

# **CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE**

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## **Diploma Thesis Title:**

“Competitive regional development strategies in modern economy”

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## ANOTACE

### KONKURENČNĚ SCHOPNÉ STRATEGIE REGIONÁLNÍHO ROZVOJE V MODERNÍ EKONOMICE

V současné době jsou priority rozvoje světového hospodářského společenství takové, že jsou určovány pozice každé jednotlivé země, úroveň její moci nejen zajištěností hlavními typy strategických materiálních zdrojů ale jsou přímo závislí na dosažených výsledcích státní politiky v oblasti regionální ekonomiky.

Ve světle těchto trendů, kdy jsou důsledky recese způsobené celosvětovou hospodářskou krizí stále velmi akutní, je rozvoj strategií pro sociálně-ekonomický rozvoj jednou z nejúčinnějších metod řízení jak na federální, tak i regionální úrovni. V této magisterské práci se autor pokusil ukázat, že strategický přístup k řízení regionálního rozvoje umožňuje přejít z aktuální manipulace s náhodně vybranými skutečnostmi k systému hodnocení, který poskytuje úplný popis vztahu ukazatelů a faktorů, který přispívá k objektivnímu řídicímu rozhodování v dlouhém časovém horizontu.

První kapitola magisterské práce je zaměřena na studium teoretických aspektů konkurenčně schopných strategií rozvoje regionu.

Druhá kapitola analyzuje konkurenceschopnost regionu na příkladu republiky Severní Osetie – Alanie. Při přechodu z makroúrovně na mikroúroveň je prezentována poměrně podrobná analýza finančních a ekonomických aktivit těžebního podniku Kavdolomit, a.s.

Třetí kapitola analyzuje závislost objemu hrubého regionálního produktu jako hlavního makroekonomického ukazatele regionálního rozvoje na příspěvku dvou klíčových odvětví republiky – zemědělství a průmyslu. Vypočítává se také předpověď úrovně GRP republiky Severní Osetie – Alanie vypočítaná na 5 let (roky 2017–2021).

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## INTRODUCTION

**Importance and relevance of the research topic.** Regional development and the reduction of disparities between leading and lagging regions is a key item on the current political agenda and academic debate in modern economy. Improvement of the welfare of the population living in the region is one of the key aims of the international competition.

Regional contexts are heterogeneous and their characteristics and features can vary across regions. The economic development of a region depends on a number of factors which influence it mainly bases in a macro-economic aspect. Each region has its specific characteristic; thus area-surveyed indicators may not have sufficient predicative potential.

The fundamental goal of economic policy is to enhance competitiveness, which is reflected in the productivity with which a nation or region utilizes its people, capital, and natural endowments to produce valuable goods and services. Improved competitiveness, as we all know, is the path to economic nirvana. High and rising productivity, measured by the value produced by a day of work, determines the level of wages that a nation can sustain and its standard of living in the medium and long run.

**The extent of research.** Theoretical and practical aspects of regional development competitiveness at different times were discussed in the works of Russian and foreign researchers and scientists such as A. N. Gerasin, I. S. Tsypin, N. M. Mikheeva, R. I. Semyonova, E.A. Nezhivenko, I. Begg, M. E. Porter, A. H. Studenmand, L. Anselin and others.

**Goal.** As a key goal of this research we consider development of complex approach to study strategies of regional development competitiveness in modern economy.

**Tasks.** The mentioned goal is achieved by the next tasks:

- to study foundations of competitive regional strategies;

- to study methods to research problems of competitiveness regional strategies;
- to analyze methodology to assess the effectiveness of competitive regional strategies;
- to scrutinize criteria and parameters of regional competitiveness in the context of sectoral potential;
- to scrutinize priority directions of social and economic competitive development of the North Ossetia-Alania Republic;
- to study Regional competitive ability in foreign and domestic markets;
- to analyze mechanism of implementation of the of the competitive social and economic regional policy;
- to create a model of basic macro-economic indicators of regional development using regression equations;
- to forecast basic macro-economic indicators of regional development using regression equations.

**Methods.** In this study as key methods we applied such methods of econometric modelling and forecasting as: modelling using regression equations of basic macro-economic indicators of regional development and forecasting using regression equations of basic macro-economic indicators of regional development.

**Object.** We consider competitive regional development strategies as an object of the research.

**Subject.** We consider mechanisms of social and economic development regulation on the regional level in the context of formation and realization of competitive regional development strategies as a subject of the research.

**Empirical base.** As for the empirical base of the research, it is made up of legislative and other normative legal acts of the state in the field of social and economic regional development, statistic books, balance reports, various open statistic links.

**Theoretical and methodological base.** Theoretical and methodological base is made up of scholar and scientific works of Russian and foreign scientists on the problems of regional development competitiveness.

**Added value** of dissertation work consists in the revealing of how priority directions of social and economic development influences on creating competitive regional development strategies in modern economic system.

The master's dissertation is a study of competitive regional development strategies as a dominating idea for sustainable regional development.

The overall research questions revolve around: how do strategies of regional development competitiveness influence on sustainable regional development in modern economy.

This study sets out to obtain an in-depth understanding of the macro- and regional-level localized processes as well as the way in which these processes are intertwined with the spatial context.

## 1. Theoretical aspects of competitive regional development strategies

### 1.1 Foundations of competitive regional strategies

In recent years, the main focus of territorial policy has been on sustaining growth, not only to address relative decline, but also to make regions more competitive. That is why, in the regional management system strategic planning becomes the necessary tool not only to respond to the increasing speed of current economic and social changes and grown competition in all spheres of life, but also to create competitive advantages. The sustainability of the regional socio-economic system and, as a consequence, the welfare of the population, depends on set strategic objectives, used resources and consistent activities to achieve them. Therefore, in the conditions of unstable market environment, competitive regional strategic planning is the key tool of public management and territorial development.

Nowadays in the Russian Federation the system of regional strategic planning is being formed within the new legislative framework: the Framework of strategic planning in the Russian Federation was approved in 2009, the Federal Law “On strategic planning in the Russian Federation” – in 2014.

The most important factor of ensuring competitiveness of Russian economy in the current context is availability of the effectively functioning system of the state strategic management.

The system of state strategic management allows [21]:

- formation of long-term priorities of the state activity in the field of social and economy development allowing private companies to decrease risks including those in taking long-term investment decisions;
- long-term solutions deployment (with lead-time 7 and more years) in the complex of medium and long-term tasks approved against each other;



- balancing of planned actions demanding significant organizational and resource expenditure (projects in energy, transportation, demography, national security, in the sphere of human potential development);
- orientation of the Subjects of the Russian Federation and municipal bodies to the activity in accordance with the set up long-term goals;
- colligation of the decisions taken during the process of state strategic management with budget limitations defined both for medium-term and long-term prospective;
- monitoring of implementation of taken decisions.

The main tasks being solved by the Ministry during realization of the strategic planning are:

- formation of the strategic management system;
- development and monitoring of the implementation of the Concept of Long-Term Social and Economic Development of the Russian Federation;
- monitoring of the projects on implementation of the main areas of activity the Russian Federation Government.

The modern practice of regional strategic planning indicates positive trends in its use for solving socio-economic problems, especially in those regions that have taken the path of the forced crisis recovery and structural modernization of their regional economy.

When the discipline of regional development emerged in the 1950s it had a strong economics basis and a focus on what firms did in regions and how their performance influenced a range of economic indicators: employment, profit, GDP and growth. In the 21<sup>st</sup> century economic geography has joined the disciplines and the focus of regional development is more on the spatial dynamics of regions – as places to live, work and invest.

According to I. A. Novikova, “a region is a large area of land that is different from other areas of land, for example because it is one of the different parts of a country with its own customs and characteristics, or because it has a particular

geographical feature» [24]. The matter is, that the national productivity is directly composed of productivity of its regions. Furthermore, each region has its specific characteristic and the fundamental goal of economic policy is to enhance competitiveness, which is reflected in the productivity with which a nation or region utilizes its people, capital, and natural endowments to produce valuable goods and services.

A common thread for regional development concerns some kind of economic and social improvement:

- more and better quality infrastructure (soft and hard);
- improved community services;
- greater and more diverse volume of production;
- lower unemployment;
- growing number of jobs;
- rising average wealth;
- improved quality of life [23].

The regional development is defined by the OECD, as a holistic process where different regional actors could participate in the definition, decision and implementation of the most convenient development for the current generations without affecting the economical investment capacity nor the social and the environmental stocks of the future generations [18].

Regional development is a core pillar of economic development for any state. Exactly competitive regional development strategies directly contribute to both regional and national development. According to the World Bank, an effective strategy for regional development would need to balance three pillars: equalization policy, active regional policy and spatial policy (Figure 1) [5].

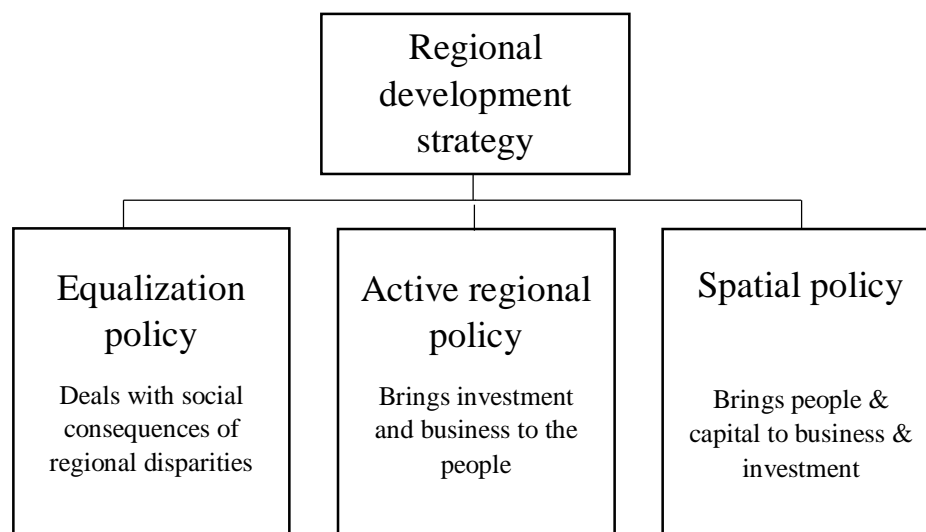


Figure 1 – Three pillars of an effective regional development strategy

The Regional Development Strategy (or simple – a Strategy) is a plan to build on the potential of a region for the benefit of people. The Strategy is built on the understanding that achieving good regional development outcomes requires a blend of economic and social investment, and ongoing support to ensure the sustainability of our regional communities [5].

An economic development strategy – whether at national, regional or urban level - starts from the premise that ‘something can be done’ to make an economy more competitive. But there is precious little agreement either on what the term ‘competitiveness’ means. In healthy regions, competitiveness and innovation are concentrated in clusters, or interrelated industries, in which the region specializes. The nation’s ability to produce high-value products and services that support high wage jobs depends on the creation and strengthening of these regional hubs of competitiveness and innovation.

World Economic Forum, which has been measuring competitiveness among countries since 1979, defines it as “the set of institutions, policies and factors that determine the level of productivity of a country [6]. And really, a competitive economy, we believe, is a productive one because productivity leads to growth, which leads to high income levels and hopefully, at the risk of sounding simplistic,

improved well-being. Basically, rising competitiveness means rising prosperity. At the World Economic Forum, experts believe that competitive economies are those that are most likely to be able to grow more sustainably and inclusively, meaning more likelihood that everyone in society will benefit from the fruits of economic growth.

As the researcher I. Lengyel states, «competitiveness is given by the level of prosperity a location can sustain based on the productivity of companies based there» [5]. So, here we have a bit different focus on competitiveness based on micro- rather than on macro-economics.

As for «regional competitiveness», the European Commission gives the following definition on it: «regional competitiveness is the ability of a region to offer an attractive and sustainable environment for firms and residents to live and work».

Practically, different definitions of competitiveness depend on focus of interests. For the nation, the OECD defines competitiveness as: “...the degree to which it can, under free and fair market conditions, produce goods and services which meet the test of international markets, while simultaneously maintaining and expanding the real incomes of its people over the long term”. It also can be stated that globalization, advances in information technology and far-reaching structural change have altered the terms of competition between cities as well as regions.

A regional development strategy will then be competitive when it will be based on a competitive advantage(s) or a region. It is worth to emphasize that a regional development strategy is not something abstract, therefore, we can judge its results according to present economic situation.

The present and future prerequisites for regional success can be approached from the standpoint of competitive advantage, a concept introduced by Michael Porter in 1990. In his book, Porter examines competitive advantage primarily on the national level, but the concept can also be applied to the sub-areas of a nation, because – as Porter points out – competitive advantage is created and sustained through a highly localized process [26].

The relation of a basic macroeconomic indicators of regional development, that are gross domestic product (GDP) and gross regional product (GRP) to population, is widely used as a measure of competitive advantage. It gives an overall picture of the level of production in an area, together with its efficiency and stage of development. Let us provide you with some statistics according to the gross regional product per capita of territorial units of the North Caucasus Federal District in the year 2014 (in percentage to the average Russian) presented in Figure 2 below [31].

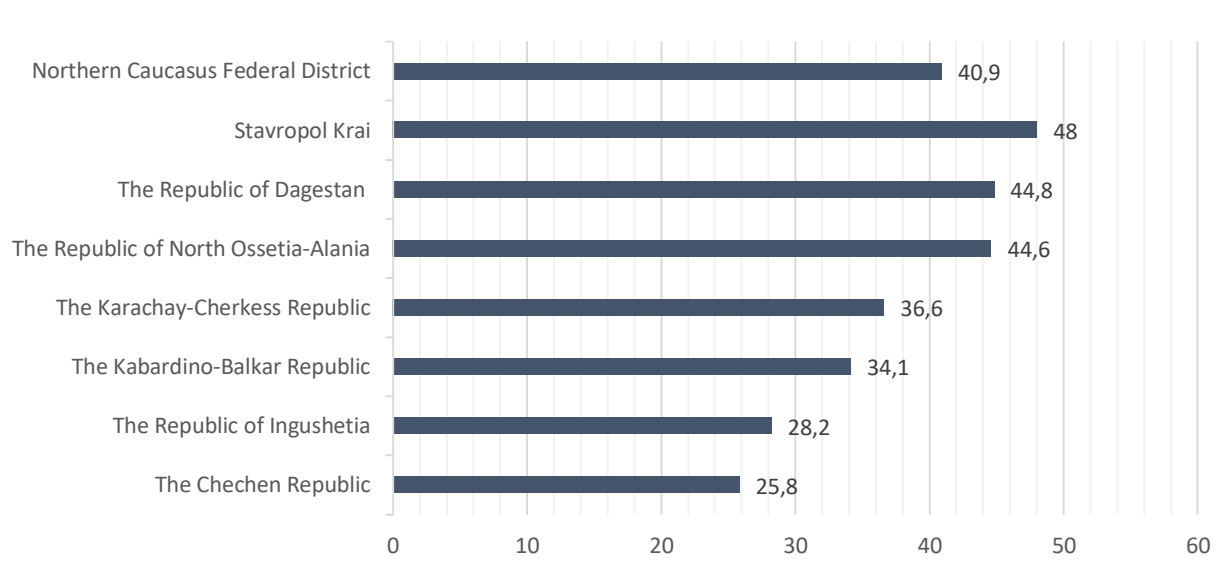


Figure 2 - The gross regional product per capita of territorial units of the Northern Caucasus Federal District, 2016 (in %, to the average of Russian)

Picture 2 shows that in 2016, GRP per capita for the North Caucasus Federal District was 2.4 times (compared with 2.6 in 2015) lower than the average for the Russian Federation.

In healthy regions, competitiveness and innovation are concentrated in clusters, or interrelated industries, in which the region specializes. The nation's ability to produce high-value products and services that support high wage jobs depends on the creation and strengthening of these regional hubs of competitiveness and innovation.

Generally, a strategy of socio-economic development of a region consists of [12]:

*General information of a region.*

As an example of the main aim of the strategy, it could be the following: «The main aim of the Strategy is to improve the development of production in the region and to improve the quality of life of its residents. The strategy will also switch from a policy of stability support to economic boost” [40]. At present, the majority of strategies have been developed according to the concept of long-term social-economic development of the state, the concept of demographic policy of the state and the strategy of national security until a particular year.

*Social and economic situation of a region.*

This part describes the next data:

- macroeconomic situation;
- population and labor resources (demographics, labor resources and migration);
- quality of life;
- labor market;
- interethnic relations (when numerous ethnic groups live on the same territory, and this factor affects the political life of the region);
- potential of natural resources;
- production potential;
- power industry;
- net & communication;
- small and medium-scale businesses.

As it is often to be, in order to provide small and medium-size businesses with access to financing it is necessary to envisage:

- support for first-time entrepreneurs with grants (grants for establishing one’s own business, carrying out education programs for applicants);
- development of a micro-financing system (loaning for replenishment of funds to enterprises as well as to credit unions);

- foundation of guarantee funds (regional funds for guarantees of payments for small and medium-size business);
- support of small and medium-size business entities, including farm enterprises, by subsidizing a part of the interest rate on obtaining credits;
- establishment and development of infrastructural interregional elements for small and medium-size business support and development.
- banking activity and foreign economic activity;
- investment & regional finances;
- environmental protection and ecological security [12].

*Region's development scenario.*

The elaboration of the region's development scenario requires an assessment of long and short-term economic priorities. Short term priorities could lie in the area of agriculture, for instance.

The economic situation in a region is affected by inner processes as well as by global tendencies of economic development of the state. Therefore, it is possible to describe three development scenarios: inertial, general and optimal scenarios.

