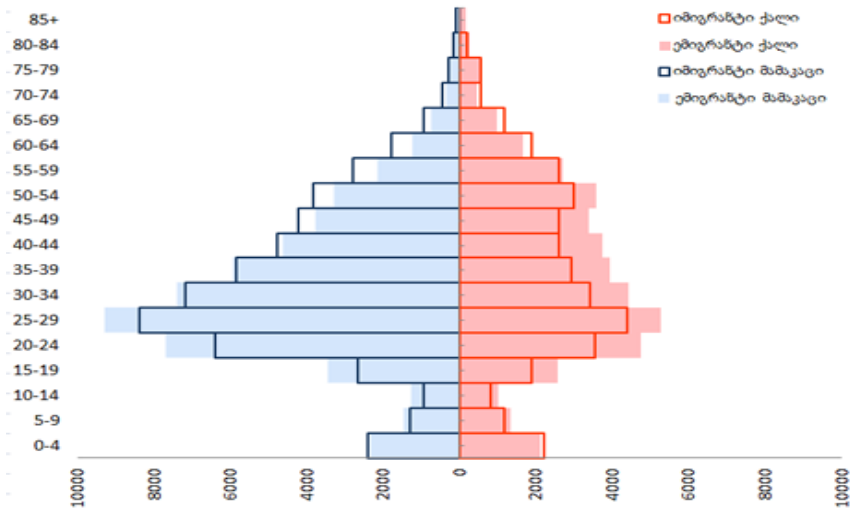
income during the specified period of market prices represents national account.

Diagram 1. Unimploiment level in 2016 based on age group (%)
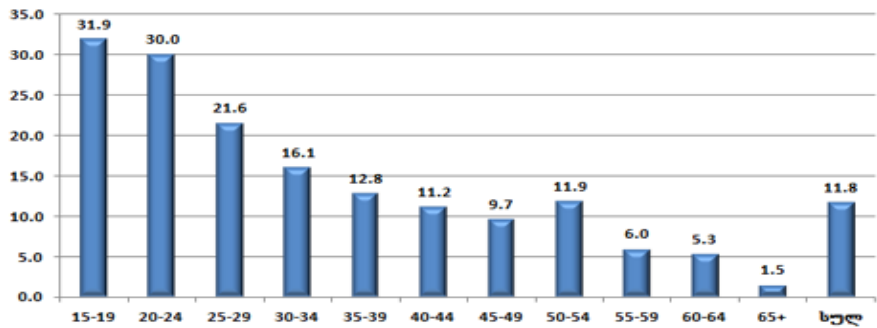
Diagram 2. Distribution emigrants and imigrants based on age group (2016 y)

Average monthly inomes in comparison with 2005 has increased by three times and amounted 1072,3 GEL in 2016 (during 11 years) and if we recalculate it on one household, it amounts 1042.2 GEL. In the interval of

this time, average monthly incomes have increased three times. Itself, average monthly income on one person amounted 294.5 GEL in 2016, which is 3,19 times more than the identical indicator in 2005. As it is shown in above mentioned data, during the last 11 years, monthly income of Georgian population on household and one person was at least tripled, which indicates on the imporovement of Georgian population well-being *[Statistics of Georgia….2017].*

Generally, unemployment rate exists in every economy but when there is the disbalance between labor supply and work request, it causes tension on labor market. What does it mean to be employed? In accordance with methodology of labor international organization, it is not compulosory for the person to have long-term labor contract or to be employed by someone to consider him/her as an employed. Despite having not good social conditions, certain part of self-employed people might be looking for additional works.

According to above mentioned methodology, if the person gets his/her own labor income, he/she should be considered as an employed. Absolute majority of self-employed people is employed in rural areas in farming. Employment in the conditions of market economy is never complete. During the last 12 years (from 2004 to 2016) average employment rate fluctuates within 52-59% of the total population.Women employment index is 44-51% and men employment index is 61-67%.

Unemployment rate is 11-17%. During the last 12 years the highest index of unemployment (16,9%) and accordingly, the lowest index of employment (52,8%) pertain to 2008-2009 years. Events taking place in august of 2008 influenced on the showings as well. Usually, men employment rate is higher than women employment rate. Diagram 2 shows the change of unemployment rate in 2004-2016 years *[Georgia….2017].*

It is important to study economic activity of population according to the age. Diagram1 represents the distribution of 15-year-old and older people in 2016 based on age groups. Comparison of these showings indicate that the highest index of unemployment is noticed in 15-19-year-old age group (31,9%) and then comes 20–24-year-old age group (by 30%). In general, with the age growth the rate of unemployment decreases, only 50–54-year old age group is the exception, where unemployment rate from the

previous group was increased from 9,7% to 11,9% and afterwards was decreased again. Also, the growth of age group share in which employment is relatively high, determines the growth of employmet in the whole population.

There were 98.3 thousand emigrants in 2016 which is more by 2.4 % than the index of 2015. In the same period the number of immigrants in comparison with the previous year was decreased by 2.5 % and amounted 90,2 thousand persons. As a result, in 2016, migration balance (difference between the number of emigrants and immigrant) negative index was registered on the level of - 8.1 thousand persons *[Statistics of Georgia....2017]* As it is shown on the Table 2, immigration balance reached its maximum in 2009 and amounted 34.2 thousand emigrants and the minimum was reached in 2012. Diagram 2 shows that 25-29 year-old emigrant men are most active in Georgia, then comes 30–34 and 20–24 year-old men emigration, there is the approximate structure with immigrant men of the above mentioned ages. The least active in emigration as well as in immigration are people who are more than 65 (retired) and children in their 10-15s. There is almoast identical age structure in emigrant and immigrant women age structure.