The inertial scenario of regional development stipulates fulfilment of all federal projects and strategies provided for the region by the state.

What considers the general and optimal development scenarios, as usual, they focus on major areas of development. For example: tourism development, industry development, transport network development, development of public healthcare, stimulation of investment activities and mechanisms of the strategy's realization and so on).

A list of priority investment and social projects (activities) or in other words, Federal target programs for a particular period to realize the Strategy to be found in Appendix 1 of the Strategy. Precisely such program-project approach is applied in the European Union, the USA, Canada, Japan as well as in other countries to solve strategic tasks of economy and social sphere development in cases when it is

necessary to concentrate resources to achieve specific goals within the established deadlines.

Federal Target Programmes are the efficient instrument to realize the state economic and social policy especially when solving long-term tasks and realizing large infrastructure projects. At regional level Federal target programs are adopted and presented as regional target programs.

The Ministry of Economic Development of Russia has performed significant work on reforming the federal target programmes institution. This allowed distinguish a range of issues to be solved with the programmes realization, eliminate the possibility of solving local and field tasks at the federal level through the use of such programmes, add them a greater goal direction, provide definite conditions and rules for their development and realization.

The total of federal target programmes measures realized in 2015 was directed to solving state policy priority missions in the directions of Consolidating and Enlarging Competitive Advantages in the Traditional Spheres (Energetics, Transport, Agricultural Sector, Natural Resources Processing), Structural Economic Diversification Based on Innovative Technological Development, Human Development, Transition to the New Model of Spatial Economic Development, set by the Concept for the Long-Term Social and Economic Development of the Russian Federation for the period till 2020 (the Regulation of the Government of the Russian Federation No.1662-r of November 17, 2008).

Let us provide you with certain ongoing Federal target programs being adopted at regional levels as well:

- the federal target program "Protection of Lake Baikal and the socio-economic development of the Baikal natural territory for 2012-2020";
- the federal target program "Housing" for 2015-2020 years;
- the federal target program "South of Russia 2014-2020 years";



- the federal target program "Improving the sustainability of residential buildings and the main objects of life-support systems in seismic regions of the Russian Federation for 2009-2018";

- the federal target program "Social and economic development of the Republic of Ingushetia for 2010-2020";

- Russian State Program "Development of the North Caucasus Federal District" for the period till 2025.

Our current Era of regional competitiveness, which began in the late 1990s, emphasizes identifying each region's competitive advantages and then prioritizing public and private investments necessary to exploit those advantages. Regions can compete globally by focusing on their unique assets. The challenge is to link and leverage these assets in new and different ways. In this constantly changing economic climate, a critical issue will be ensuring that federal and state economic development programs represent sound investments in economic growth. The nation will reap the biggest economic dividends when each of its regions invest in those public goods that matter most to increasing and maximizing a competitive edge in global markets.

## 1.2 Methods to research problems of competitiveness regional development strategies

Over the past two decades, the role of strategic management in Russia, given the varied and multi-directional vectors of different socio-economic institutions, remains significant. However, despite the quite long period of its formation and development, the issue of strategic management such as its quality, still remains relevant. The matter is, that innovation approaches to development whether at the federal or regional level, such as strategic planning, develops faster than Russian legislation system can implement them.

At present, the system of strategic planning in Russia (including regional and municipal levels) is beginning to be formed on a new basis. With the adoption of Federal law no. 172 “On strategic planning in the Russian Federation” in 2014 [12] the legal principles of strategic planning at the federal, regional and local levels were established together with the powers of the relevant federal and local authorities. However, practice shows that public authorities (mostly regional) and local governments have neither the expertise of quality strategic planning, nor technology for its implementation with the use of scientific techniques.

According to the collective of authors from the Institute for Socio-Economic Research at Ufa Research Centre of the Russian Academy of Sciences D. A. Gainanov, G. F. Biglova, A. G. Ataeva, one of the most common bottlenecks in most policies is a lack of coordination interests among interested parties (stakeholders) and the issue of determination of key potentials for economic development of territorial socio-economic systems (hereinafter - TSES) [11].

A lot of number of domestic research studies is devoted to studying «economic potential». Russian economists B.M. Mochalov, V.N. Mosin, D.M. Kruk, L.I. Lopatnikov, A.M. Rumyantsev consider economic potential as the total capacity of industries to produce industrial and agricultural products, carry out capital construction, transport cargo, and provide services to the population [18]. As for B. Plyshevskii, A. Todoseichuk, Y. Lychkin, and A. Tsygichko, they identify economic potential with categories such as “resources”, “investment”, “investment resources”, “national wealth”, “facilities and resources”. Another definition gives us L. Samoukin, O. Kozlova, who consider it in relation to production relations characteristic of each socio-economic structure, which occur between individual employees, labor groups, and management authorities of an enterprise or an organization, economic sectors as a whole on the full use of their abilities to produce goods and services [21].

D. A. Gainanov states that the main scientific problem of strategic planning and management system formation at all economic levels is misunderstanding of the

principles of strategic planning and its correlation with basic economic terms: market, potential, interests, resources etc. Quite often playing with economic terms takes place, confusion of definitions without systematic understanding of their correlation. To solve this problem, the author proposes a concept of strategic management of key development potentials of multi-level territorial socio – economic systems (hereinafter – TSES) which main idea lies in the concept: TSES development strategy is based on implementation of key development potentials of a particular territory, the transformation of which through the use of appropriate technology and competencies into new resources ensures the achievement of qualitative parameters of economic growth and the quality of life based on coordination of interests of TSES economic agents (Appendix D) [11].

As the researcher states it, the main idea of the concept is that TSES development strategy to be based on implementation of key development potentials of a particular territory, the transformation of which through the use of appropriate technology and competencies into new resources ensures the achievement of qualitative parameters of economic growth and the quality of life based on coordination of interests of TSES economic agents.

Ideally, methodological principles which meet the concept of strategic management is the following:

Principle 1. The target of the strategic planning itself is to achieve parameters of the country's national security and its regional projections.

The main purpose of strategic planning is rational distribution of efforts and resources of a relevant territorial socio-economic systems for ensuring sustainable socio-economic development and strengthening national security of both the country as a whole and its socio-economic parameters at the regional and local level.

Principle 2. The basis for territory's development is its capacity, which is a combination of tangible and intangible resources, unique technologies and competencies in the economic system.

Under the basis of development or potential we understand basic resources, which is exactly a set of tangible and intangible assets used to meet social needs of the territory's economic agents. They can be either explicit (recorded, controlled) or shadow (unrecorded and uncontrolled). However, the set of resources does not determine its ability to self-development and competitiveness in the long term. It is obvious that in modern conditions the main role in the formation of competitive advantages of both economic actors and territorial systems belongs to the ability to exploit their resources rather than to the resources themselves.

Principle 3. The choice of the territory's development vector is determined according to coordination of interests of economic actors and different territorial levels within a unified system of strategic planning in the Russian Federation.

Russian legislation implies formation of a three-level system of strategic documents: at the federal, regional and municipal levels. We are primarily interested at the second one. At the regional level, the following strategic documents are being developed:

- strategy for socio-economic development of the region;
- region's SED forecast;
- long-term budget forecast of the region;
- region's medium-term SED forecast;
- action plan for the implementation of the region's SED strategy;
- regional state programs;
- regional scheme of territorial planning [23].

Such a large number of documents take into consideration the interests of all economic agents: enterprises, households, federal, regional and local authorities. Interests of economic agents are defined as formalized needs of economic actors for any good, which is the motivation for decisions and actions in economic or other activities [6]. Unfortunately, we often face the situation when the set of municipal policies may in many positions be in conflict with the strategy of a constituent entity the Russian Federation, and the strategies of constituent entities – with federal

strategies. Furthermore, there is an absence of effective mechanisms of coordination in the framework of public-private partnership strategies of major companies, including natural monopolies.

In order to solve the problem of forming a unified system of strategic planning it is necessary to ensure the interaction of all levels of competitiveness of the national economy: macro-economic (management of economic system as a whole), meso- and microeconomic (interaction of enterprises, firms, and entire industries and households). Because priority of the country's national security parameters should become the main principle in this area with the greatest possible harmonization of interests within the country and individual economic actors. So, first of all it is important to understand whether or not the economic interests are implemented by setting goals and objectives which are expressed in performance indicators.

Principle 4. Methodological techniques for adoption and implementation of strategic documents at different governance levels are based on the program-project approach which claims rational allocation of resources to achieve strategic objectives of territory's development.

The traditional approach to the development and implementation of territorial and sectoral programs is the program-target approach. In paragraph 1.3 we are going to touch them by putting down the methodology for assessing the effectiveness of the implementation of the State Programs at regional level. The structure of programs and projects depends on the specific areas, as well as on the main stakeholders' strategic documents at their disposal, which can be implemented into the strategy of a localized area if there is at least one point of intersection through priority functions.

Development of a region is the most important task for regional governments, while strategic planning is the most important tool for development of a region in modern economy. Despite the active development of tools and methods for strategic planning, Russian federal, regional, and municipal authorities still have no clear understanding of the role, limits of application, and content value of

strategic documents. The methodological principles of the concept of implementation of strategic planning having been discussed in this paragraph could be helpful in creation the methodological basis for the development of documents on the long-term prospects of territories' development and develop a set of prompt tactical measures.

### 1.3 Methodology to assess the effectiveness of competitive regional strategies

We cannot imagine tools for assessment the effectiveness of competitive regional strategies implementation in modern regional economic research without the use of mathematical tools. The past fifty years of economic science can indeed be characterized by the development of a plethora of quantitative methods for describing, analyzing and predicting economic phenomena.

As it is known, one of the direct tools of realization of the regional strategy is the Program-target approach in managing regional development. The effectiveness of the implementation of State (targeted) program at regional level determines to a large degree the success of the regional development strategy being adopted.

The methodology for assessing the effectiveness of the implementation of the State Program takes into account the need for the assessments [36]:

- the extent of achievement of the goal and the solution of the tasks of the State program as a whole;
- the extent of implementation of the target level of expenditures;
- the timeliness of the implemented activities of the sub-programme and (or) the main activities of State Program.

There is a common approach to make an assessment of the extent of the objectives' achievement of the State Program adopted in the Russian economy (Formula 1):

$$DI = \frac{\frac{F_1}{P_1} + \frac{F_2}{P_2} + \dots + \frac{F}{P}}{K}, \quad (1)$$

where DI - indicator of achievement of planned values of indicators of State Program;

F – actual value of indicator of State Program;

P – target (planned) value of indicator of State Program in the reporting period;

k – number of indicators of State Program.

Assessment of the degree of timeliness of realization of the State Program is calculated as follows (Formula 2):

$$SS_M = \frac{SSN_{fact} + SSZ_{fact}}{2 \times M}, \quad (2)$$

where  $SS_M$  – the indicator of timeliness of realization of the State Program;

$SS_{fact}$  – the number of activities of State Program, that were carried out in accordance with the established deadlines;

$SSZ_{fact}$  – number of State Program activities completed with accordance of established deadlines;

M – number of activities of State Program.

What concerns the assessment of the extent of implemented target level of expenditures of the republican budget (BL), it is calculated by the Formula 3:

$$BL = O/L, \quad (3)$$

where BL – the indicator of the extent of implemented target level of expenditures of the republican budget;

O - actual realized performance of the republican budget funds under the state program in the reporting period;

L - limit of budgetary obligations for the implementation of the state program in the reporting period.

In the case when  $BL < 1$  through savings of budgetary funds, provided that all activities and indicators (indicators) are fulfilled, it is considered that  $BL = 1$ .

And finally, evaluation of the effectiveness of already implemented State Program ( $O_i$ ) is calculated according to the Formula 4:

$$O_i = 0,6 \times DI + 0,25 \times BL + 0,15 \times SS_M, \quad (4)$$

where  $O_i$  - the indicator of the effectiveness of the implemented State Program [36].

In the practical part of our work we are going to apply such methods of econometric modelling and forecasting as: modelling using regression equations of basic macro-economic indicators of regional development and forecasting using regression equations of basic macro-economic indicators of regional development. The role of econometric modeling and forecasting shouldn't be underestimated in regional economic research.

Theoretical and practical aspects of forecasting using regression equations in regional economic research at different times were discussed in the works of Russian and foreign researchers and scientists such as W.W. Leontief, A.G. Voronin, A.P. Gerasimov, V.G. Sadkov, D.A. Raisberg, D.L. Birch, and others. L. R. Klein, W. W. Leontief, F. Modigliani, J. Tobin and others.

Let us provide you with the definition of «regression analysis». Regression analysis is a form of predictive modelling technique which investigates the relationship between a dependent (target) and independent variable (predictor) [7]. This technique is used for forecasting, time series modelling and finding the causal effect relationship between the variables.

There are multiple benefits of using regression analysis:

- it indicates the significant relationships between dependent variable and independent variable;
- it indicates the strength of impact of multiple independent variables on a dependent variable [13].

Linear regression is usually among the first few topics which people pick while learning predictive modeling. Linear Regression establishes a relationship between dependent variable (Y) and one or more independent variables (X) using a best fit straight line (also known as regression line).

It is represented by an equation (Formula 5):

$$y = a + bx + e, \quad (5)$$



where  $a$  is intercept,  $b$  is slope of the line and  $e$  is error term. This equation can be used to predict the value of target variable based on given predictor variable(s). The difference between simple linear regression and multiple linear regression is that, multiple linear regression has ( $>1$ ) independent variables, whereas simple linear regression has only 1 independent variable.

Important Points:

- there must be linear relationship between independent and dependent variables;
- multiple regression suffers from multicollinearity, autocorrelation, etc.
- linear regression is very sensitive to outliers. It can terribly affect the regression line and eventually the forecasted values.

Forecasting practice has been improved since the 20-th century and has become more acceptable. Researchers involved in forecasting gained respect and some, such as Lawrence R. Klein, Wassily W. Leontief, Franco Modigliani, and James Tobin, even received Nobel prizes in economics. The methodology of forecasting is the study of the range of different approaches to undertaking econometric analysis and is concerned with rules governing the building of statistical models in economics.

According to researcher J. Scott Armstrong, forecaster's major tasks are: to formulate the problem, to obtain information, to select forecasting methods, to implement methods and finally, to evaluate methods, and use forecasts [27].

One of the main goals of creating econometric modelling research is building forecasts with a sufficient accuracy. By means of these techniques we can judge the effectiveness of implemented strategies according to changings (in prediction) in figures and whether they change in time with a tendency to gradual increase with linear subjection.

This paragraph is organized around the similar steps in order to conduct a forecasting of basic macroeconomic indicators of regional development in Chapter 3. Speaking generally, several principles are extremely useful for econometric

forecasters: keeping the model simple, using all the data you can get, and using theory (not the data) as a guide to selecting causal variables.

The very first step of strategy for economic forecasters is to define the objectives of the modeling effort. Often this is the most difficult part of forecasting. Defining the problem carefully requires an understanding of the way the forecasts will be used.

After the problem statement one should collect data or gather information on chosen variables. There are always at least two kinds of information required: (a) statistical data, and (b) the accumulated expertise of the people who collect the data and use the forecasts. For this purpose, in our research we use an official statistics data of regional economy priority sectors from the official web-site of Russian federal state statistics service.

The next step is to determine the set of variables which are sufficiently relevant. The initial list of variables can be lengthy, but one essential step is to whittle it down to about two or more variables before estimation. For this purpose, we made a comparative analysis of our variables by calculation the Simple Linear Regression Model's Parameters using the ordinary least squares (OLS) method, then we chose several ones, that are much more suited for further forecasting analysis according to its determination coefficients  $R^2$  which values are very close to 1. As we already stated, in order to make a prediction, we used the method of simple linear regression while selecting variables for multiple linear regression model. The main function of simple linear regression equation is to study relationship between the variables. Once we have the regression equation, we can use the model to make predictions. The regression line is the «best-fit» line, passing through the point spread plot. The equation for a line is the following and is presented in Formula 6 below:

$$y = a + bx, \quad (6)$$

where  $y$  - the dependent variable (that's the variable that goes on the  $y$  axis),

$x$  - the independent variable (i.e. it is plotted on the  $x$  axis);

b - the slope of the line;

a - the y-intercept.

a and b could be found the next way according to Formulas 7, 8:

$$a = \frac{(\sum y)(\sum x^2) - (\sum x)(\sum xy)}{n(\sum x^2) - (\sum x)^2}, \quad (7)$$

$$b = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}, \quad (8)$$

In its turn a linear model has the form as written in Formula 9:

$$y = b_0 + b_1X + e, \quad (9)$$

That is the same thing, you just use variables  $b_0 + b_1$  instead  $a + b$  and the  $\varepsilon$  is the error term.

The formula for correlation coefficient  $r$  for checking your model is as follows (Formula 10):

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2)}}, \quad (10)$$

Remember, you can use simple linear regression to find a predictive function only when a correlation coefficient shows that data is likely to be able to predict future outcomes and a scatter plot of the data appears to form a straight line [25].

As we practice the basic techniques of econometrics science on models with simple linear equations in order to develop them to more complex models, the next step will be the multiple regression analysis based on the construction of the multiple regression model. Multiple regression analysis is a powerful technique used for predicting the unknown value of a variable from the known value of two or more variables - also called as the predictors. More precisely, multiple regression analysis helps us to predict the value of  $Y$  for given values of  $x_1, x_2, \dots, x_k$ .