In order to make quantitative characterization of the employment of population, statistcs takes into account special indices. They are of two types: **absolute and relative indices.** Absolute index of employment includes: number of employed people in economy, distribution of employed people in economy according to specific fields, according to sex, age and education, number of people who have reached the employable age, who are engaged in pproduction etc. Relative index of employment characterizes what is the level of population and its specific groups' engagement in economy. They include employment coefficient, labor resource coefficient, coefficient of employable population employment etc. Employment coefficient is largly use in comperative analysis. It indicates the share weight of employed people in the quanitiy of population:

For example, according to the statistics of 2016, the total number of Georgia's total population was $N = 3720,4$ thousand persons, $N_E = 1783$ thousand persons of which were considered employed. Correspondingly,

we get $K_E = 38.8\%$ for employment coefficient. K_E=47,9% (Table1 in the appendix) is not taken into account by employment coefficient, which includes old people, children i.e. part of the population who can also take part into creation of public production, this might be evaluated as the negative side of this characteristic. Population employment coefficieint depends on age-sex structure of population. For instance, the change of population number beyond the working age, in children or old people, might cause the change of employment coefficient and vice versa. That's why, labor resource employment coefficient is used to make deeper analysis, which indicates the share weight of employed not in the whole population but in the potentially employable population:

$$K_E^{LR} = \frac{N_E}{N^{LR}} 100\%$$

where K_E^{LR} (**Employment Population Ratio of Labor Resource**) **–** is the coefficient of labor resource employment, N^{LR} - is the number of potentially employable population. For example, in 2016, the number of economically active population amounted N^{LR} = 2021,5 thousand persons (Table2 in the appendix), for the labor resource employment coefficient we get: K_E^{LR} = 88,2%". *(Unated.... 2016: 13)*

Labor resource employment coefficient can give us relatively precise and realistic picture of employed people in the country. It depicts the specific weight of people employed in economy. We should discuss the statistics by 2016. The number of employable women amounted N_{Women}^{PEA} = 855,84 thousand and the number of employable men amounted N_{Men}^{PEA} = 927,16 thousand *(Table 4 in the appendix).* As a result, we get the following coefficient of women and men employment:

$$K_{E(Women)}^{PEA} = 64,5\% \; ; \;\; K_{E(Men)}^{PEA} = 71,7\% \;.$$

Pecularity of employment coefficient of people having working age is that oncreases the actual rate of population involved in production, as in denominator the share of children and old people is not envisaged numerator forsees their share in economy. However, this fact does not diminish the actual values of given coefficient, on the contrary, with the

above mentioned coefficients it enables us to make a complex analysis of population empoloyment.

When analyzing the employment of Georgian population, we have to take into account the fact that the age of work capacity for men is more by 5 years than the work capacity of women, therefore, differentiates approach is required to explore the quality of engagement in economy of men and women having the employable age. Additionaly, it is important to note that not every person having the employable age is able to work. They include certain categories of population which due tu different reasons are not or can not be employed, for example, people with inborn disabilities, work injuries, serious deseases etc. Actually, they can be considered as unemployable people. In this regard, if we proportion the number of employed people of working age with the total number of employable people, employment coefficient might be also determined:

$$K_E^{EPEA} = \frac{N_E}{N^{EPEA}} 100\%$$

where, K_E^{EPEA} (**Employment Population Ratio of Employable Population with Employable Age**) – is the coefficient of employable population employment with working age and N^{EPEA} –is the total number of population with working age, it can be calculated if the number of population with working age out of forking force is clear, i.e. the number of unemployable people in working age, number of unemployable population with working age will be subtracted from the number of population with working age and we wil get the number of employable population with working age. **Absolute and relative sizes** can also describe the population unemployment index.

Absolute index describes the scale of unemployment and encompasses the number of officially registered unemployed people, also, their distribution according to administrative territorial principle, accommodation, sex, age, education etc. Absolute index of unemployment has its negative side as well, it does not take into account the degree of population unemployment. Relative index of unemployment is characterizes the share of officially registered unemployed people in relation with comparable base.

For example, registration of unemployed amounted 241,6 thousand in 2016, when the number of economically active people amounted 2021,5 thousand (Tbale 4 in the appendix), accordingly, the coefficient of economically actove people will be: $K_U^{EA} = 12,3\%$. „In fact, this coefficient depicts the degree of unemployment of economically active people and might be calculated according to the parameters of regions, residence, districts etc".

In the third chapter of the dissertation "**Social-economic estimation of Georgia's population structure**" demographic situation of Ajara Autonomous Republic is characterized, demographic optimum as the aim of demographic policy is studied, optimal type reproduction parameters of Geogrian population is analyzed, age-economic pyramids of the population are developed, analysis of interconnection between Ajara Autonomous Republic and population structure is made.

In the last decades, annual natural growth of population was noticed only in three regions: Ajara, Samtskhe-Javakheti and Kvelo Kartli (there is relatively big number of etnic and religious minorities).

The demographic development of any country can be realized by processes that will have a negative impact on the viability of the country. To neutralize these negative events, it is necessary to develop and implement a certain demographic policy. This or that demographic situation can be relatively desirable and acceptable or vice versa. Deviations of the real level of demographic processes from desired ones create obstacles to the development of society, in particular, the difficulties of managing social and economic processes. Determining the level of desired and real demographic characteristics is an important task for the whole community.

Therefore, it is important to determine the optimal characteristics of demographic processes. Demographic optimum is the optimal type of population reproduction and ultimately, the goal of population policy. The complex interrelation between economic and demographic processes is a comprehensive criterion for demographic optimum. This criterion should take into account many important processes: 1) when looking for the criteria of population optimum, quantitative (for example, number of children in the family) as well as qualitative characteristics (for example,

material) should be taken into consideration; 2) Optimality criteria envisage not only the number of population but also the number of educated and skilled workers; 3) During the change of optimality criteria, new optimal type of population reproduction will not be established at once, because the inertion of demographic processes shoul be taken into account. Thus, criteria should be opted according to tomorrow's requirements.

In the process of exploring the optimum of Georgian population, population should be evaluated from static and dynamic angles. Static optimum is characterized by unchanged demographic features during the long time, unexistance of migration and one and the same birth and death rate density. As for dynamic optimum, it is characterized by the change of demographic process rates and as a result, demographic structure starts moving.

In families, provisionally, the number of children might be from 1 to 4. In practical calculation, one of the simple methods is the calculation of optimal size net coefficient, which was introduced by Hungarian scientists - R. Andork and K. Miltent *[R. Andork. 1968. – C. 16-29]*. Formula of calculation:

$$R_0 = \sqrt{\frac{vV}{jJ}}$$

In 2015-2016 the total number of stationary population until the working age amounted $J = 0,19089$ (by 2015) and $J = 0,2021,5$ (by 2016), number of unemployable elderly on average amounted $V = 0,14234$ by 2015 but by 2016 it was: $V = 0,14367$. It is estimated that expenses for keeping one unemployable elderly amounts 0.85 share of employable person's expense but i.e. $v = 0,85$ but one person's expense who is dependant with employable age amounts 0.65 share of employable person's expenses i.e. $j = 0,65$. In the above mentioned formula, envisaging of these meanings enables us to calculate optimal net coefficient meaning of Georgian population reproduction in 2015-2016 for the whole population in Georgia:

by 2015 $R_0 = \sqrt{\dfrac{0{,}85 \cdot 0{,}14234}{0{,}65 \cdot 0{,}1869}} = \sqrt{0{,}995} = 0{,}997$

by 2016 $R_0 = \sqrt{\dfrac{0{,}85 \cdot 0{,}14367}{0{,}65 \cdot 0{,}19089}} = \sqrt{0{,}984} = 0{,}992$

Accordingly, in 2015–2016 optimal net coefficient of the whole population reproduction in Georgia amounted and amounts 0,997-0,992-ს.

Negative side of optimal net coefficient calculation is that in the capacity of optimality criteria the ratio of expenses only on one person in different age groups is used and the change of absolute quantity standard of living is not taken into account. Besides, calculations by this formula envisage the fact as if, unemployable population is not working in young and old age groups, nonetheless, the part of this population might be participating in labor work. This technique of calculation can be utilized in the study of demographic optimum but above mentioned suppositions should be taken into consideration. Definitely, there is another more difficult method of population reproduction calculation. Utilization of their calculations showed that in major cases optimal meaning of netcefficient is located between $1 \leq R_0 < 1{,}5$.

Demographic investments. Determination of the volume of community expenses is one of the important topics to be learned. The change of the volume of community expenses is conditioned by the different paces of population number change, volume of migration and also by the change of age-ses composition of the population.

Quantitative characteristics of the population are not constant because the number of total population as well as its specific age-sex composition is changed. Despite these changes, standard of living must not decrease. This condition leads to changes in the general expenditure of families, socio-cultural rewuirement satisfaction etc. **"Thus, society expenditure which aims at maintaining certain standard of living in the conditions of population quantity and compostion changes-represents demographic investments".**

Evaluation of the change of demographic investment value is possible on the basis of age and economy pyramid. Through this method, the change of population requirements via the prism of age-sex composition changes can be calculated. Evaluation of the quality of demographic investment

changes in the conditions of population quantity and composition is reduced on the level of requirement index calculation.

Subsistance minimum is calculated on the basis of consumer basket. National Statistics Office of Georgia calculates the subsistence threshold according to consumer basket. Necessary expenses for keeping one unemployable elderly amounts on average 0.85 share of employable person. Accordingly, in 2015–2016 optimal net coefficient of total population reproduction in Georgia amounts 0,997-0,992. Negative side of optimal net coefficient calculation is that in the capacity of optimality criteria the ratio of expenses only on one person in different age groups is used and the change of absolute quantity standard of living is not taken into account.

Task from the angle of generilised economic estimation is becoming very relevant in Georgia, on which the change of population quantity and age composition should be studied. One of the tools for this kind of generilised estimation is the use of age-economic pyramid.

In the frame of dessartation topic, we conducted internet survey. About 500 respodents were interviewed. 36% of interviewed people have 4 family memebers and there are not more than 2 children in those families. Monthly income of 34.42% of interviewed people is up to 2000 GEL, as for 30.55%, their total income is more than 2000 GEL , 35.03% has the income emounting less than 1000 GEL, if we compare it with expenses, monthly family expenses of 32.58% of interviewed people is up 2000 GEL and the expenses of 17.21% amountes more than 2000 GEL. In total, monthly family expendure of 50.02% is not more than 1000 GEL, i.e. if we make average calculation by the following exchange rate: 1$=2,5, their expendure is 400 $.