The multiple regression model has the form (Formula 11):

$$y = \beta_1 + \beta_2x_2 + \beta_3x_3 + \beta_nx_n + u, \quad (11)$$

where  $y$  – dependent variable;

$x_i$  – independent variable;

$\beta_i$  – unknown coefficient associated with  $x_n$ ;

$u$  – independent error.

The regression line we wish to estimate is as in Formula 12:

$$y = b_1 + b_2x_2 + b_3x_3, \quad (12)$$

where  $y$  – interception;

$x_n$  – independent variable (regressor);

$b_i$  – slope coefficient.

To estimate the regression line we use in MS Excel environment the Data analysis Add-in and Regression.

The regression output has three components:

- regression statistics table;
- ANOVA table;
- regression coefficients table.

The next step in studying our model is evaluation its significance using various tests, what we are going to speak about in more detail in Chapter 3.

To be able to build a forecast with a sufficient accuracy, it is necessary to make a prediction by choosing the required amount of time (years) based on the available data. In other words, build time-series simple linear models with two or more unknown variables. After putting the received values in linear regression models, we can get the predicted values individually for each variable for the given years in the future. By inputting these new values into the multiple regression equation, we finally obtain predicted values for the dependent variable  $y$ .

As a rule, forecasting using regression equations of regional development basic macroeconomic indicators suggests that almost any macroeconomic indicator changes in time with a tendency to gradual increase with linear subsection.

## 2. Competitive ability as a dominating idea for sustainable regional development

### 2.1 Criteria and parameters of regional competitiveness in the context of sectoral potential

Competitiveness of the region is determined by the presence of certain competitive sectors or segments of the particular industry as well as by the ability of regional authorities to create conditions for regional enterprises to achieve and retain a competitive advantage in certain areas.

Let's move from the macro level to the micro level on the example of a successfully developing industrial enterprise of one of the Russian Federation's subjects, namely, the Republic of North Ossetia-Alania. The analytical part of our study is presented in the form of analysis of financial and economic activity of open joint stock company "Kavdolomit" (hereinafter – OJSC «Kavdolomit»).

The Republic of North Ossetia-Alania is a federal subject of Russia located on the Northern slope of the Greater Caucasus, part of the North Caucasian Federal District. Vladikavkaz is the capital city of the region. It is one of the most densely populated Russian regions [42].

According to Head of the Republic of North Ossetia-Alania V.Z. Bitarov, today's economic development environment, even with the impact of the global crisis, is cardinally different from the situation in preceding years. Both official statistics and leading social and economic indicators show that North Ossetia is now one of the most stable regions in Southern Russia in terms of economic growth and development. The republic has been taking comprehensive measures to ensure an effective investment policy, create a favorable investment climate and improve the relevant legislative framework [33].

As is highlighted in the Concept for the long – term social and economic development of the Russian Federation until 2020, transition to the innovative – driven and socially – oriented stage of development seems impossible without the

formation of appropriate institutional environment in Russia determining the main «rules» of doing the business [15].

According to Russian Managers Association, the effectiveness of usage of the internal resources of an enterprise is no less important for the overall business growth than the external environment since the difference between the resource opportunities create a huge difference in the economic activity of the last ones [16].

This is an increasingly important for such an enterprise as OJSC «Kavdolomit» - one of the leading enterprises of the Republic of North Ossetia – Alania. OJSC "Kavdolomit" specializes in the production and processing of Bosninsky dolomite deposit. The enterprise is located in the capital city of the Republic of North Ossetia-Alania, in Vladikavkaz city Bosninsky dolomite deposit is one of the best deposits in Europe due to the high technological properties, cleanliness, huge explored and virtually unlimited geological reserves and favorable mining conditions of development. Moreover, it is a source of unique dolomite in its composition, which is characterized by consistency on chemical, mineralogical, petrographic and physico-mechanical parameters.

OJSC "Kavdolomit" is the main Russian exporters of dolomite. From 98 to 99% of the total Russian exports are accounted for a share of the enterprise [39].

Dolomites of Bosninsky deposits are high quality raw materials for the manufacture of glass, tar-dolomite refractories, magnesium oxide. OJSC "Kavdolomit" is the company of full production cycle, from raw material production to sales. The enterprise provides with dolomite the leading enterprises of the glass industry of the Russian Federation, Ukraine and Belarus. The main reserves nationwide dolomite for glass industry (71.5%) are concentrated in Bosninsky dolomite deposit. OJSC "Kavdolomit" offers the following types of products:

- dolomite lump and dolomite powder – for the glass industry;
- mineral powder for dry mixtures and mineral powder for asphaltic concrete and organomineral mixtures.

Among the enterprise's advantages there are:

1. Own resources: it allows you to make the necessary volumes of crushed dolomite not depending on the market situation and eliminating intermediaries.

2. High quality product: dolomites of Bosninsky deposit are characterized by consistency of chemical and physical and mechanical parameters.

3. Modern production technologies: allow to make the process of production of dolomite products perfect.

4. Reliable and stable supplies: availability of own raw materials, storage facilities, staff professionalism are the guarantee of the stability of supply.

Main competitors in the field of activity (within internal market) are considered the next companies:

- the State Unitary Enterprise (SUE) «Vladimirskoe Kariyeroupravlenie», Vladimirskaya Oblast’;
- JSC «Kovrovskoe Kariyeroupravlenie», Vladimirskaya Oblast’;
- LLC «Kapital Magnezit», Vladimirskaya Oblast’.

Prospects of development up to year 2020 are: the search for new consumers; creation a complex of production on the basis of dolomite raw material; technical re-equipment and modernization of acting facilities [30].

Main types of the enterprise’s activity are:

- mining, processing and sale of dolomite;
- production and sale of construction materials;
- foreign-economic activity;
- carrying out repair and construction works.

Management structure of OJSC «Kavdolomit» consists of such authorities as [35]:

- General Meeting of shareholders;
- Board of Directors;
- Director-General – the single-person executive body of the enterprise.

Visualized organizational structure of OJSC «Kavdolomit» is presented below (Figure 3) [35].

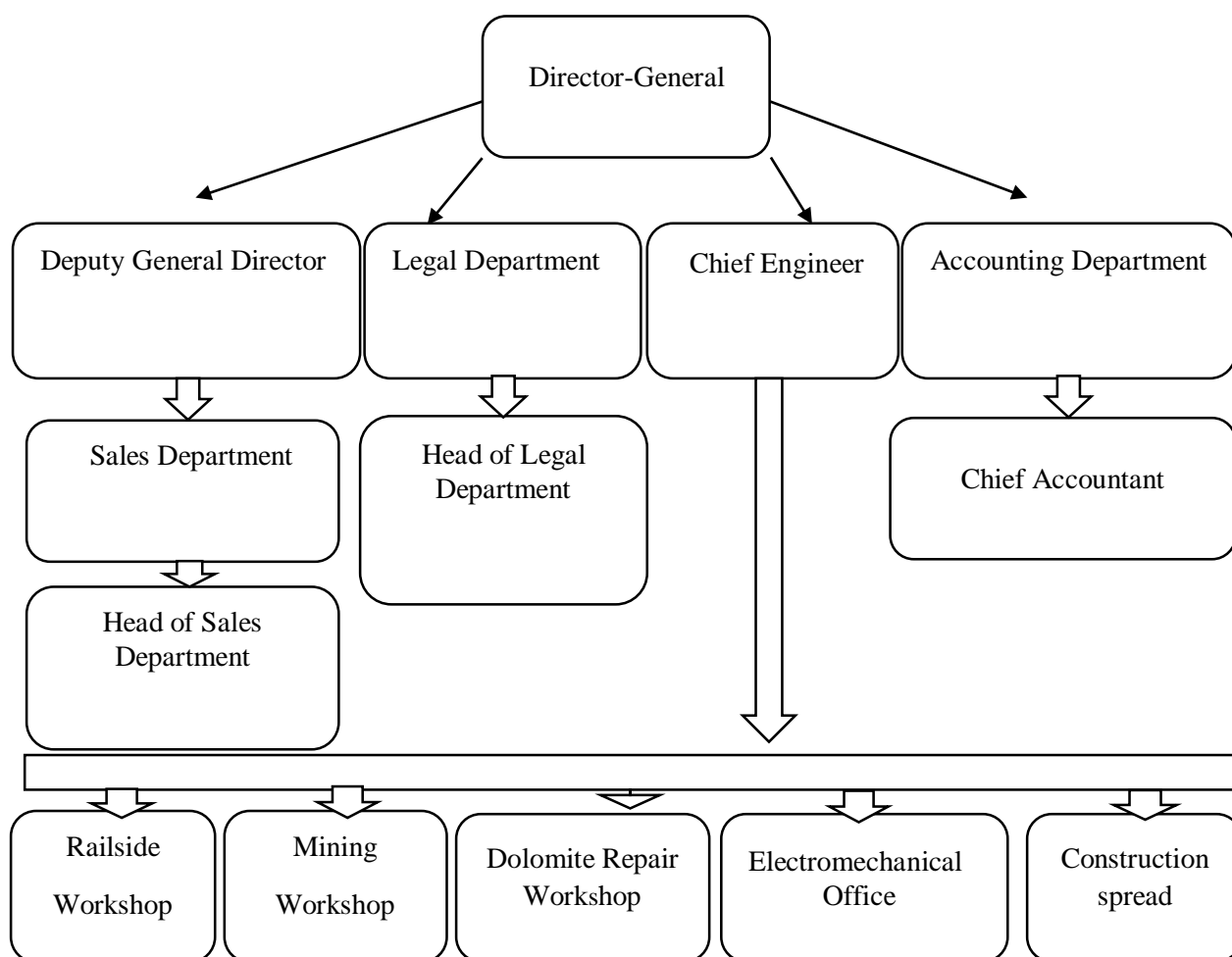


Figure 3 – Organizational structure of the OJSC «Kavdolomit»

The major body in charge of taking the most important decisions at OJSC «Kavdolomit» is General Meeting of its shareholders, the powers of which specifically include the elections of the Board of Directors. The enterprise shall be responsible to hold annual General Meetings of shareholders every year and considers the results of its activity. Equities produce income in the form of dividends. Dividends are part of the appropriation of a stock company's profit. Most often, the dividend payments are ultimately determined by the shareholders' meeting.

Board of Directors consists of 5 members:

Chairman of Board of Directors: Bestolov R. U. – Director General of OJSC «Almazzolotokomplekt», participatory share in the charter capital: 0%.

Members of Board of Directors:



Aguzarov R.A. – Director General of JSC «Kavdolomit», participatory share in the charter capital: 40%.

Kharlamov M.A. – Deputy General Director of JSC «Almazzolotokomplekt», participatory share in the charter capital: 0%.

Sumenov T. K. – member of Board of Directors of JSC «Almazzolotokomplekt»,

Buklov S.S. – Director of LLS «Briz», participatory share in the charter capital: 0%.

Management structure of the enterprise consists of such authorities as:

- General Meeting of shareholders;
- Board of Directors;
- Director-General – the single-person executive body of the enterprise.

The following financial analysis of OJSC «Kavdolomit» was conducted through evaluation and comparative analysis of such key financial indexes as performance measures, efficiency measures and profitability measures expressed in various ratios. The evaluation and comparative analysis were undertaken over the period from 2014 till 2016 based on the published information from the both balance sheet and annual report of the enterprise with the author's own processing [30, 32].

Exactly the financial analysis is one of the first tools to control the effectiveness of usage of the internal resources of an enterprise. Financial analysis is a process of examination of financial information of main results of a company's financial activity to assess the effectiveness with which funds and resources are employed in a company as well as efficiency and profitability of its operations in order to identify reserves to increase its market value and ensure further development [8]. The results of financial analysis play a crucial role in taking managerial decisions and devising a strategy for further successful development of a company.

Let's start with analysis of the efficiency of OJSC «Kavdolomit» sales presented in Table 1.

Table 1 – Analysis of the efficiency of OJSC «Kavdolomit» sales

Year	Sales, rub.	Profits, rub.	Assets, rub.	Asset Turnover	Profit Margin, rub.	ROA,%
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
2014	206 973	22 960	253 455	0,063	56 243	6,812
2015	255 410	50 034	297 659	0,167	57 533	13,202
2016	317365	100055	313879	1,038	50 800	28,943

Common profitability ratios include such indicator among other ones as Profit Margin, because investors will be reluctant to associate themselves with an entity with poor earning potential. Creditors also avoid companies with deficient profitability since the amounts owed to the creditors may not be paid. In its turn, Return on Assets evaluates how much profit a company is able to keep for every dollar it makes i.e. if the company is using money wisely. Therefore, in 2014, the return was 6.8% and the in the next two years it grew almost by three times - to 28.943%. So, productivity of Assets has increased. Having a sufficiently high return on Assets, the enterprise is using its Assets productively.

We also made a brief analysis of the enterprise's strengths, weaknesses, opportunities and threats known as SWOT-analysis, which is presented in Table 2 below.

Table 2 – SWOT-analysis of OJSC «Kavdolomit»

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>- own resources;</li> <li>- high quality product;</li> <li>- modern production technologies;</li> <li>- reliable and stable supplies;</li> </ul>	<ul style="list-style-type: none"> <li>- some significant workshops were re-equipped in the year 1974 las time;</li> <li>.</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>- to become a «millionaire» enterprise by increasing the Company's current capacity after full technical re-equipment in the framework of realization an investment project included in the strategic plan of social and economic development of the North-Caucasus Federal Region up to the year 2025;</li> </ul>	<ul style="list-style-type: none"> <li>- threats of indirect influence connected with political and economic situation in the country;</li> <li>- legal risks connected with changes in regulations of customs supervision;</li> <li>- scientific and technological progress creates prospects for the transition of glass enterprises to new technologies that can replace dolomite as raw materials.</li> </ul>

In order to have a more comprehensive view of the enterprise's economic activity, let's look at the key indicators of OJSC «Kavdolomit» presented in the Table 3.

Table 3 – Indicators of financial and economic activity of OJSC «Kavdolomit», 2014 – 2016

#	Indicators	Years			Growth rate, %
		2014	2015	2016	
1.	Revenue, thous. rub.	206 973	255 410	317 365	
1.1	% of the level of the previous year	138,0	123,4	124,3	128,6
2.	Cost of goods, thous. rub.	181 111	205 376	217 310	
2.1	% of the level of the previous year	135,9	113,4	105,8	118,4
3.	Cost of 1 rub. of product, rub.	0,88	0,80	0,68	
3.1	% of the level of the previous year	98,9	90,9	85,0	91,6
4.	Net income, thous. rub.	17 266	39 296	90 845	
4.1	% of the level of the previous year	132,7	227,6	231,8	197,4
5.	Product profitability, %	12,5	19,6	31,5	21,2

The Table 3 shows a significant growth of such indicators as revenue, cost of goods, net income and other ones to which they relate over the period under review. From the Enterprise's official reports it is known that in 2013 volumes of production and sales of products were considerably lower than in the next three years because of under – utilized capacity that is directly connected with the negative consequences of the world financial and economic crisis. So, the average annual growth rate for the years 2014 – 2016 were as following: revenue – 28,6%, cost of goods – 18,4%, net income – 97,4%. Thus, the most rapidly growing indicator was the net income that is mostly connected with the growth in other income and volume of production.

Comparing a company's performance from one period to another (current year vs last year, etc.) is named as trend analysis. This analysis determines the future viability of the business. There are four general classes of financial measures:

- Performance Measures;
- Efficiency Measures;
- Leverage Measures;
- Liquidity Measures.

All of the following calculations presented in the Table 4 are based on year-end balance sheet figures [32]:

Table 4 – Common-size financial statement of OJSC «Kavdolomit»

#	Indicator	Meaning			Growth (+, -), %
		Years			
		2016	2015	2014	
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
<b>Part 1 Performance Measures</b>					
1.1	Market Value Added, thous. rub.	201 854	111 009	71 713	68,2
1.2	Return on capital ROE, %	36,563	24,932	14,593	58,7
1.3	Return on assets (ROA), %	28,943	13,202	6,812	106,5
<b>Part 2 Efficiency Measures</b>					
2.1	Total asset turnover	1,038	0,167	0,063	343,5
2.2	Inventory turnover	2,755	2,533	2,315	9,1
2.3	Days in inventory	132,49	144,09	157,68	- 8,3
2.4	Receivables turnover	5,266	4,823	4,610	13,8
2.5	Average collection period (days)	69,3	75,7	79,2	- 6.8
2.6	Profit margin, rub	50800	57533	56243	- 6.95
2.7	Operating profit margin	30035	44549	38984	-9.15
<b>Part 3 Leverage Measures</b>					
3.1	Long-term debt ratio	0,0669	0,231	0,272	-57,4
3.2	Long-term debt-equity ratio	0,172	0,679	0,861	-47,85
3.3	Total debt ratio	0,208	0,470	0,533	-33,75
3.4	Times-interest-earned	6900,3	3450,6	1583,4	108,9
<b>Part 4 Liquidity Measures</b>					
4.1	Net-working-capital-to-total-assets	37,57	30,97	22,64	29
4.2	Net-working-capital, thous. rub.	117923	92195	57376	44,3
4.3	Current ratio	2,798	2,295	1,866	22,4

Quick ratio	1,255	1,065	0,905	17,4
Cash ratio	0,127	0,129	0,132	1,91

One of the indicators of economic efficiency is profitability. To be precise, it shows how efficiently the enterprise uses its material, labor and both financial and natural resources. There are at least three financial ratios reflecting profitability: Market Value Added (MVA), Return on Equity (ROE) and Return on Assets (ROA).

Shareholder wealth creation normally be represented by the market value of the firms' shares. It is the shareholders' appraisal of the firms' efficiency in employing their capital. So, it is possible to attain positive MVA only when the firm earns a return in excess of the cost of capital. From an investor's point of view, MVA is seen as the best indicator of shareholder's wealth creation.