By envisaging subsistance minimum per person, this amount of money is not sufficient for families consisting of 5 or more members. The change of Ajara Autonomous Republic population in 2002-2017 according to statistics administration is given in below given diagram. It is noteworthy that basing on population cencus of 2014, population number of Ajara Autonomous Republic amounted 333,953 thousand people, which is given in the diagram in the column of 2015, when the number of population was reaching nearly 400 thousand persons in previous years (Diagram 3).

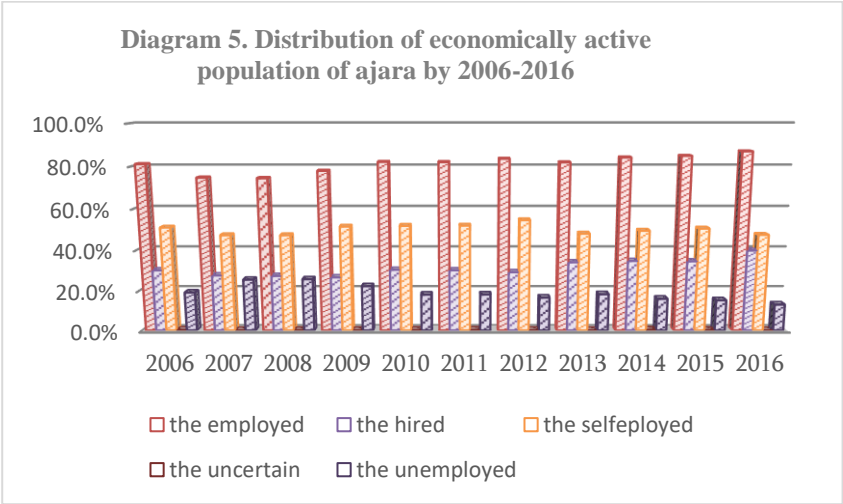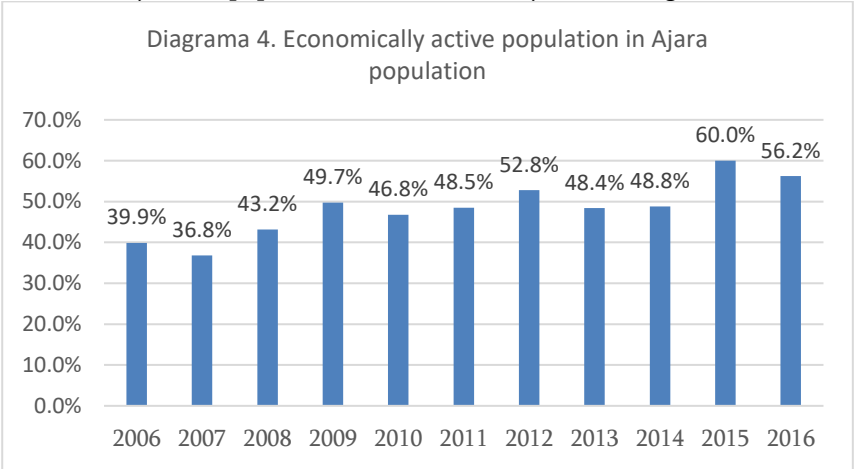Diagram 3. The change of Ajara Autonomous Republic population in 2002-2017
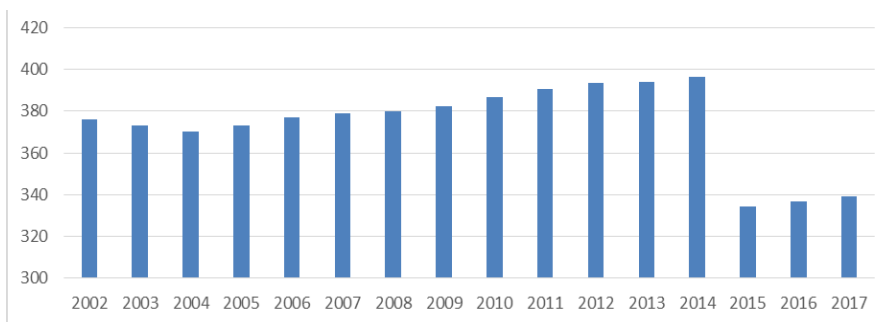
According to indices of 2014, 46% of Ajara Autonomous Republic population is in Natumi, 22% in Kobuleti Municipality (9% of total population comes on Kobuleti), in Khelvachauri municipality 16%, in Keda municipality 5%, in Shuakhevi municipality 4%, in Khulo municipality 7%. Nearly 55% of population lives in towns and 45 % in villages.

By 2002 the population of Ajara Atonomous Republic amounted to $N(2002) = 376$ thousand persons. By 2014– $N(2014) = 396$ thousand persons.. Accordingly, by this 12-year period natural growth coefficient is $b = 0.004$. With this pace of growth, it is very simple to calculate for example, the number of Ajara population after 25 years by 2027 will be $N(2027) = 420$ thousand persons. Pace of this growth during 25 years is definitely low. During the population census in 2014, supposedly, different calculation methodology was used and exactly this defines the significant decrease of population almoast by 40 thousand persons. Therefore, it is better to calculate Ajara population natural growth coefficient in 2015-2017 separetely from the previous years.

Particularly, if $N(2015) = 334$ thousand persons and $N(2017) = 339$ thousand persons, for this 3-year period for natural growth coefficient we get $b = 0.004$, accordingly, through the use of this methodology by 2027, the number of population will be $N(2027) = 350$ thousand persons. Integral research on household proves that potential share of economically active population of Ajara in Ajara Autonomous Republic total population by 2006-2016 flactuates between 36%-60%. Important growth tendency is

not noticed but still it is possible to say that in the last years the number of economically active population was increased by 5-8% (Diagrama 4).

Diagrama 4. Economically active population in Ajara population

Diagram 5. Distribution of economically active population of ajara by 2006-2016

Legend: the employed, the hired, the selfeployed, the uncertain, the unemployed

Distribution of economically active population of Ajara by 2006-2016 enables us to evaluate the percentage share of employed, hired, self-employed, those involved in certain activities and unemployed people in economically active population throughout the country. In 2006-2016 share

of employed population in economically active population is located between 75%-87%, in addition, in the last years, especially in 2016 it reaches87%- which is maximum index. Shrae of hired population is in the middle of 27%-40%, selfemployed population in the middle of 47%-55%, share of population having unknown works is insignificant and amounts maximum 0.2% and finally, share of unemployed people from economically active population fluctuates between 13%-25%, also, percentage share of unemployed people in the last years decreases and by 2016 reaches record minimal index- 13% (Diagrama 5).

If we estimate the rate of economically active population employment and economic activity by 2006-2016, we can conclude the following: rate of employment in this period fluctuates between 36%-60%, rate of economic activity between 50%-71%. According to rates of employment and economic activity, minimal index is registered in 2007 - 36.4% and 48.8%, maximal index according to employment rate is registered in 2015 - 60.1%, according to economic activity rate in 2012 - 71.1% (Diagrama 6).

Diagram 6. rate of economically active population employment and economic activity by 2006-2016
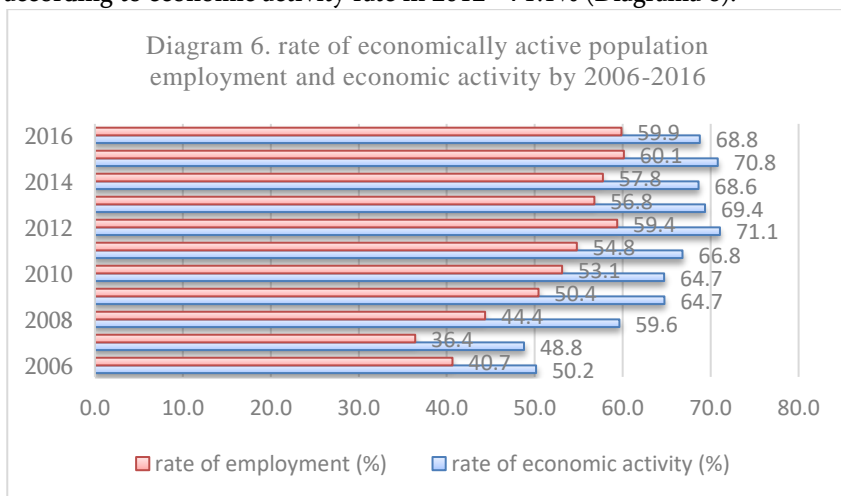
If we use statistics of population cencus of 2014 for age-sex distribution of Ajara population, it is possible to calculate net coefficient of population reproduction (R_0). For this purpose, we should calculate the share of unemployable young people in Ajara stationary population - J, share of

unemployable elderly- V, necessary expense for keeping one dependant unemployable elderly towards employable person's expenses - v and the expense of one dependant person who is of employable age towards employable person's exepenses - j. By 2014 meanings of this parameters are: $J = 0.064$, $V = 0.11$, $v = 0.85$, $j = 0.65$. Accordingly, for net coefficient of Ajara population we get:

$$R_0 = \sqrt{\frac{vV}{jJ}} = \sqrt{\frac{0.85 \cdot 0.11}{0.65 \cdot 0.064}} \approx 1.5.$$

Basic economic-demographic parameters for the whole Georgia and Ajara Autonomous Republic and on their basis calculated reproduction net coefficient according to sex (male, female and both genders) and residence (town, village) is given below (table 2).

By 2014, in the whole Georgia the total number of population amounted 4 490,5 thousand persons. Share of employable population was 68.9% of total population. Share of unemployable younger people was 15,9% of total population, share of unemployable older people was 14.0%. In these conditions, we get the following reproduction net coefficient for Georgia:

$$R_0 = \sqrt{\frac{vV}{jJ}} = \sqrt{\frac{0.85 \cdot 0.14}{0.65 \cdot 0.15}} \approx 1.07.$$

Parameter	Total			Town population			Village population		
	Both genders	Male	Female	Both genders	Male	Female	Both genders	Male	Female
Ajara Autonomous Republic									
Share of employable population	64.7%	32.0%	32.7%	36.2%	17.4%	18.8%	28.5%	14.6%	13.9%
Share of unemployable younger people J (%)	6.4%	3.4%	3.0%	3.7%	2.0%	1.7%	2.7%	1.4%	1.2%
Share of employable older people V (%)	11.0%	4.3%	6.6%	5.4%	2.0%	3.4%	5.6%	2.3%	3.3%
Net coefficient of reproduction R_0.	**1.50**	**1.29**	**1.71**	**1.38**	**1.16**	**1.60**	**1.65**	**1.45**	**1.85**