The «market value» formula has the following interpretation: total of the firm's market value of debt and market value of equity. Invested capital also known as capital employed is the summation of equity and debt capital supplied by the firms' shareholders and debt holders to finance assets.

ROE measures net profit in comparison with the firm's own capital. Of all the fundamental ratios that investors are interested in, one of the most important is return on equity since it shows the income to shareholders per 1 RUB/EUR/USD invested.

ROA is another financial ratio which measures the amount of profit the firm generates as a percentage of the value of its total assets. In other words, the ratio reveals how much profit a firm earns for every RUB/EUR/USD of its assets. Generally, the higher ROA – the better, however, the profit percentage of assets varies by industry. For instance, in the USA the average ROEs in the mining industry are considered those between 5% and 9%, with the best-performing companies producing ROEs closer to 15% or better.

The Enterprise's MVA has grown from 71 713 mln. rub. in 2014 to 201 854 mln. rub. in 2016 with an average growth rate more than 68%. Positive MVA is definitely the sign of shareholder value creation.

According to the figures referring to ROE, it is possible to state that the net profit to shareholders per ruble invested is higher than 36% that indicates a positive return with average annual growth rate equal to 58,7%. So, OJSC «Kavdolomit» managed to increase its ROE over the studied period from 14,6% to 36.6%. As it was mentioned above, the higher the ROE is, the better it shows the worthiness of the investment.

In 2014 ROA was equal to 6.8% and 2 years later it grew more than 3 times - to 28.943% showing a steady growth more than 58% annually on average. It means that productivity of assets has increased. Having a sufficiently high ROA, the Enterprise uses its assets productively.

Efficiency performance ratios are also a helpful tool to evaluate an enterprise's performance. Such kind of ratios as Total Asset Turnover, Inventory Turnover, Days in Inventory, Receivables Turnover and Average Collection Period measure how well an enterprise uses its assets liabilities to generate income.

Total assets Turnover ratio indicates the efficiency of assets' using. In general, it applies that the larger the value of the ratio, the more positively the situation is assessed. A minimal recommended value of this indicator is 1. Yet the value varies among industries as well.

Another important indicator of efficiency is Receivables Turnover ratio. The turnover speed of receivables shows the number of turnovers or transformation into cash. The meaning of this ration is quite simple: the quicker the turnover the liabilities, the quicker an enterprise is able to collect and use the awarded money for other needs.

It is of high importance for a company to manage its inventory levels as it shows whether sales efforts are effective as well as whether costs are being controlled. So, for this purpose there exists an Inventory Turnover ratio assessing

how many times a company has sold and replaced inventory during a period. The speed with which a company can sell inventory is a critical measure of business performance. Obviously, the higher the inventory turnover, the better, since a high inventory turnover typically means a company is selling goods very quickly and this also indicates that there's demand for the product.

Figure 4 below illustrates the trend of efficiency measures of OJSC «Kavdolomit»:

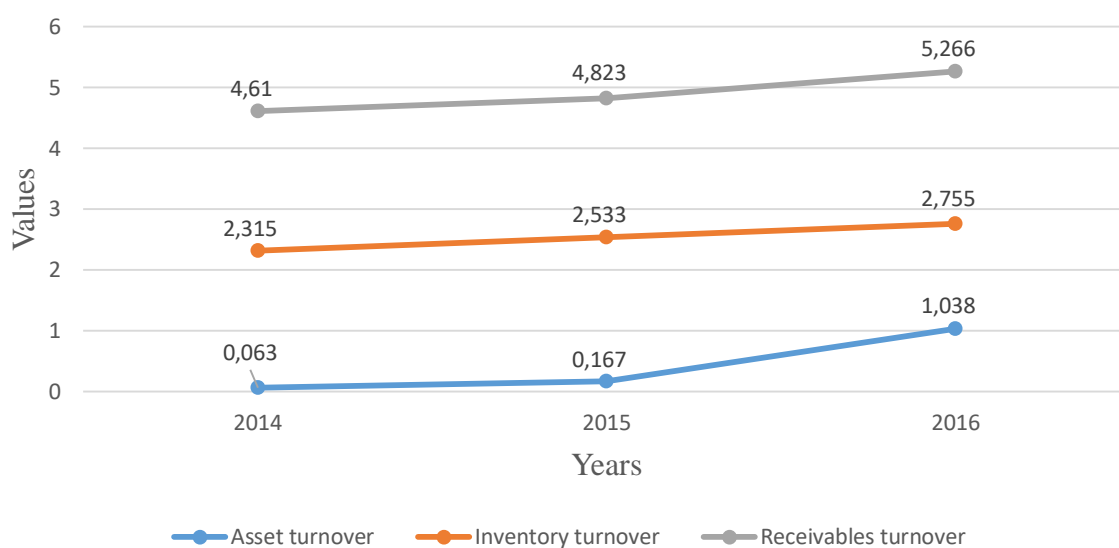


Figure 4 – Efficiency Measures of OJSC «Kavdolomit»

In general, the higher the Accounts Receivable turnover ratio, the better: it shows quick collection from customers and re-investment of the received money. However, a high ratio may show an over stringent credit policy which is an imprudent use of funds. In 2014, the Accounts Receivable Turnover ratio was 4.61% and the next year the ratio was equal to 5.82%, and in 2016, it was 5.266%. Therefore, we suppose, the enterprise is doing well its credit policy. To see the whole picture, the enterprise should also examine the average length of time that it takes to collect on receivables by determining the collection period. The Enterprise's Inventory Turnover and Total Assets Turnover have also increased from 2014 to 2016 according to numbers, demonstrating the positive trend over the studied period.

Such ratio as Days in Inventory measures how many days it takes for inventory turnover during the period. The Average Collection Period (days) is the amount of time taken for a business to receive payments owed in terms of accounts receivable. It has decreased from 2014 to 2016 that is a positive fact. We can suppose that the firm succeed in its credit policy and has improved it. Usually, a high DSO number tells us that company is selling its product on credit and taking longer to collect money.

As it is known, the higher the Profit Margin, the better the cost controls within the company and higher the return on every dollar of revenue. It is also an important measure of operating performance since it shows that the profitability generated from revenue. The higher Profit Margin values show that the profitability generated from revenue and so it is an important measure of operating performance. The enterprise's profitability ratio has increased from 2014 to 2016 demonstrating the average annual growth rate equal to 6.95%, this indicates that the enterprise managed to reduced costs and increased sales. Thus, the earning power of the business increased from 2014 to 2016.

Operating Profit Margin is the ratio of operating income to revenue of the company. The Operating Margin measures the volume of the revenue an enterprise has after cost of goods sold deduction of costs, and also general, commercial, administrative expenses, as well as expenses related to depreciation and amortization. The peak of operating profit margin was reached in 2015 which was followed by decreasing in the next 2016 year with average annual growth rate no less than 9,15%.

The next group of measures to be analyzed is the group of leverage measures. It includes the analysis of the following ratios: long – term debt ratio, total debt ratio, time – interest earned.

A decreased debt ratio is a good sign for any company. In 2014 the Company's total debt was higher if compared with the industry average (53,32% > 50%) but in



2016 it has decreased dramatically – to 20,84%, it indicates that paying off their liabilities has much improved the balance sheet results.

The last group of measures in the following analysis is the group of Liquidity measures which estimate the speed with which a company can turn its assets into cash to meet short-term debt. It is a company's ability to meet its maturing short-term obligations. This knowledge is of great importance for conducting business activity in the face of adverse conditions such as economic recession, for example. Let us have a closer look at the measures within the next category:

Quick ratio is also known as the acid-test ratio. It should be noted that inventories are not included because of the length of time needed to convert inventories into cash. This ratio was 0,9% in 2014 but it rose up in 2015 as well as in 2016 (1,255). Precisely, it measures how well an organization can meet its current obligations without resorting to the sale of its Inventory. It is known as one of the most «trustful» indicator of a company's financial performance.

As we can see, the Company's liquidity position has improved from 2014 to 2016. The Current ratio for 2014 was equal to 1.87%; it indicates that for every 1 ruble of current liabilities, the firm has 1.87 of current assets on hand. In 2016, the current ratio was 2.8 that shows very good results.

Net working capital was equal to 57 376 rub. in 2014, therefore, the liquidity position has improved from 2014 to 2016 (117 923). Such an increase in net working capital is a favorable sign, thus, the Company is doing well on liquidity front.

Net-working-capital-to-total-assets is one of the most keenly watched financial ratios by investors, business owners, and other stakeholders since it expresses the net current assets or working capital of a company as a percentage of its total assets. In 2014, working capital to current assets was 22.64% and grow up to 37.57% in 2016.

The conducted analysis of key financial indexes of OJSC «Kavdolomit» shows that there has been a positive trend of its financial indexes. Eventually, all of

this is the result of implementing the right development strategy and creation and further implementation appropriate and sound managerial decisions.

In 2016 the Republic's authorities have proposed over 30 top-priority investment projects as part of the Government Programme Investment Plan for the Development of the North Caucasus Federal District [33]. Implementing these projects will require public support from the federal budget in the form of government guarantees, partial loan interest subsidies and budgetary allocations from the Russian Investment Fund. One of the such 30 top-priority projects is OJSC «Kavdolomit». Initiator is the enterprise itself. Project summary: re-equipment of the open pit and construction of a dolomite grinding plant in the frame of the enterprise's strategy. On reaching design capacity, the open pit will have a total yield of 882,000 tonnes per year, and the production volume of dolomite powder (which is in high demand) will exceed 600,000 tonnes per year [39].

Nowadays in a constantly changing environment the activity of an industrial enterprise has been changed qualitatively. In order to work effectively in the conditions of increasing competition, an industrial enterprise needs constantly develop all aspects of its activity in the context of business environment. In this sense, the enterprise should evaluate and monitor its economic sustainability and ensure full and effective usage of internal factors of production development. Ensuring the stable functioning and development of the real sector of economy is the basis for implementing the strategy of sustainable economic development in the whole country. Being high on the political and economic agenda, development of theory and practice of economic stability of an industrial enterprise acquires an important theoretical and practical importance.

## 2.2 Priority directions of social and economic competitive development of the North Ossetia-Alania Republic

The Republic of North Ossetia - Alania is located in the North Caucasian Federal District of the Russian Federation. The area of the Republic is 8000 sq. km

(that is 0,05% of the Russian Federation square). 48% of the area consists of mountains. The Republic consisted of 6 cities, 1 urban-type settlement and 214 villages. The population of North Ossetia is in the amount of 704 000 people (0,5% of Russian federation population). 450,4 thousands of people live in urban area. The capital of the Republic is Vladikavkaz, where there live 307,3 thousands of people [42]. To give a general idea about the location of the Republic within the Russian Federation, Figure 5 is presented [41].



Figure 5 – Territory of the Republic of North Ossetia – Alania within the Russian Federation

The share of North Ossetian gross regional product within the GDP of Russia reaches 0,2%, while within the Northern Caucasus Federal District – 8,2% (2015 years' statistics) [37]. Stavropol krai, Republic of Dagestan and North Ossetia made the largest contribution to a total gross regional product of the Federal District (Figure 6). Rather low volumes of GRP in regions of North Caucasus federal district define a possibility of considerable growth rates of macroeconomic indicators in these constituent entities of the Russian Federation.

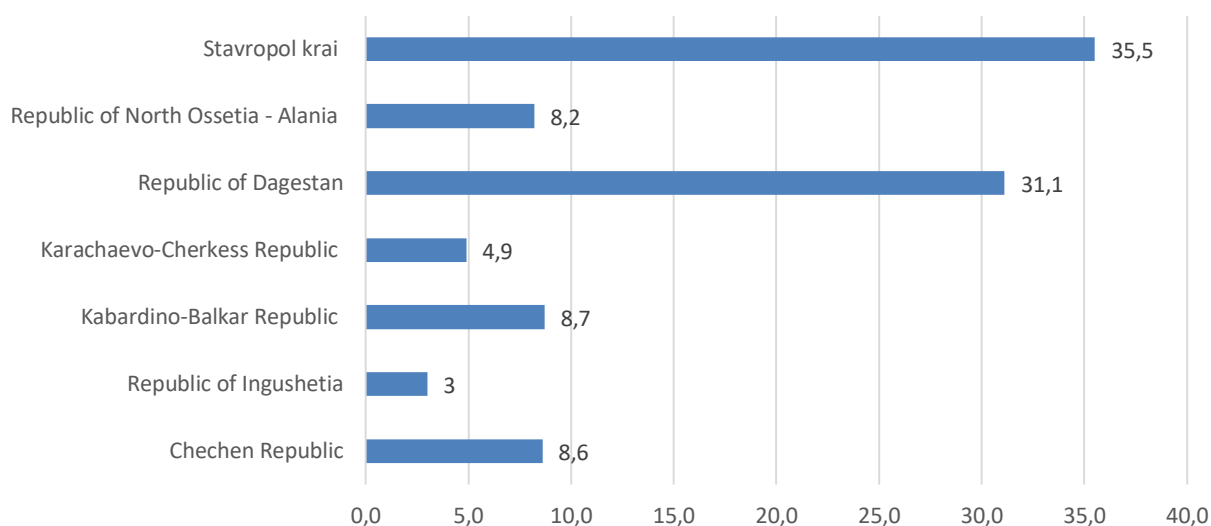


Figure 6 – Share of the constituent entities of the Northern Caucasus Federal Area within the total gross regional product, 2016, %

Macroeconomic effectiveness of a region is also characterized by values of gross regional product per capita. In 2015 the macroeconomic indicator reached 181 039.9 rub. (in current prices) and ranked the third place within the Federal District [37]. However, Northern Caucasus republics are far from the highest positions according to the values of gross regional product per capita among the rest of the Russian regions. So, for example, in 2012 gross regional product per capita in Northern Caucasus Federal District was 2.7 times lower than that of the average Russian, and as early as 2015 the gap has increased to 2.8 times [31].

Dynamics of the main socio-economic indicators of North Ossetia was varying over the period 2001 – 2015 [31]. It could be seen that the overall trend before the year 2007 is positive. As a result of financial and economic crisis of 2008 and then, 2012 there had been a marked decline in the growth rate of volumes of works and services in industrial production, construction, trade, transport and communication that on the mainly basis found its reflection in growth rate of gross regional product (Figure 7).

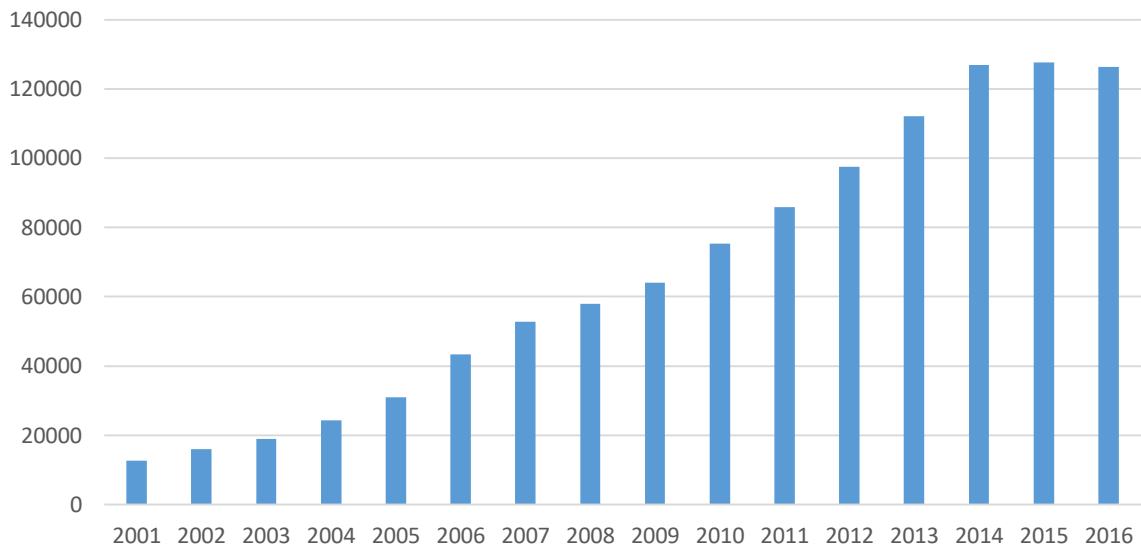


Figure 7 - North Ossetian gross regional product, 2001 – 2016 (in current process, mln. rub.)

Within the industry structure of gross regional product in 2015 the dominated industries are: services, agriculture, manufacturing, construction, transport and communication (Figure 8). Trade is a dynamically developing industry of North Ossetia and one of the primary sources of employment of population. According to official statistics of 2016, more than 40 000 people are involved in trade out of 293 659 officially employed population, while the share of trade comprises almost 18% in the volume of gross regional product [31].