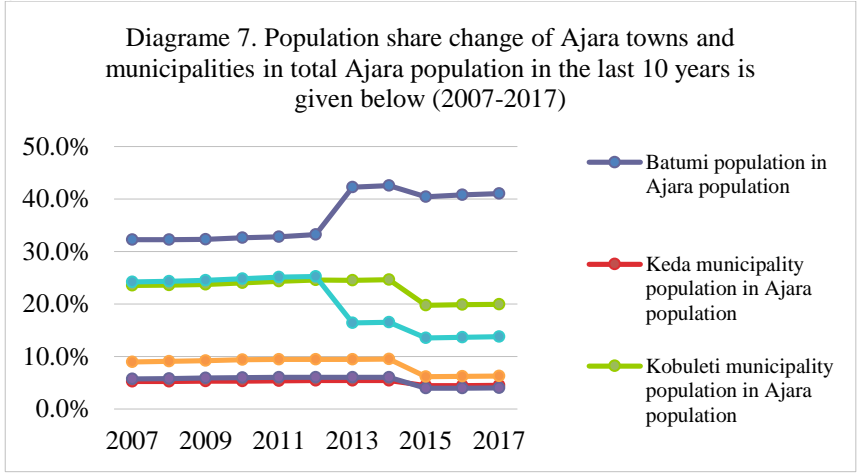| Georgia									
Share of employable population	68.9%	33.4%	35.5%	32.3%	15.0%	17.2%	23.2%	11.9%	11.3%
Share of unemployable younger people J (%)	15.9%	8.4%	7.5%	9.2%	4.8%	4.4%	6.2%	3.3%	2.9%
Share of employable older people V (%)	14.0%	5.3%	8.7%	5.9%	2.1%	3.8%	6.0%	2.4%	3.6%
Net coefficient of reproduction R_0.	**1.07**	**0.91**	**1.23**	**0.91**	**0.75**	**1.06**	**1.12**	**0.97**	**1.27**

If we compare it with the identical calculations made for Ajara, we will notice that generally, the pace of population growth in Ajara region is larger than in Georgia. Moreover, according to our calcuations, in 2015-2016 meaning of reproduction optimal net coefficient in Georgia it was even more diminished and equaled 1.

Analysis of employable population from the angle of sex and residence gives us interesting results. Specifically, share of employable population in Ajara is 64.7% of total population, in which half of them are women and half of them men. In towns, share of employable men is less nearly by 1% than women and in rural areas vice versa. This tendency is maintained throughout Georgia (apart from occupied areas, indices of which are not known for us). In total, share of employable population in the towns of Ajara amounts 36.2%, in villages-28.5 %-ს, while the population of the Autonomous Republic of Adjara during the last 10 years is steadily rising from 8.62% to 9.12% (Appendix 2). It is interesting to find out. Advantageously, it is interesting to find out which territorial unit of towns and municipalities of Ajara Autonomous Republic conditions the growth of Ajara population number in the total population of Georgia. Population share change of Ajara towns and municipalities in total Ajara population in the last 10 years is given below (2007-2017, Diagrame 7).

Decrease of Khulo municipality population from 9% to 6%, Shuakhevi municipality population from 5,8% to 4%, Kobuleti municipality population from 23.5% to 19.9% is noteworthy. As for Khelvachauri mucicipality, population decreases from 24.2% to 13.8% but certain objective facts should be taken into account and one of these facts is that

areas of Khelvachauri belong to Batumi. Undoubtedly, Batumi development plan probably implies broadening as well. Since 2012, Batumi is expanding at the expense of the border municipality - Khelvachauri territories. Part of Khelvachauri population has already been referred to the city by place of residence. Accordingly, town population growth from 32.3% to 41.1% is partially conditioned by this. However, town population continues to grow without these territiorial changes and practically, stable growth of Ajara population comes exactly on Batumi population.

Diagram 7. Population share change of Ajara towns and municipalities in total Ajara population in the last 10 years is given below (2007-2017)

Conclusions:

- We classified Qualitative methods of determination population, such as: economic-demographic prediction, study of changes in demographic structure of population, study population reproduction regime Demographic models of population (Stochastic and simulated models of economically active population; stationary model of population; Exponential model of describing the change of life, logarithmic model and stable model).
- It is shown advantages of the exponential model to describe of changes population among other models. In this case the absence of natural growth indicators that allow us to judge the number of population growth or decrease. This indicator is the most practical parameter that

represents the effectiveness of population change.

- Estimated distribution of birth rate, mortality and natural growth coefficients as per the whole Georgia and specific regions. It should be noted that Adjara is the highest rate of natural growth from regions, while the lowest is Racha-Lechkhumi and Kvemo Svaneti regions.
- Analyzed models of statistical-quantitative assessment of population, such as: quasi-stable model of population; Malthus Model Stable model of population; Prognosis of the population based on the exponential model; Predicting demographic models Predicting dynamics with statistical characteristics.
- It is emphasized that a stable model of population reproduction has created a new era in terms of methodological development of the population and has become the basis for the analysis of demographic processes. If the population does not change the rate of birth and mortality for a large amount of time, then the true coefficient of natural growth is constant.
- It is shown that using statistical characteristics of the dynamics of population forecasting model will help to determine the average pace of economic growth and the growth of average economic growth and economic growth.
- For the January 1, 2017, the number of Georgian population (except those living in the occupied territories) reached 3 720,4 thousand people, which is 0,18 percent more than the same number of previous years. It is underscored that the increase in the number of population has affected the natural growth rate of 2016. 57,2% of the country's population (2 128,5 thousand people) live in the city and 42.8% (1 591,9 thousand) in the village. In comparison with the previous year, the share of men grew by 0.1% and reached 1 781.5 thousand and the share of women decreased by 0.2% and reached 1 936,7 thousand. 47.9% of Georgian population and 52.1% are women.
- It is the classified composition of the population from the source of income (hired workers detained in private and household, detained in private farms, scholarship holders, pensioners and state dependents, other sources of income dependent on others). The standard of living and income of the population depends on employment. Classified also

types of economically active population, types of unemployment and demographic factors of employment.

- The average monthly income of the population for 2016 is estimated and compared with the same data for 2005. The analysis showed that in comparison with 2005, the average annual income increased by 3% in 2016 (11 years) and amounted to 1072.3 million Lari, which is 1042.2 lari for the calculation of one household. In this interval, the average monthly income for the household increased 3-fold. In turn, the average monthly income was calculated in the amount of GEL 294.5 in 2016, which is 3.19 times higher than in 2005. As a result, for the last 11 years the average monthly income of the Georgian population has tripled.

- The level of unemployment rate of Georgian population is estimated. In 2016 unemployment rate decreased by 0.2% compared to 2015 and constituted 11.8%. It should be noted that in 2016 unemployment has reached the lowest level in the last 13 years. In 2016 economically active population constituted 54.3% of the population of the working age population (15 years and older). Compared to the previous year, the level of population activity increased by 1.3% and employment level by 0.2%. In 2016, the level of employment in Georgia's urban settlement has decreased by 0.5% and rural settlement - 0.1%, compared to the previous year, the level of activity in urban settlement is reduced by 0.8% and rural settlement - 0.1%. The lowest rate of unemployment is recorded in Kakheti region (5.2%), followed by Shida Kartli (8.2%). These two regions are obviously the richest regions in Georgia, in which the main occupation is viticulture and agriculture. In 2016, the unemployment rate in urban settlement has decreased by 0.4% and in rural settlement rates 0.2%.

- It is important to study the economic activity of the population according to age. The highest rate of unemployment is observed in the age group of 15-19 years (31,9%), followed by age group of 20-24 years (30%). The unemployment rate decreases generally in terms of age growth, the exception is the age group of 50-54, where unemployment has increased from 9,7% in the previous group to 11,9%. The economically active part of population in Georgia is not equal to 2/3 of

the total population of people with working age, which is behind the EU index (70%).

- It is shown that the number of labor force affects the number of live newborns and external migrations. The number of immigrants in 2016 reached 98.3 thousand people, which is 2.4% more than in 2015. During the same period, the number of immigrants decreased by 2.5% compared to the previous year and amounted to 90.2 thousand people. Most of the emigrants in Georgia are aged 25-29 years. 65% of Georgian immigrants are Georgian, 8% are Russian, 3% are Turks, 7% are Armenians, 45% are Georgians, 10% are Russians, 6% are Turks, and 5% are Armenians. A high proportion of Georgians in the total number of immigrants and immigrants is connected by job seekers seeking work abroad or processes of return to their homeland.

- It is estimated the unemployment rate in the regional context and it is shown that unemployment rate to have increased in the regions such are Imereti, Tbilisi and Shida Kartli. In Tbilisi, where unemployment is the highest, this indicator increases by 0.6%, and in the regions of Imereti and Shida Kartli - by 2.0 and 0.2% respectively. The unemployment rate in the regions of Samegrelo-Zemo Svaneti and Adjara is reduced by 2.5% and 2.1% respectively.

- The trend of the average monthly change in nominal wages is analyzed. In 2000-2016, the average monthly nominal wage for employees in the state and non-state sectors increased. During this period, the employed private sector workers had more reimbursement than those employed in the public sector. In particular, the average monthly nominal wage employed in the public sector in 2000 was 94.8 lari. In 2016, it reached 945.1 lari (almost 10 times). The average monthly nominal wage employed in the private sector in 2000 was 66.6 lari in 2000. In 2016, it reached 825.6 lari, and meanwhile, the average monthly nominal wage for private sector employers in this interval increased 12.4 times. This increases quite high rates over the next 16 years.

- It is substantiated that graphical methods of employment of the population, such as: pyramidal, square and triangular structural diagram, are a valuable tool for studying the dynamics of the economy

in the economy. It is also important to study the composition of the employed population. On the basis of a balanced method, the essence of which is to build structural links between different employed and unemployed groups. Balanced tables for determining the important proportions in the economy are presented.

- It is shown that when forecasting the employed population, the extrapolation forecasting method is the priority, which, in comparison with other methods in the age and sex cohorts (groups), allows us to obtain more adequate information on the evolution of employment of the population.

- It was calculated the optimal net coefficient of the population Georgia in 2015-2016, which is 0.997-0.992 respectively. It is emphasized the negative side of calculations net coefficient, namely, the fact that the criterion of optimality is used only in the ratio of population per person in different age groups, and the change in the absolute value of life is not taken into account.

- We conducted an Internet survey of the main element of the demographic structure - the family. It was found that the policy of supporting the family in Georgia could not solve the demographic problems - create the appropriate conditions for social support for large families and use of the practice of EU member states. 36% of the respondents have a family number of 4, and the number of children in these families does not exceed 2. Participation in the survey was mainly received by young respondents aged 21-40, those who actively use the Internet and social networks. 34.42% of respondents have an average monthly income up to GEL 2000, 30.55% have more than GEL 2000, 35.03% less than GEL 1000. In comparison with the expenses, the monthly family expenses up to 2000 GEL are 32.58% of respondents, 17.21% - more than 2000 GEL. For 50.02% of monthly family expenses does not exceed 1000 GEL, i.e. about 400 $. The absolute majority of respondents are employed, namely 40.82% in the public sector and 35.1% in the private sector, 23.65% of respondents are temporarily unemployed or at best self-employed. 76.23% are employed near the place of residence, and 23.77% - in a remote location or outside the country.