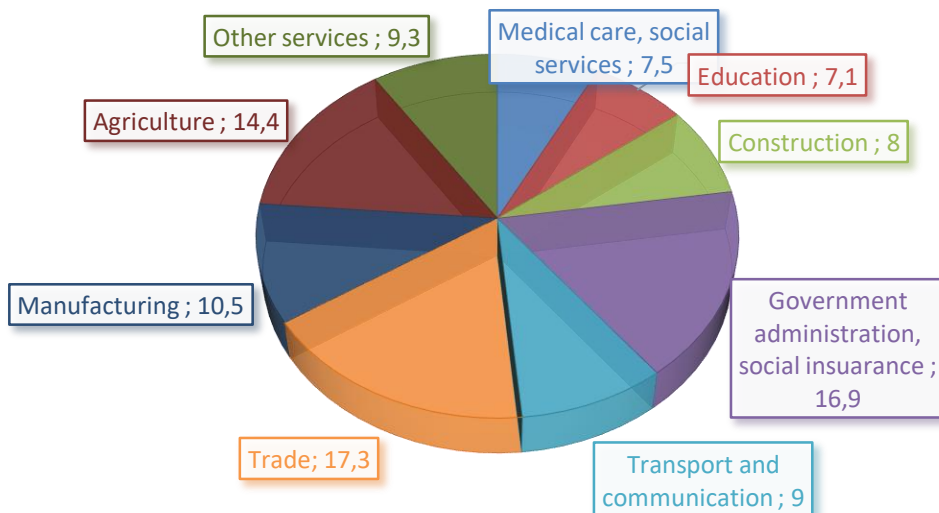


Figure 8 – Gross regional product structure of the Republic of North Ossetia – Alania, 2016, %

Key economic sectors in the Republic of North Ossetia-Alania which we are going to include in multiple linear regression model are: agriculture and manufacturing.

Agriculture is an important branch of economy of North Ossetia and make more than 14% within the structure of gross regional product. The overall state of agro-industrial complex over the period 2007 - 2016 is characterized by decrease of growth rate of total agricultural production from 137% in 2007 to 91.2% in 2016, averaging 110.06% annually [34]. However, the Republic is among those constituent entities of Russ which suffer from the lack of land resources. Therefore, for the region is of high relevance intensive methods of agricultural production: cultivation of fruit gardens, production and processing of vegetables, beef raising and dairy cattle-breeding. Interestingly, the annual growth rate of total agricultural production in both Federal District and Russian Federation are almost of the same rate: 112.5% and 112.6% respectively.

In 2016–2020, the main tasks facing the Republic’s agriculture sector are oriented toward implementing a government programme to develop agriculture and regulate markets for agricultural produce, raw materials and foodstuffs. The main indicators of the industry is presented in Table 5 below [31].

Table 5 – The main indicators of agriculture sector

Main indicators of agriculture sector	Years								Growth rate, %
	2009	2010	2011	2012	2013	2014	2015	2016	
Agriculture, mln. rub.	17,801	21,464	23,448	25,877	25,719	26,653	24,484	25,310	5,57
Number of small agribusiness enterprises, units	997	1025	1235	1349	1489	1474	1481	1378	4,98
Production in farms of all categories, thous. tons	557,5	500,6	595,0	617,9	748,5	850,4	652,0	707,5	3,2

The Table 5 shows us a sustainable growth in each column from 2009 to 2013 which slow down by 2016, namely: the average annual growth rate in agriculture during the studied period was 5,57%, a number of small agribusiness enterprises has increased from 997 in 2009 to 1378 in 2016, showing the average annual growth rate no less than 4,9%. What considers production in farms of all categories, the average growth rate was equal to 3,2%.

Considering the period 2009 – 2016, agricultural production index achieved its highest value in 2011 (equal to 106.0%), then it was gradually declining up to the 2016 when it reached its minimum over the past 8 years (87.9%). Therefore, the average annual growth rate of agricultural production index was 97.4 % [33].

Today the key objective is to meet growing consumer demand in RNO–Alania and neighboring regions with home–grown livestock products. Plans also call for continuing to develop small agribusiness enterprises to more efficiently integrate small landholdings and private farms into the republic’s larger economy.

In the period up to 2018, plans call for setting perennial plantings in an area of up to 380 ha annually to complete reconstruction of low–yielding gardens, and revitalize a garden nursery complex capable of producing plantings at a capacity of 100–150,000 fruit transplants and 500,000 shrub transplants.

The first steps are now being made to establish agribusiness holdings that will enable a more rational use of agricultural and processing enterprises’ production capacities:

- LLC Iraf–Agro (crop, poultry meat and whole milk production). Milk and meat processing entities equipped with up–to–date facilities;
- JSC North Ossetian Gormolzavod (whole milk products, yoghurt, ice cream production);
- LLC Master Prime Beryozka (dairy, cheese production);
- CJSC Alpha Dairy Factory (dairy products);
- LLC Da (meat and sausage products, and specialty foods production);
- LLC Alania–Fish (trout breeding, production and processing);

- JSC Semenovod (corn seed, rapa seed and soya seed);
- LLC MADIO+ (construction of a fur farm with full-cycle mink and sable breeding).

The development of wholesale and retail trade sector is an important indicator of the investment development, since the sector has one of the largest share in gross regional product of the North Ossetia-Alania Republic. One of the main indicators of wholesale and retail trade are shown in the table below (Table 6) [37].

Table 6 – Key indicators of sector of trade (in current prices, mln. rub)

Indicator	Years								Growth rate, %
	2009	2010	2011	2012	2013	2014	2015	2016	
Gross retail trade output, mln. rub.	44.69	54.37	6736	76.49	84.22	92.89	101.9	105.3	113
Gross trade output per capita, rub.	63722	76353	94777	108101	119275	116101	144655	149749	112.9

Despite the negative trend of share of trade within the industry structure of gross regional product during the period 2009 – 2016 [31], the annual growth rate of such indicators as gross retail trade output and gross trade output per capita are characterized by sustainable growth (growth rates are equal to 113% and 112.9% respectively).

The largest share in the commodity structure of retail trade turnover in 2016 refer to:

- knitted goods – 8,2%;
- motor spirit – 6,0%;
- leather shoes – 4,7%;
- confections – 3,1%;
- construction materials – 3%;
- fresh vegetables – 2,9%;
- fresh fruit – 2,9%,



- alcohol beverages and beer – 2,3%,
- bakery – 2,3%,
- dairy – 2,2%.

In addition to the presented analysis here we propose brief statistics of regional major companies of wholesale trade and their financial indicators (Table 7) [33].

Table 7 - Regional major trade companies and their financial indicators

#	Company	Industry	Revenue, mln. rub.		Selling increase, %	Earnings (losses) before tax, mln. rub.	Net income, mln. rub.
			2015	2014			
1	LLC «Amira»	wholesale trade	1 756,90	1 763,30	-0,4	0,2	0,2
2	LLC «T I K»	wholesale trade	1 710,50	1 421,20	20,4	136,9	109,6
3	LLC «Alaniaregiongas»	wholesale trade	1 829,50	1 490,70	22,7	0,6	0,6
4	LLC «OPT-TORG»	wholesale trade	1 818,80	1 803,90	0,8	362,3	362,2
5	LLC«Steyton»	wholesale trade	1 984,70	2 346,10	-15,4	0,1	0,1
6	LLC«Atlant»	wholesale trade	2 915,70	1 417,00	105,8	2,4	1,5
7	LLC«SNS Vladikavkaz»	wholesale trade	2 546,70	2 839,30	-10,3	29,4	22,4

The described trends determine that general economic instability and uncertainty about the future as well as further ruble devaluation influence consumer behavior. Many economic limitations were introduced in 2014 and they have certainly affected consumer behavior. The embargo placed on food imports resulted in increasing prices for imported products and price rises for raw materials and ingredients both domestic and of foreign origin.

In the Republic of North Ossetia-Alania as industry-stars occupying a dominant position according to the market share and growth rate of industry we consider wholesale and retail trade, agriculture and manufacturing. These industries may require significant financial investments and support.

The Republic of North Ossetia–Alania has a well–developed manufacturing sector and possesses the essential infrastructure for investment. Of practical interest are the identified and explored deposits of limestone, marl, dolomite, marble and basalt. Inert construction materials (clay, sand and gravel) are widely used. There are oil deposits with prospective resources of about 13.4 million tons in the republic. The Republic of North Ossetia–Alania is developing in accordance with the objectives and priorities of the long-term development strategy of social-economic and investment sectors, which reflects the development of key sectors of the Republic’s economy. Environmental conditions in the Republic allow successful development of many industries, while subsurface resources rich in various minerals create necessary prerequisites for that.

RNO–Alania’s profitable companies posted earnings growth of 67.8% in 2014. RNO–Alania produces 35% of Russia’s zinc, as well as 46% of lead, 15% of hard metal alloys, 83.6% of electric contactors, and about half of curtain fabric produced in Russia [17].

In addition, the republic is home to manufacturers of building materials and components (JSC PZhBI and JSC MOEMZ), glass (JSC Iristonsteklo), electric contactors, furniture (JSC ROKOS), corrugated board packaging (JSC Digorsky Corrugated Board Package Plant), knitwear (JSC Mozdok Clothing Factory), starch products (JSC Beslan Corn Plant) and an enterprise for repairing railway rolling stock (JSC Vladikavkaz Car Repair Plant).

In the industrial sector, there operate 60 large and medium-sized enterprises for mining ores, dolomite, repair of railway rolling stock, production of lead, zinc, tungsten, copper rolled products, hard alloys, building materials, glass, electrical equipment, packaging, furniture, knitwear and food products. The share of individual product types is rather significant in the national scale. For example, the republic produces 39% of Russia’s zinc, 46% of lead, nearly 38% of tungsten, 15% of hard alloy metal, 32 % of cadmium, one third of electrocontact material and about half of curtain fabric [38].

The Republic has significant stock of various construction materials:

- sand and gravel composites – 250 mln. cub. m at 33 deposits and sites;
  - mortar sands of various commercial categories – 16265 thous. cub. m and 27290 thous. cub. m of C2 category;
  - brick tile – 16 deposits and sites. Moreover, there are 40 types of clay referring to the different genetic types which have been tested in production of drilling fluids, ceramics and pottery;
  - dolomites- 228076 thous. ton of A+B+C categories and 4231 thous. ton of C2 category reaching 70,7% of the crude dolomite material for glass industry and 10,2 % of Russia's national dolomite stock;
  - limestones - 105871 thous. ton of A+B+C1 categories (8,3 % of Russia's national carbon-bearing raw stock);
  - marls – 95598 thous. ton of A+B+C1 categories;
  - bentonite clays - 50 mln. ton of P1+P2 category and 10 mln. ton of C2 category;
  - quartz sands – 8,5 mln. cub. m of the explored stock and more than 65 mln. ton of prospective resources;
  - facing stones– 2953 thous. cub. m of A+B+C categories;
- and there are also promising deposits of healing stone [34].

More than 70% of Russia's national stock of dolomites is concentrated in the republic. OJSC «Kavdolomit» provides full technological re-equipment and production expansion including special-purpose machines; crushing and screening equipment; construction, mastering and commissioning of facilities for grinding of sledged dolomite, railroad construction and launch of the diesel loco. The overall production efficiency upon reaching the rated capacity level will come to 882 thousand tons per year.

Let's look more precise at main indicators of mining and manufacturing industry presented in the Table 8 below [31].

Table 8 - Main indicators of mining and manufacturing industry of the North Ossetia-Alania Republic

#	Main indicators of mining and manufacturing industry	Years								Growth rate, %
		2009	2010	2011	2012	2013	2014	2015	2016	
1	The number of active enterprises and its subsidiaries according to type of activity, units:									
1.1	Mining	70	65	66	68	72	58	56	54	-3,3
1.2	Manufacturing	806	735	886	1031	1014	915	900	909	2,3
2	Volume of locally produced and shipped goods, performed works and rendered services according to type of activity, mln. rub.									
2.1	Mining	319	407	326	358	433	547	628	581	10,3
2.2	Manufacturing	11396	14003	15522	15564	16639	16561	22649	18685	8,5
3	Industrial Production Index in % to the previous year	98,8	106,0	110,6	102,6	107,9	97,7	91,7	89,6	-8,3
4	Production Index according to type of activity in % to the previous year									
4.1	Mining	122,9	123,9	128,0	80,2	101,7	97,2	108,7	105,0	-0,34
4.2	Manufacturing	112,0	99,5	111,8	105,3	107,8	99,0	89,0	87,7	0,06

The Table 8 shows us a sustainable growth in each column from 2009 to 2013, however, starting from 2014 the indicators were decreasing during the next three years. From 2009 and by the year 2016, the number of active enterprises and its subsidiaries in mining sector has decreased from 70 to 54 ones with average annual negative growth rate 3,3%. It is obvious that the same recession trend is seen in

production index of mining sector which decreased from 122,9% in 2009 to 105% in 2016. The opposite trend could be noted in manufacturing industry – the average annual growth rate of the number of active enterprises was equal to 2,3% and what considers the volume of locally produced and shipped goods, performed works and rendered services, the figures also demonstrate growth rate no less than 8,5% annually.

Despite the recession in the number of enterprises within the mining sector, the volume of locally produced and shipped goods, performed works and rendered services in the industry were increasing annually by 10,3% on average over the studied period.

What concerns industrial production index, its peak value was in 2011 when it was equal to 110,6% and beginning from the next year the figures tend to decrease with average annual negative growth rate 8,3%.

Despite, the main sources of employment remain agriculture and trade sector which continue to create new jobs for locals, the population today faces high level of unemployment leading to low standards of living among the majority of population. Besides, the population gives the following ranking of challenges:

- corruption (“everything is for sale, those who have money will always go unpunished”);
- lack of opportunity for young people;
- low level of the leadership’s professionalism.

One of the reasons behind the issues is that the Republic is a subsidized region, in general two out of three rubles in the Republic’s budget come from the federal center [34].

Since the Republic is agriculture-oriented, the key problems affecting its agro-industrial complex is the shortage of lands suitable for farming and high wear and tear of the sector's fixed assets.

Foodstuffs and farm commodity have been imported in the amount of 16.83 million USD (35.5% of import volume) in 2015. The volume of the imported product is 7.3% lower than in 2014.

In 2015 external trade turnover of the members of External Economic Activity of the Republic of North Ossetia amounted 92.67 million USD that is 13.1% lower than during the same period in 2013 [37].

The external trade balance was negative in the amount of -2.15 million USD. Its formation was mostly influenced by the trade with: Armenia (negative balance is -7.80 million USD), Italy (-7.46 million USD) and China (-4.98 million USD). Meanwhile the essential magnitude was positive trade balance with Turkey (18.45 million USD.) The Republic of North Ossetia share among the subjects of the North Caucasian Federal District in 2015 in external trade turnover is 2.95% (in 2014 it was 3.36%) [37].

The share of export in the commodity turnover of the Republic is 48.83% of cost volume in I-IV quarter of 2015. The members of External Economic Activity of North Ossetia carried out export operations in the amount of 45.26 million USD that is 2.76 million USD lower than the same period 2014. Members of External Economic Activity of the Republic in their export operations favored non-CIS countries. The cost volume of export in these countries is estimated at 40.43 million USD (with the share of export 89.3%). In the CIS countries it is estimated at 4.82 million USD, or 10.7% [34]. Study of investment risk elements of the Republic and its ranking in the context of opportunities and threats for regional development is presented in the Table 9 [33].

Table 9 – Ranking of investment risk components as opportunities and threats for development of the North Ossetia-Alania Republic

Factors of investment risk	Rank of risk according to opportunity for development	Rank of risk according to threat for development
Ecological risk	8	1
Social risk	6	2

Economic risk	2	3
Financial risk	3	4
Administrative risk	5	5
Criminal risk	7	6

Rank of investment risk as an opportunity for development is characterized by the probability of income from investment, as a threat for development – by the losses after investment of financial resources.

### 2.3 Regional competitive ability in foreign and domestic markets

Key determinants of regional competitiveness may be identified as: productive capital, human capital, infrastructure, the competitiveness and adaptive capability of firms (for example innovation) and the interactions of all these factors.

At current time researchers and regional policy makers are actively discussing methodological and applied aspects of region's competitiveness as a factor of the economic growth of the national economy and the regions themselves [23].

Among the competitive advantages of the Republic of North Ossetia on the domestic market there could be highlighted the following ones [40]:

- quality of human capital (highly - educated, healthy population with cultural traditions) is the main resource for almost all targeted strategic priorities of development;

- the natural and climatic conditions and cultural-historical heritage create the potential for the development of a tourist - recreational complex, which can become an engine of growth in the development of small businesses in the provision of services and handicrafts;

- the Republic's geostrategic position at the crossroads of two the most important transport corridors of the North Caucasus ("Trans Caucasus" and "North-South"), which contributes to the development of economic relations between the North Caucasian republics;

- realization of high energy potential through the construction small hydropower stations on mountain rivers can not only cover the republic's need for electricity, but also produce it for external consumers.

The essence of the interpretation of competitiveness is the region's ability to compete and strive to gain a leading position. However, it should be understood that competition between regions within the country has significant differences from competition between countries, both in content and in form [21]. The majority of studies focused on the region's competitiveness are more or less related with the studies of the production of competitive goods by enterprises located on the territory of a region. Competitiveness of such enterprises is seen as the most important factor of regional competitiveness itself. In its turn, competitiveness of a region can determine the competitiveness of an enterprise located on its territory. Today among the competitive enterprises successfully performing its activities in the Republic of North Ossetia-Alania are the following: industrial enterprise «Kavdolomit», furniture factory «ROKOS», technological centre «BASPIK», group of companies «Bavaria» and others.

Today, the region's competitiveness in the external market is closely connected with the notion of globalization. It requires a huge effort to win a worthy place on the market, especially on the growing and perspective ones.

The logic of global competition leads to the elimination of less efficient productions and as a result - to the victory of those ones which possess unique technologies and the highest efficiency. According to some scientists and politicians, more than half of the world's population is engaged in deliberately inefficient production. And really, Russian entry to World Trade Organization threatens the existence of many uncompetitive manufacturing enterprises [18].



Competitiveness in the real sector, in its main industry - manufacturing is determined by such indicators as growth rates, structure, scale of production, costs per production unit, its quality. Among the industrial enterprises within the North Caucasus Federal District implementing large-scale investment programs should be highlighted the North-Ossetian metallurgical plant "Electrozinc" located in Vladikavkaz. Among the perspective segments of the North Caucasian industry is the sector of defense, among which is the «Pobedit» plant also located in the capital of the North Ossetia Republic.

Competitiveness of the region is also determined by the industrial production index. For example, in 2016 the leading position was occupied by the Republic of Dagestan (140,3% in relation to the preceding year), the growth rates of Stavropol kray and the Karachay – Cherkess Republic were 107,6% and 106% respectively [31]. According to the index of industrial production, the Republic of North Ossetia-Alania ranks the 4<sup>d</sup> place - behind the Karachay – Cherkess Republic and the Kabardino – Balkarian Republic. However, as of results of 2016 of socio-economic development of North Ossetia the main macroeconomic indicators experienced negative growth. The least increase in the index of industrial production were observed in the Republic of Kabardino – Balkaria and in the Republic of Ingushetia: 100,7% and 100,2% respectively [31]. The relatively low rates of industrial production in the Republic of North Ossetia are primarily because of the fact that as soon as the Republic opened for the penetration of higher quality imported goods, there were closed such local factories as shoe factory, sewing factory, stocking factory, leather factory, watch factory. In recent years the production of alcohol, vodka and alcoholic beverages increase its capacity. As for the champagne, grape wines, North Ossetia is one of their main producers in these segments [33]. The opportunities of foreign economic relations are restrained by the fact that it is impossible to provide a high qualified product with relatively low production costs and a high degree of competitiveness on the old, physically and morally obsolescent equipment most of our enterprises. According to the analysis of the main production

facilities of enterprises, with which the Ministry of Industry and Trade interacts, the wear of machinery and equipment is about 57% [15]. Another important indicator is the rate of retirement and renewal of main production facilities. Unfortunately, it is too low - 1.9-2.5 (retirement), 2.4-3.7 (renewal). There is a notion of competitiveness not only in terms of quality, but also in terms of production costs (cost price). The best option is when these two components are combined which makes it possible to produce high quality products with the minimum costs.

## 2.4 Factors of regional competitiveness

Practically, different definitions of competitiveness depend on focus of interests. Researcher Iain Begg proposes to us the following definition of competitiveness at the company level: “For a firm, competitiveness is the ability to produce the right goods and services of the right quality, at the right price, at the right time. It means meeting customers’ needs more efficiently and more effectively than other firms” [5]. For the nation, the OECD defines competitiveness as: “...the degree to which it can, under free and fair market conditions, produce goods and services which meet the test of international markets, while simultaneously maintaining and expanding the real incomes of its people over the long term” [4].

According to Professor Michael E. Porter from Harvard Business School, economic policy to enhance competitiveness, especially at the federal level, has traditionally focused on opposite poles. On one extreme, policymakers have sought to improve the general business environment that affects all firms. On the other extreme, policies have sought to benefit the competitiveness of individual firms and workers.

However, a crucial locus for federal economic policy has been largely ignored, which is clusters. Clusters are a striking feature of all modern economies. They are geographic concentrations of firms, suppliers support services, specialized infrastructure, producers of related products, and specialized institutions (e.g.,

training programs and business associations) that arise in particular fields in particular locations. Clusters often involve a mix of manufacturing and services, and combine industries in different parts of traditional industrial classification systems.

For example, the cluster mapping project at Harvard Business School has utilized the locational correlation of employment in pairs of industries to define cluster boundaries across the entire economy [2]. The original data reveal 41 traded clusters, each of which can be divided into a number of sub-clusters of industries whose locations are ever more strongly correlated. Cluster mapping reveals the distinctive economic geography of each region. Figure 9 presents a map of the United States' which reveals the leading clusters in a selection of regions:

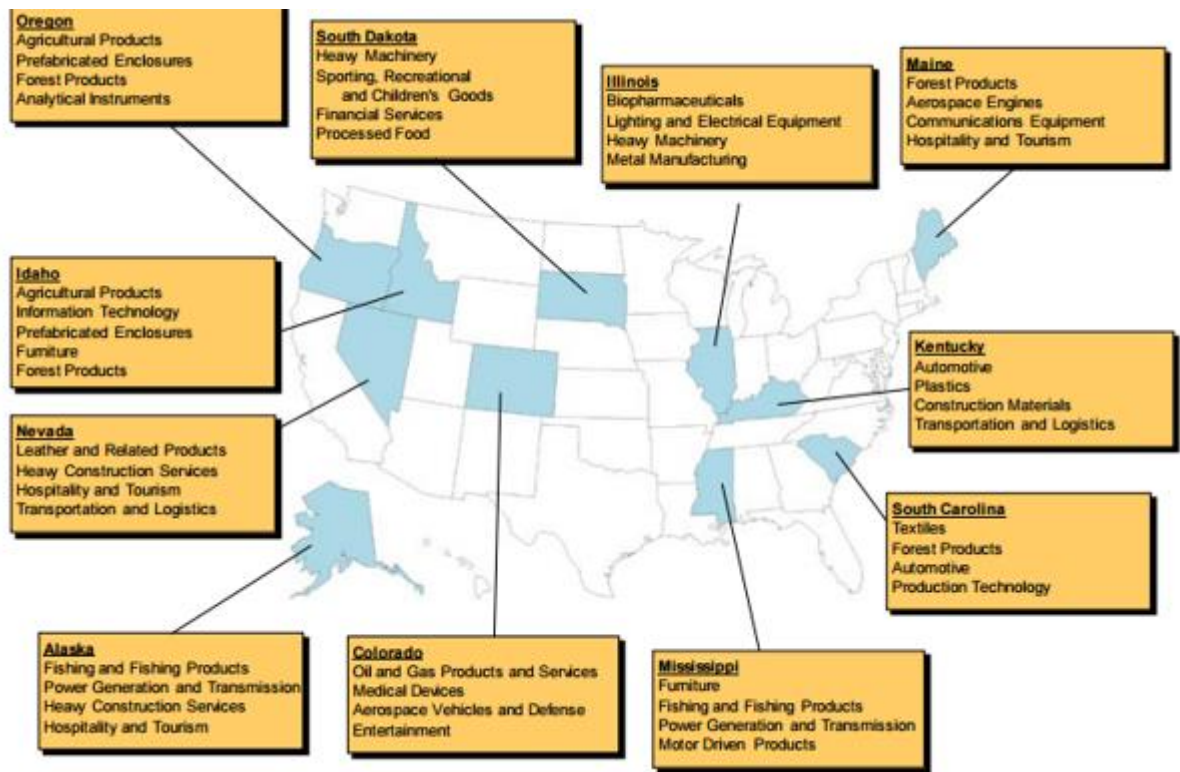


Figure 9 – Specialization by Traded Cluster (the USA, 2009)

On average, the top five clusters account for 52% of traded employment in United States Economic Areas.

Clusters emerge spontaneously based on market forces, and the process of cluster formation will occur naturally as new firms form, suppliers develop,

infrastructure investments respond to local needs, specialized institutions grow, and established firms elsewhere locate operations in growing cluster concentrations.

However, cluster mapping data is currently available only for the USA and Canada but it is a good idea to be adopted by other countries and, in particular, in Russia.

Definition of interregional competition may be conceptualized as the following: a process that occurs among territorial units aiming to increase the welfare of the people living in the cities or regions by promoting the development of regional and local economy, a development that certain groups try to influence explicitly or often implicitly through local policies by competing and rivalizing with other territorial units [14].

Here we propose some key characteristics of interregional competition:

- improvement of the welfare of the population living in the region is one of the key aims of the international competition. This income is distributed to a wide range of the local population especially through a high rate of employment;

- the players of interregional competition are the territorial units: regions and cities, the interests of which are represented by local groups often competing with one another. In this sense, the (city or county) local government's coordinating role is indispensable in this network;

- the main instrument of interregional competition is the development and implementation of local economic development ideas facilitating the economic development. The creation of a business environment that generates an improvement in the income generating capacity of the local economy is obviously essential;

- interregional competition occurs primarily among the territorial units of the same hierarchical level and in the same competitive phase, so among cities or regions of similar development level and size. Therefore, an industrial region, for instance, is not a direct competitor of an agrarian region or a city region operating as a logistics-financial centre.

One can notice that the results of interregional competition are similar to those of the competition among countries: in the region successfully competing welfare (living standard) improves, employment and incomes (wages) are high, new investments take place, talented young people and successful businessmen move there, etc.

Summarizing the competition among regions, it occurs with economic goals to achieve the constant improvement of living standard. Competitive advantage is created and sustained through a highly localized process. Differences in national values, culture, economic structures, institutions, and histories all contribute to competitive success. The economic development of a region depends on a number of factors which influence it mainly bases in a macro-economic aspect. Each region has its specific characteristic; thus area-surveyed indicators may not have sufficient predicative potential. Regions can only be successful by actively implementing a bottom-up development strategy that departs from a widely accepted vision of future and harmonizing projects that have different economic development effects with the help of dynamic regional networks.

### 3. Enhancement of public administration of social and economic regional development

#### 3.1 Methodology to develop competitive strategy of social and economic regional development

Achievement of a high level of economic and social development of the Republic of North Ossetia-Alania is possible in the result of a multilevel modernization. In 2012-2025 development of the Republic will be completed in five stages [40].

The first stage (2012-2013) is based on the implementation and expansion the existing competitive advantages in traditional spheres of economy with the purpose of increase of efficiency of resource economy and formation of preconditions of stable industrial development model. At this stage, there will be established foundations of institutional development and formed the basis of the innovative core.

It is necessary to create conditions for the development and preparation for the implementation of system investment projects, to launch the legalization of business, to create conditions for total security enhancement.

The second stage (2014-2015) is based on launching and implementation of system investment projects, creation of institutions and a system of innovative development, providing conditions for improving the quality of life.

The third stage (2016-2017) is about the creation of prerequisites for post-industrial-development providing a system transfer of the economy into the regime of post-industrial (innovative) development at the next stage.

The fourth stage (2016-2020) is like a spurt in increasing the economy's competitiveness, in improving quality of life and social environment on the basis of a transition to a new postindustrial development model.

The fifth stage (2021-2025 and further) will be aimed at consolidating the postindustrial model of development and achieving the positions of the subject with high development rates. The accumulated knowledge and capital potential corresponding to advanced economies will ensure the trend of sustainable social and

economic development of the Republic of North Ossetia-Alania with the support of the innovative "economy of the future", which has a powerful service sector as the main driving force of economic growth.

Development of the Republic of North Ossetia-Alania depends on many internal and external factors, but first of all, the economic policy, the trends of economic development, external challenges. In this regard, there could be three possible scenarios for the development of the Republic of North Ossetia-Alania up to 2025:

- inertial scenario;
- base case scenario;
- optimistic scenario [34].

Scenarios are based on predictive assessment of key indicators of socio-economic development of the Republic of North Ossetia-Alania until 2025 (including forecasts for control points: 2013, 2015, 2017, 2020, 2025).

The inertial scenario is based on the achievement of basic indicators of the socio-economic development Strategy of the North Caucasian District until 2025 in terms of socio-economic development indicators of the Republic of North Ossetia-Alania, reflected in the documents "Strategy of social and economic development of the Republic of North Ossetia-Alania until 2030" and "Plan for the implementation of the Strategy of socio-economic development of the North Caucasus Federal District until 2025 in the Republic of North Ossetia-Alania".

The inertial scenario is characterized by the following parameters: consolidation and expansion of competitive advantages in the traditional spheres of economy in order to form a sustainable industrial development model, at the same time, maintaining the productivity gap in most industries of economy compare with the best foreign leading producers which will lead to a minor modernization of the economic structure of the republic.

What concerns the base case scenario, it provides: consolidation and expansion of competitive advantages in the traditional spheres of economy in order

to form a stable industrial development model and the creation of prerequisites for post-industrial development. Also it provides an Achievement of target values of all federal and regional target programs, operating on the territory of the Republic of North Ossetia-Alania; implementation of the majority of long-term priority projects and programmes which realize the comparative advantages of economy; growth of investment attractiveness of the Republic of North Ossetia-Alania [40].

The optimistic scenario is compared with the implementation of the innovative scenario of the Concept of long-term development of the Russian Federation until 2020. Realization of this scenario will allow us to suppose that the income level and quality of life in the Republic of North Ossetia-Alania will reach the indicators typical for the regions-leaders. The optimistic scenario assumes a high average annual rate of growth in investments in fixed assets, which ensures the strengthening of the innovation component of economic growth based on the use of postindustrial sources of development.

### 3.2 Mechanism of implementation of the competitive social and economic regional policy

Implementation of the Socio-Economic Development Strategy of the Republic of North Ossetia-Alania assumes the formation of a system of mechanisms linking the defined goals, resources and performers in the framework of program-targeted approach to management. Realization of strategy assumes of formation clear formalized mechanisms on three levels: strategic, tactical and operational. Let us present you visual hierarchy of strategy realization mechanisms (Figure 10) [21].



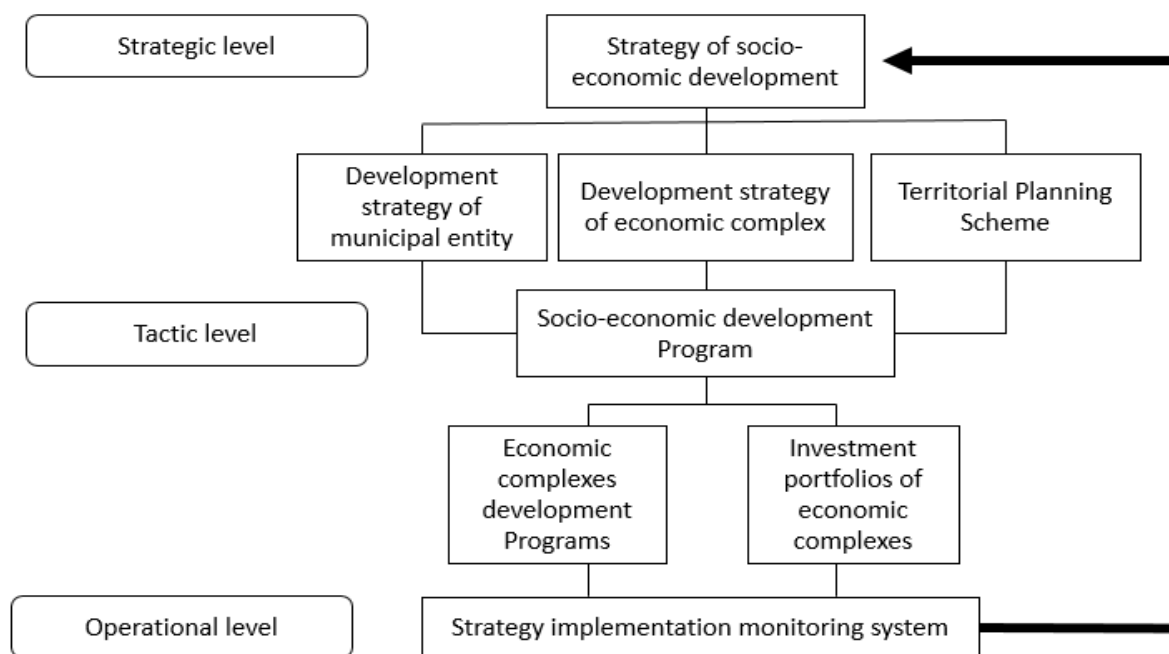


Figure 10 - Hierarchy of strategy realization mechanisms

The strategic level includes development of key strategic documents defining the long-term development goals of the Republic of North Ossetia-Alania. The establishment of long-term development goals is made with direct cooperation of the Head of the Republic and the Chairman of the Government of the Republic. The main documents are the following: Programme of socio-economic development of the Republic of North Ossetia-Alania for a period 2012-2017, complex sectoral strategies, a scheme of territorial planning.

At the tactical level of managing the implementation of the Strategy it is provided a formation and step-by-step implementation of targeted development programs of complexes being developed in the sectoral executive bodies of the Republic. If necessary, other legal documents regulating relations in various spheres of publicity could be developed.

The operational level assumes to create a monitoring system of the Strategy's implementation. Monitoring includes both an analysis of the target use of budgetary funds, and the correlation of the obtained results based on the developed system of socio-economic development indicators of the Republic.

As the main procedures for implementation of the socio-economic development Strategy of the Republic of North Ossetia-Alania are considered:

- the formation of a goals tree that implies a clear definition of: costs, performers and evaluation mechanisms;
- multi-project management of the implementation of investment portfolios specific industries;
- formation and adjustment of the legal framework governing the implementation of the Strategy;
- creation of an integrated monitoring and control system of Strategy implementation [40].

### 3.3 Modelling using regression equations of basic macro-economic indicator of regional development

In the current Diploma Thesis as an example of multiple linear regression model we consider a model in which we analyze the dependence of volume of the North Ossetian gross regional product on the contribution to it the key economic sectors over the period 2007 - 2016. Further prediction will be made for the years 2017 – 2021. What should be done first is to decide what kind of variables to be chosen in the model equation. For this purpose, let's make a comparative analysis using an official statistics data according to following sectors: agriculture, construction and manufacturing. Particular in our case, by means of ordinary least squares were obtained simple linear regression models describing dependence of gross regional product individually on agriculture, manufacturing and construction. The results of calculation are presented in the Tables below (10 - 21) based on latest data presented on the official website of the Russian Federal State Statistics Service, being last updated on 02.05.2018 [31]. It was applied «Package analysis» and statistical functions of MS Excel to calculate the parameters of the multiple linear regression model.