- In 2006-2016, the share of the employed in the economically active population is 75-87%. In recent years, especially in 2016, it has reached a record 87.02%. The share of the population is less than 0.2%, while the share of the unemployed from the economically active population in recent years ranges from 13% to 25%, and the share of self-employed population is between 27% and 40%. The percentage of the unemployed is declining and by 2016 reaches a minimum level of 13%.
- It is assessment of the level of employment in the Autonomous Republic of Adjara. The employment rate for 2006-2016 varies between 36% -60% and the level of economic activity at 50% -71%. The minimum rate of employment and economic activity is recorded in 2007 - 36.4% and 48.8%, and the highest rate of employment in 2015 - 60.1%, according to economic activity level - 71.1% in 2012.
- An interesting analysis gave an analysis of the proportion of the working population, depending on sex and place of residence. In particular, the share of workers in the Autonomous Republic of Adjara is 64.7% of the total population of the Autonomous Republic of Adjara, in which half of them are women, and half of them are men. The proportion of working men in cities is about 1% less than women, and in rural areas. This trend is practically preserved throughout Georgia (with the exception of the occupied territories, we have no data). In the cities of the Autonomous Republic of Adjara, the population is 36.2%, and in the villages - 28.5%. The population of the Adjarian Autonomous Republic has been steadily increasing from 8.62% to 9.12% of the total population of Georgia.
- he decrease in the population of the Hulo municipality from 9% to 6%, the reduction of the population in the Shuakhai municipality from 5.8% to 4%, and the decrease in the population of the municipality of Kobuleti from 23.5% to 19.9% are underlined. As for the municipality of Khelvachauri (from 24.2% to 13.8%), we are dealing with a number of objective processes. One of these processes relates to the development plan of the city of Batumi. Since 2012, Batumi is expanding at the expense of the border municipality - Helvachauri territories. Part of the population of Khelvachauri has already been

referred to the city by place of residence. Accordingly, because of this, the urban population increased from 32.3%, to 41.1%.

- Analysis of the overall internal product indicates that in addition to the capital, almost all regions are decreasing, in Kvemo Kartli - 22.5% decrease, in Guria almost 16.3% decrease in Samtskhe-Javakheti - 15.8% Samegrelo Zemo Svaneti region - 8,9%. In the capital, the rate of increase of 2.5% and the increase of 37,1% in Adjara. Demographic processes are directly reflected in the growth rate of the total value of the region.

- It is mentioned that, In the Adjara Autonomous Republic in recent years, such economic activities as: agriculture, hunting and forestry, fishing, fisheries (-57,8%); Product recycling by households (- 30,9%); Transport and Communications (-56,1%); The state governance (-26,6%) has an overall decrease in value added. However, the growth of 37,1% in Adjara in these years is mainly due to the high rate of growth of the total value added to various types of service (71.8%)

Recommendations:

- In different regions of Georgia there is a very different standard of assistance from many of the local budgets. The Georgian government should initiate the necessary measures to take into consideration the recommendations presented in the survey and reflect on the strategic document. If nothing has changed in the country, the crisis will reach the peak after 40-50 years and is expected to be a demographic catastrophe.

- In case of active demographic policy, preference should be given to socio-demographic, hardworking groups, young, demographic growing families. The main demographic problem for Georgia is to stop the population decline. Measures to increase the birth rate should be taken in those regions where the demographic indicators are lower than the national average. Support should be provided to families by the number of children. Forecasting employment and unemployment indicators requires a methodological approach. It is necessary to carry out a systematic demographic analysis of the age structure of the

population, which essentially determines the economic parameters of the region. At the same time, the government should conduct a study of the economic parameters of the Adjara region based on the demographic analysis of the age structure of the population;

- The demographic aspects of the analysis of the age structure of the population should be used by local self-government and the trends in the development of demographic processes in the Adjara region taken into account.

- In order to study the pattern of the demographic structure of the population, it is necessary to assess the results of changes in the demographic structure of the population, since approximately 60% of the population of Georgia is an economically active labor resource that should be taken into account taking into account the economic potential of the Adjara Autonomous Republic;

- Depending on the scientific recommendations of the economic demographics and demographic structure of the population should be carried out in depth study of the labor market problems in the economic sphere of Georgia

- A quantitative analysis of the demographic processes of the Georgian population suggests that in order to combat unemployment, the Georgian government should use the decentralization goal as one of the effective means of increasing the level of employment. In other words, if there is an opportunity to use the economically active population in the regions, deliberate decentralization of labor resources can become the basis for reducing the unemployment rate on the one hand and the development of the regions. However, this issue is complex and requires more detailed consideration.

- Studying the activity of the population across Georgia in the age range, made it possible to establish that the activation level increases by 45-49 years, and then decreases, and the employment rate increases to 40-44 years, and then the fall begins. Therefore, the government should take care of young people so as not to emigrate to young intellectual capital abroad.

Published works:

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2. K. Chanidze- Influcence of Christianity of demography. Eight international-scientific conference "Christianity and Economy" (2015, pg 164-168)
3. K Chanidze - Evaluation of demographic processes on the basis of quantitative-exponential models. International-scientific conference. (2015, pg. 87-95)
4. K. Chanidze - "Modern models of population statistical-quantitative evaluation"o international-scientific conference "Innovative technologies and globalization". Unite Arab Emirates. (2016. pg. 91-99)
5. K. Chanidze, N. Kontselidze, "Significance of relative indices in quantitative characterization of population employment" - Finance and Economics Conference. 2016. Frankfurt. Germany.(http://www.lcbr-archives.com/fec2016proceedings.html)