The proposed analysis starts with the sector of agriculture. Statistics data of agriculture (in current prices, mln. rub.) and gross regional product (in current prices, mln. rub) is presented in Table 10.

Table 10 – Basic data for construction the simple linear regression model. Agriculture ( $x_2$ ) and gross regional product ( $y$ ).

#	Years	Variables	
		$x_2$ (mln. rub.)	$y$ (mln. rub.)
1	2007	14,194	52,8047
2	2008	15,174	57,7074
3	2009	17,801	64,0814
4	2010	21,464	75,3274
5	2011	23,448	85,8767
6	2012	25,877	97,4488
7	2013	25,719	118,6375
8	2014	26,653	125,9605
9	2015	24,484	126,0512
10	2016	25,310	125,4983

Below there is Table 11 with calculations of the simple linear regression model's parameters using OLS method.

Table 11 – Calculation of the simple linear regression model's parameters

i	t	X	Y	$x*y$	$x^2$	$y^2$
1	2007	14,194	52,8047	819,093	201,470	3330,098
2	2008	15,174	57,7074	972,365	230,250	4106,375
3	2009	17,801	64,0814	1340,896	316,876	5674,157
4	2010	21,464	75,3274	1843,264	460,703	7374,859
5	2011	23,448	85,8767	2284,984	549,809	9496,308
6	2011	25,877	97,4488	3069,996	669,619	14074,975
7	2013	25,719	118,6375	3239,591	661,467	15866,174
8	2014	26,653	125,9605	3359,637	710,382	15888,855
9	2015	24,484	126,0512	3072,693	599,466	15749,748
10	2016	25,310	125,4983	3199,209	640,596	15977,213
$\Sigma$		220,124	1002,99	23201,728	5040,638	107538,760
		$(\Sigma x)^2$	$(\Sigma y)^2$			
		48454,575	1005988,940			

slop,m=	5,7563
y-int,b=	-26,41
r=	0,9453
R <sup>2</sup> =	0,8937

For illustrative purposes, it is also presented a scatterplot, in other words, a graphical representation of the results of the regression analysis, constructed in MS Excel environment (Figure 11).

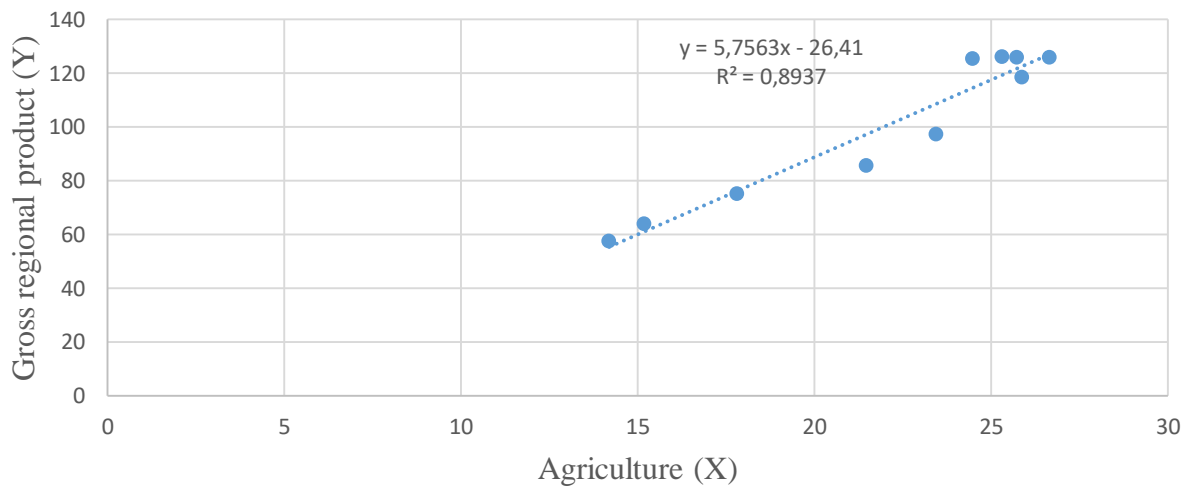


Figure 11 – Graphical representation of the regression analysis. Dependence of gross regional product on agriculture

Sufficiently high R Square equal to 0.89, gives a ground to state that the scatterplot reveals close relationship between two variables and, hence, indicates that the variables are almost moving in the same direction, whether they rise or fall. Hence, it reveals that in 89% of cases any changes in the amount of agriculture will lead to the changes in the gross regional product.

As it is clear from Figure 8,  $b_0 = -26,41$  and  $b_1 = 5,7563$ . Therefore, the linear regression equation is the following (Formula 13):

$$y = 5,7563x_2 - 26,41, \quad (13)$$

It is worth noting that the coefficient  $b_1$  shows X variable level of influence on the Y-intersection. So, changings in revenue of agriculture by 1% leads to the changings in gross regional product to 5, 7653 monetary units. Now, the same analysis will be conducted for manufacturing industry. Table 12 provides us with

the statistics data of manufacturing (in current prices, mln. rub.) and gross regional product (in current prices, mln. rub.).

Table 12 – Basic data for construction the simple linear regression model. Manufacturing ( $x_3$ ) and gross regional product ( $y$ ).

#	Years	Variables	
		$x_3$ (mln. rub.)	$y$ (mln. rub.)
1	2007	17,598	52,8047
2	2008	11,396	57,7074
3	2009	15,314	64,0814
4	2010	15,522	75,3274
5	2011	15,564	85,8767
6	2012	16,639	97,4488
7	2013	16,561	118,6375
8	2014	20,227	125,9605
9	2015	18,123	126,0512
10	2016	16,310	125,4983

Table 13 provides us with calculations of the simple linear regression model's parameters using OLS method.

Table 13 – Calculation of the simple linear regression model's parameters

i	t	x	y	$x*y$	$x^2$	$y^2$
1	2007	17,598	52,8047	1015,528	309,690	3330,098
2	2008	11,396	57,7074	730,267	129,869	4106,375
3	2009	15,314	64,0814	1153,558	234,519	5674,157
4	2010	15,522	75,3274	1332,983	240,932	7374,859
5	2011	15,564	85,8767	1516,696	242,238	9496,308
6	2012	16,639	97,4488	1974,018	276,856	14074,975
7	2013	16,561	118,6375	2086,040	274,267	15866,174
8	2014	20,227	125,9605	2549,634	409,132	15888,855
9	2015	18,123	126,0512	2274,400	328,443	15749,748
10	2016	16,310	125,4983	2061,600	266,016	15977,213
$\Sigma$		163,254	1002,99	16694,724	2711,961	107538,760
		$(\Sigma x)^2$	$(\Sigma y)^2$			
		26651,869	1005988,940			

slop,m=	11,318
y-int,b=	-403,8
r=	0,9579
$R^2$ =	0,9411

A scatterplot of regression analysis is presented on Figure 12.

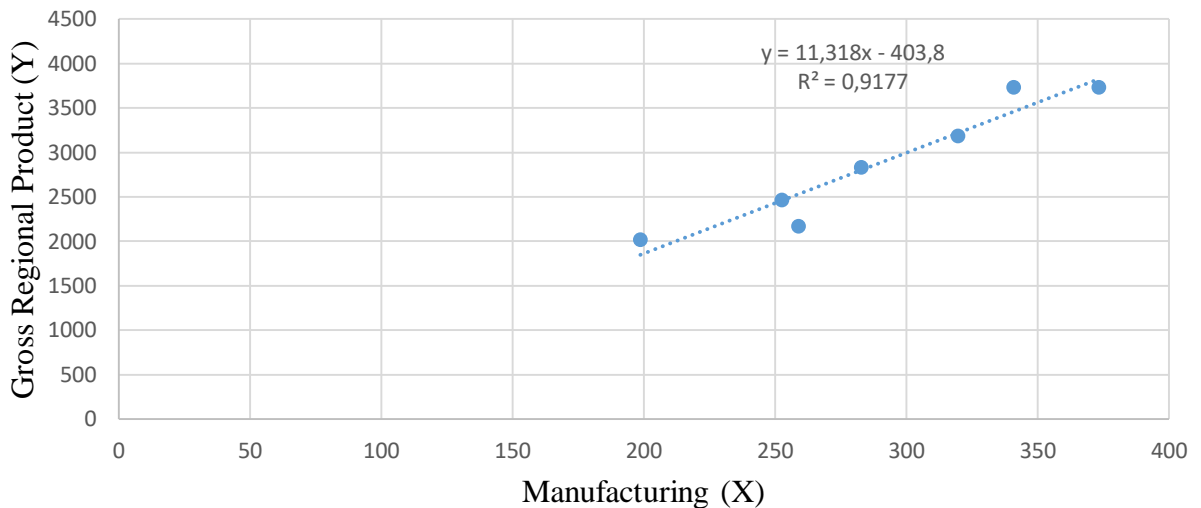


Figure 12 – Graphical representation of the regression analysis. Dependence of gross regional product on manufacturing

Rather high value of coefficient of determination R Square = 0,9177 proves a strong relationship between the variables.

The above shows sufficiently high overall goodness-of-fit measure: R Square = 0.9177, therefore, it is possible to state about close relationship between the variables, revealing that in 91.77% of cases the changes in the amount of manufacturing will lead to the changes in the gross regional product.

As it can be seen from the Table 7,  $b_0 = -403,8$  and  $b_1 = 11,318$ . Therefore, the linear regression equation has the next form (Formula 14):

$$y = 11,318x_2 - 403,8, \quad (14)$$

As it was mentioned earlier, the coefficient  $b_2$  shows X variable level of influence on the Y-intersection. So, changings in revenue of manufacturing by 1% leads to the changings in gross regional product to 11,318 monetary units.

The last simple linear regression model considers gross regional product as dependent variable and construction as explanatory variable.

Table 14 presents statistics data of sector of construction (in current prices, mln. rub.) and gross regional product (in current prices, mln. rub.).

Table 14 – Basic data for construction the simple linear regression model. Construction ( $x_4$ ) and gross regional product ( $y$ )

#	Years	Variables	
		$x_4$ (mln. rub.)	$y$ (mln. rub.)
1	2007	11,399	52,8047
2	2008	12,241	57,7074
3	2009	12,944	64,0814
4	2010	14,654	75,3274
5	2011	12,092	85,8767
6	2012	12,854	97,4488
7	2013	20,953	118,6375
8	2014	22,445	125,9605
9	2015	16,462	126,0512
10	2016	10,538	125,4983

Below there is a Table 15 with calculation of the simple linear regression model's parameters using OLS method.

Table 15 – Calculation of the simple linear regression model's parameters

i	t	X	y	$x*y$	$x^2$	$y^2$
1	2007	11,399	52,8047	657,8021	129,9372	3330,098
2	2008	12,241	57,7074	784,4155	149,8421	4106,375
3	2009	12,944	64,0814	975,0327	167,5471	5674,157
4	2010	14,654	75,3274	1258,442	214,7397	7374,859
5	2011	12,092	85,8767	1178,353	146,2165	9496,308
6	2012	12,854	97,4488	1524,973	165,2253	14074,98
7	2013	20,953	118,6375	2639,261	439,0282	15866,17
8	2014	22,445	125,9605	2829,215	503,778	15888,85
9	2015	16,462	126,0512	2065,948	270,9974	15749,75
10	2016	10,538	125,4983	1332,014	111,0494	15977,21
$\Sigma$		146,582	1002,99	15245,46	2298,361	107538,8
		$(\Sigma x)^2$	$(\Sigma y)^2$			
		21486.28	1005989			

slop, $m=$	1,73973122
y-int, $b=$	44,553
$r=$	0,66035363
$R^2=$	0,4361

A scatterplot based on the regression analysis is provided below (Figure 13).

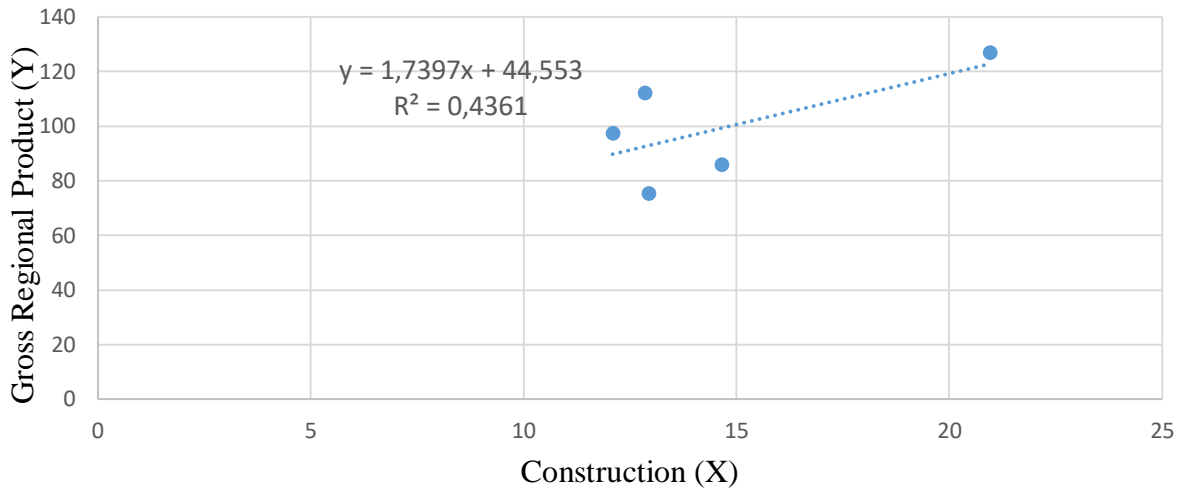


Figure 13 – Graphical representation of the regression analysis. Dependence of gross regional product on construction.

Rather low value of coefficient of determination R Square = 0.4361 indicates a poor relationship between the variables. So, only in 43,61% of cases the changes in the volume of construction will lead to the changes in the gross regional product.

As it can be seen from the Table 16,  $b_0 = 40,553$  and  $b_2 = 1,7397$ . Therefore, the linear regression equation has the next form (Formula 15):

$$y = 1,7397x_4 + 44,553, \quad (15)$$

As it was mentioned earlier, the coefficient  $b_2$  shows X variable level of influence on the Y-intersection. So, changings in revenue of construction by 1% leads to the changings in gross regional product to 1,7397 monetary units.

From this analysis one can see that agriculture and manufacturing are much more suited for further forecasting analysis as its determination coefficients R Square are sufficiently high and which values are very close to 1.

In addition to the presented study of gross regional product of the Republic of North Ossetia-Alania, we propose a cluster analysis of gross regional product and two priority sectors (agriculture and manufacturing, which we are going to include in multiple linear regression model) for three republics: the Republic of North



Ossetia-Alania, the Karachay-Cherkess Republic and the Kabardino-Balkar Republic (Appendixes A, B, C) [31].

Panel data model presented in the Tables from the appendixes A, B and C shows us how far the groups of variables are separated apart from each other. For example, the second column contains the years for which the data set is taken and the third column contains the volume of particular sector in current prices for each of three republics. What about the other columns, they contain the calculation as well as the result of applying the method of moving average. It can be said that in some sense it is data arrangement, in other words, the table shows the measure of spread of our data around the mean values.

The last column as one of the methods of data processing operation can be helpful for further drawing up ratings of republics, from which it would be seen, whether the position of one or another republic is among leaders or, versus, outsiders with the respect to each other. The use of Panel data model can thus help to assess a tendency (trend) in order to develop and implement the right strategies in the nearest future – more mild ones for leaders and more intensive for lagging regions. For example, we can notice from the tables that the largest output of agriculture sector with a tendency to growth of all three regions has the Kabardino-Balkar Republic. However, the results also show that the speed of agriculture industry development of the Karachay-Cherkess Republic is quite high and according to its output the industry has increased sufficiently in recent years comparing with the Republic of North Ossetia-Alania. Similar conclusions could be drawn from the Panel data model for manufacturing industry.

As we stated earlier, models with simple linear equations are the simplest and basic models of econometrics. Exactly this kind of models are under the focus of attention to practice on them the basic techniques of econometrics science, which then could be developed and generalized to be applied to more complex models. Particular in our case, by means of OLS method were obtained simple linear regression models describing dependence of gross regional product on agriculture,

dependence of gross regional product on manufacturing and finally, dependence of gross regional product at the same time on both sectors linearly. So, the first model equation has the next form (Formula 16):

$$y = 5,7563x_2 - 26,41, \quad (16)$$

where y – gross regional product;

x – agriculture.

The second model equation has the form (Formula 17):

$$y = 11,318x_3 - 403,8, \quad (17)$$

where y – gross regional product;

x – manufacturing.

To complete the picture, let's consider multiple linear model with three unknowns, in which there will be included agriculture as well as manufacturing. The data for further processing represented in Table 16 consisted of four columns: in the first one we put the number of observations and the other three columns contains the following data: gross regional product as y (mln. rub), agriculture as  $x_2$  (mln. rub) and manufacturing as  $x_3$  (mln. rub).

Table 16 – The data set for the construction multiple linear regression model

Number of observations	Variables		
	y	$x_2$	$x_3$
1	52,8047	14,194	17,598
2	57,7074	15,174	11,396
3	64,0814	17,801	15,314
4	75,3274	21,464	15,522
5	85,8767	23,448	15,564
6	97,4488	25,877	16,639
7	118,6375	25,719	16,561
8	125,9605	17,801	20,227
9	126,0512	21,464	18,123
10	125,4983	23,448	16,310

The multiple linear regression model has the form (Formula 18):

$$y = \beta_1 + \beta_2x_2 + \beta_3x_3 + u, \quad (18)$$

After we obtained the coefficients, the next step in studying our model is evaluation its significance, what we are going to speak about further.

So, now we wish to estimate the regression line (Formula 19):

$$y = b_1 + b_2x_2 + b_3x_3, \quad (19)$$

We do this using in MS Excel environment the Data analysis Add-in and Regression. The only change over one-variable regression is to include more than one column in the Input X Range.

The regression output has three components:

- regression statistics table;
- ANOVA table;
- regression coefficients table.

Firstly, let's start with interpreting the regression statistics table. This is the following output in the Table 17.

Table 17 - Regression Statistics

Indicator	Value	Explanation
Multiple R	0,966390857	R = square root of R <sup>2</sup>
R Square	0,933911288	R <sup>2</sup>
Adjusted R Square	0,915028798	Adjusted R <sup>2</sup> used if more than one x variable
Standard Error	8,094502635	This is the sample estimate of the standard deviation of the error u
Observations	10	Number of observations used in the regression (n)

The above gives the overall goodness-of-fit measures: R<sup>2</sup>=0,9339. Correlation between y and y-hat is 0,9664 (when squared gives 0,9339). Formula for adjusted R<sup>2</sup> is the following (Formula 20):

$$R^2_{adj.} = 1 - \left[ \frac{(1-R^2)(n-1)}{n-k-1} \right], \quad (20)$$

After we put the figures into the equation, we got the Formula 21:

$$R^2_{adj.} = 1 - \left[ \frac{(1-0,9339)(10-1)}{10-2-1} \right], \quad (21)$$

So, according to calculation, Adjusted R Square = 0,915.

As for the standard error, it refers to the estimated standard deviation of the term  $u$  and is equal to 8,0946. It is sometimes called the standard error of the regression. It is not to be confused with the standard error of  $y$  itself or with the standard errors of the regression coefficients given below.

R Square equal to 0,9339 means that 93.39% of the variation of  $y_i$  around  $\bar{y}$  (its mean) is explained by the regressors  $x_2$  and  $x_3$  – that indicates close relationship between variables.

Our next step is connected with interpreting ANOVA Table (Table 18).

Table 18 – ANOVA

Indicator	Df	SS	MS	F	Significance F
Regression	2	6481,22	3240,60	9,05	0,000074
Residual	7	458,65	65,52		
Total	9	6939,87			

The ANOVA (analysis of variance) table splits the sum of squares into its components.

Total sum of squares is calculated like in Formula 22.

$$\text{TSS} = \text{Residual (or error) sum of squares} + \text{Regression (or explained) sum of squares}, \quad (22)$$

General formula for R Square is presented in Formula 23:

$$R^2 = \frac{1 - \text{Residual SS}}{\text{Total SS}}, \quad (23)$$

Then, from data in the ANOVA table we get (Formula 24):

$$R^2 = \frac{1 - 458,646}{6939,866}, \quad (24)$$

The column labeled F gives the overall F-test of  $H_0: \beta_2 = 0$  and  $\beta_3 = 0$  versus  $H_a$ : at least one of  $\beta_2$  and  $\beta_3$  does not equal zero.

Aside: Excel computes F this as (Formula 25):

$$F = \frac{\text{Regression SS}/(k-1)}{\text{Residual SS}/(n-k)}, \quad (25)$$

Then, (Formula 26):

$$F = \frac{(6481,219)/(2-1)}{(458.646)/(10-2)}, \quad (26)$$

Thus we got F equal to 9.0457.

The column labeled significance F has the associated P-value. Since  $0.000074 < 0.05$ , we reject  $H_0$  at significance level 0.05. Table 19 below contains the regression output.

Table 19 – Regression coefficients

Indicator	Coefficients	St. error	t-Stat.	P-value	Lower 95%	Upper 95%
y-intercept	-33,23	19,67	-1,68	0,13	-79,75	13,28
x <sub>2</sub>	5,58	0,69	8,08	8,08	3,95	7,21
x <sub>3</sub>	0,65	1,41	0,46	0,65	-2,68	3,98

In the table  $\beta_1$  denote the coefficient of gross regional product,  $\beta_2$  the agriculture coefficient and  $\beta_3$  the manufacturing coefficient. Then:

- Column «Coefficient» gives the least squares estimates of  $\beta_j$ .
- Column «Standard error» gives the standard errors (i.e. the estimated standard deviation) of the least squares estimates  $b_j$  of  $\beta_j$ .
- Column «t Stat» gives the computed t-statistic for  $H_0: \beta_j=0$  against  $H_a: \beta_j \neq 0$ .

This is the coefficient divided by the standard error. It is compared to a t with  $(n-k)$  degrees of freedom where here  $n=10$  and  $k=2$ .

- Column «P-value» gives the p-value for test of  $H_0: \beta_j = 0$  against  $H_a: \beta_j \neq 0$ .

0.

This equals the formula 27:

$$\Pr\{|t| > t\text{-Stat}\}, \quad (27)$$

where  $t$  is a  $t$ -distributed random variable with  $n-k$  degrees of freedom and  $t\text{-Stat}$  is the computed value of the  $t$ -statistic given in the previous column.

- Columns «Lower 95%» and «Upper 95%» values define a 95% confidence interval for  $\beta_j$ .

A simple summary of the above output is that the fitted line is (Formula 28):

$$y = b_1 + b_2x_2 + b_3x_3, \quad (28)$$

where  $y$  – interception;

$x_2$  – independent variable (regressor);

$x_3$  – independent variable (regressor);

$b_2$  – slope coefficient;

$b_3$  – slope coefficient.

The Multiple Regression Model is presented in Formula 29:

$$y = -33,23 + 5,58x_2 + 0,65x_3, \quad (29)$$

where  $y$  – dependent variable;

$x_2$  – independent variable;

$x_3$  – independent variable;

$\beta_2$  – unknown coefficient;

$\beta_3$  – unknown coefficient;

Besides this, we could calculate confidence intervals for the slope parameters with some fixed confidence level, for example, 95%. And even other confidence intervals can be obtained for further compare the intervals itself. Thereby, 95% confidence interval for slope coefficient  $\beta_2$  is from Excel output:

$\beta_2$  [ 3,9503730; 7,215174], for the  $\beta_1$  [ - 79,753692; 13,2893061]; for the  $\beta_3$  [-2,6827727; 3,986378].

The next type of our variables significance testing is test hypothesis of zero slope coefficient, in other words, «test of statistical significance».

The coefficient of  $x_2$  has estimated standard error of  $\approx 0,69034$ , t-statistic of  $\approx 8,0869$  and p-value of  $\approx 0,000085$ . It is therefore statistically significant at significance level  $\alpha = 0.05$  as  $p < 0.05$ .

The coefficient of  $x_3$  has estimated standard error of  $\approx 1,4101$ , t-statistic of  $\approx 0,4622$  and p-value of  $\approx 0,000065$ . It is therefore statistically significant at significance level  $\alpha = 0.05$  as  $p < 0.05$ .

In order to evaluate coefficients statistical significance, it is necessary to compare values of t-statistics with critical value  $t_{cr.}$ , which is taken from the Student's distribution table after putting down significance level and number of degrees of freedom.

There are 10 observations and 3 regressors (y-intercept,  $x_2$  and  $x_3$ ), so we use the next inequality:  $t(10-3) = t(7)$ .

Thereby, we have 7 degrees of freedom, with significance level  $\alpha = 0.05$ ,  $t_{cr.} = 2.92$  (according to the Student's distribution table), so  $|t \text{ Stat}| > t_{cr.}$ .

Analysis indicates that with probability of 95% the variables cannot be considered significant in the equation as t-Statistics in modulus are greater than critical values taken from Student's distribution table.

Using the test hypothesis on a regression parameter, we test whether  $x_2$  and  $x_3$  have coefficients  $\beta_2 = 1.0$  and  $\beta_3 = 1.0$ .

Example 1:  $H_0: \beta_2 = 1.0$  against  $H_a: \beta_2 \neq 1.0$  at significance level  $\alpha = 0.05$ .

Then (Formula 30):

$$t = \frac{(b_2 - H_0 \text{ value of } \beta_2)}{(\text{standard error of } b_2)}, \quad (30)$$

So, we have (Formula 31):

$$t = \frac{(5,582737 - 1.0)}{0,69034}, \quad (31)$$

Finally, t is equal to 6,6383.

Example 2:  $H_0: \beta_3 = 1.0$  against  $H_a: \beta_3 \neq 1.0$  at significance level  $\alpha = 0.05$ .

Then (Formula 32):

$$t = \frac{(b_3 - H_0 \text{ of } \beta_3)}{(\text{standard error of } b_3)}, \quad (32)$$

What gives us (Formula 33):

$$t = \frac{0,06518 - 1.0}{1.4101}, \quad (33)$$

After calculations we have  $t = -0,6629$ .

Overall test of significance of the regression parameters is no less important than previous ones. With the help of this method we test  $H_0: \beta_2 = 0$  and  $\beta_3 = 0$  versus  $H_a$ : at least one of  $\beta_2$  and  $\beta_3$  doesn't equal zero.

From the ANOVA table the F-test statistic is 9,0457 with p-value of 0.000074. Since the p-value is less than 0.05 we reject the null hypothesis that the regression parameters are zero at significance level equal to 0.05.

In conclusion of conducted analysis, it is possible to state that the parameters are jointly statistically significant at significance level 0.05.

Though, MS Excel is very helpful in calculating such types of tests, it also has particular limitations. The most widespread ones are:

1. Excel restricts the number of regressors (only up to 16 regressors).
2. Excel requires that all the variables be in adjoining columns.
3. You may need to move columns to ensure this, for example, if the regressors are in columns B and D you need to copy at least one of columns B and D so that they are adjacent to each other.
4. Excel standard errors and t-statistics and p-values are based on the assumption that the error is independent with constant variance (homoscedastic).
5. Excel doesn't provide alternatives, such as heteroskedastic-robust or autocorrelation-robust standard errors and t-statistics and p-values.
6. More specialized software such as STATA, EVEIWS, LIMDEP, PC TSP and others is needed.

Thus, using OLS we found the regression equation (Formula 34):

$$y = -33,23 + 5,58x_2 + 0,65x_3, \quad (34)$$



Coefficient of determination R Square = 0,9339 that shows close linear relationship between variables. With  $p\text{-value} < 0.05$  the null hypothesis  $H_0$  testing that the coefficients are equal to zero can be rejected.

### 3.3 Forecasting of the gross regional product of the North Ossetia-Alania Republic

One of the main goals of creating econometric modelling research is building forecasts with a sufficient accuracy. For this purpose, particularly in our model, first of all, it is necessary to make a prediction having chosen the required amount of time (years) according to sectors under the study.

Based on the available data for the years 2007-2016 (Tables 20, 21) using the method of least squares let's build a time-series simple linear models with two unknown variables, in which explanatory variable is time, and the dependent variable - the amount of the relevant sector of economy (mln. rub.).

Table 20 – Data set for time-series simple linear model for the variable  $x_2$  (agriculture, mln. rub.)

#	Year (x)	Variable $X_2$ (y)
1	2007	14,194
2	2008	15,174
3	2009	17,801
4	2010	21,464
5	2011	23,448
6	2012	25,877
7	2013	25,719
8	2014	17,801
9	2015	21,464
10	2016	23,448

The next table provides us with time-series simple linear model for the variable  $x_3$ .

Table 21 - Time-series simple linear model for the variable  $x_3$  (manufacturing, mln. rub.)

#	Year (x)	Variable $X_3$ (y)
1	2007	17,598
2	2008	11,396
3	2009	15,314
4	2010	15,522
5	2011	15,564
6	2012	16,639
7	2013	16,561
8	2014	20,227
9	2015	18,123
10	2016	16,310

Thus, we can get the needed predictive values for agriculture and manufacturing for the years 2017-2021 (Tables 22, 23).

Table - 22 Predicted values for agriculture for the years 2017-2021, mln. rub.

#	Years	Predicted values ( $x_2$ )
1	2017	25,432
2	2018	28,095
3	2019	31,524
4	2020	34,953
5	2021	35,111

From the above table it can be seen that the volume of agriculture will increase over the predicted period by approximately 4,4% annually. Figure 14 illustrates graphically the trend of the predicted values.

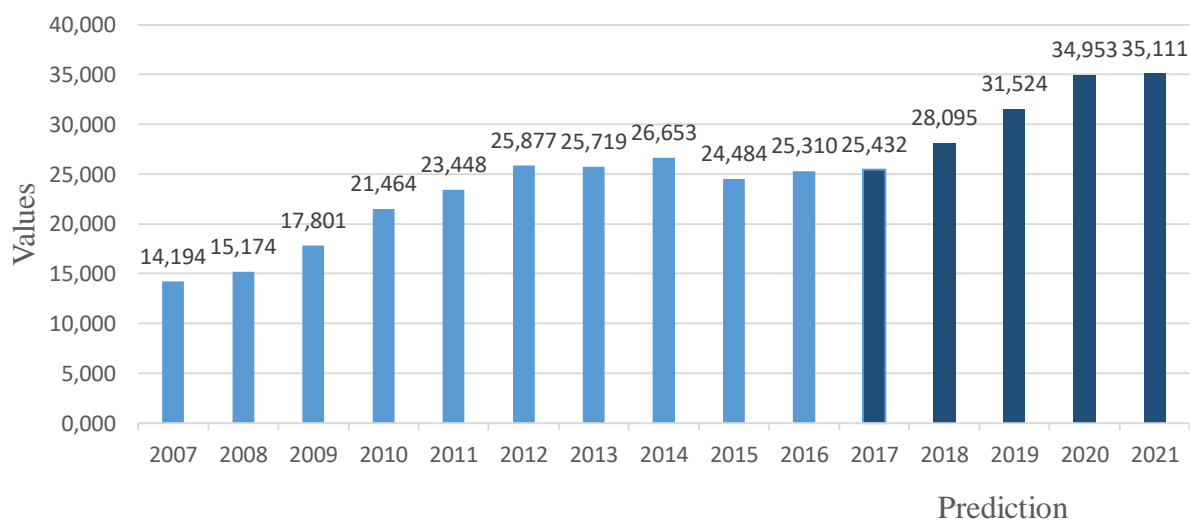


Figure 14 – Predicted values for the sector of agriculture, 2017 - 2021

The next table provides us with prediction for the manufacturing industry for the next 5 years.

Table 23 - Predicted values for manufacturing for the years 2017-2021, mln. rub.

#	Years	Predicted values ( $x_3$ )
1	2017	16,565
2	2018	18,589
3	2019	20,614
4	2020	22,639
5	2021	24,664

According to the forecasted figures, the volume of manufacturing in the period 2017 – 2021 will increase, comprising the average annual growth rate equal to 8,5%.

Figure 15 illustrates the trend:

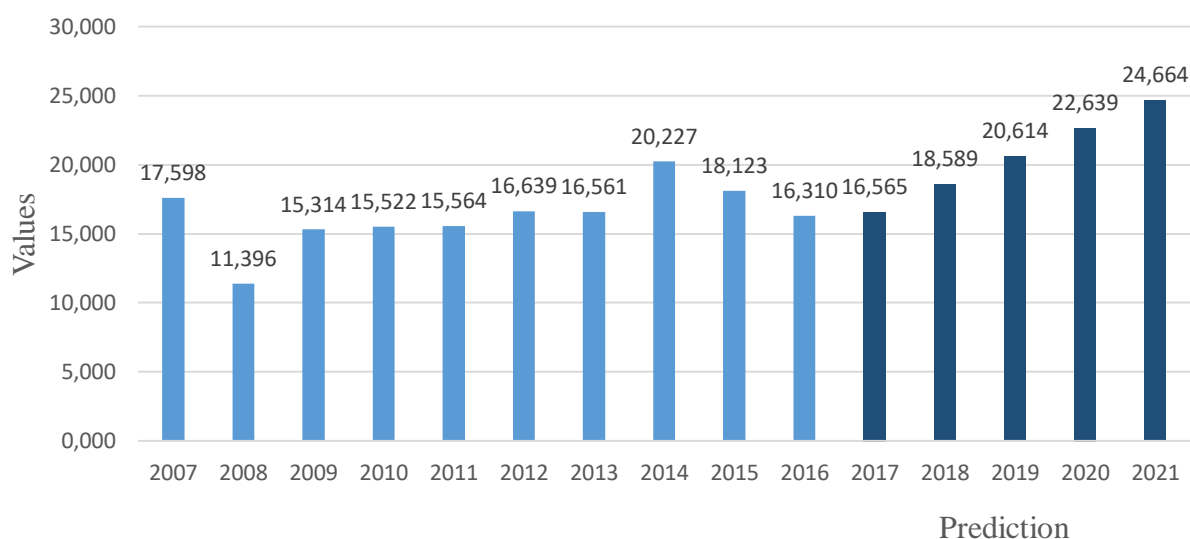


Figure 15 – Predicted values for the manufacturing industry, 2017 - 2021

As it is obvious from the data presented in the last two tables, the obtained figures have trend towards growth. Now let's do the same steps for both sectors in order to get a forecast for multiple linear regression model (Formula 35).

$$y = -33,23 + 5,58x_2 + 0,65x_3, \quad (35)$$

Predicted values for the Republic's Gross Regional Product is presented in the Table 24.

Table 24 - Predicted values for gross regional product of the North Ossetia-Alania Republic, mln. rub.

#	Years	Value
1	2017	133,1872
2	2018	145,0237
3	2019	156,8601
4	2020	168,6966
5	2021	170,5331

The obtained predicted values prove the increase in the volume of the North Ossetian gross regional product for the period 2017 – 2021. The overall trend is presented on Figure 16 below.

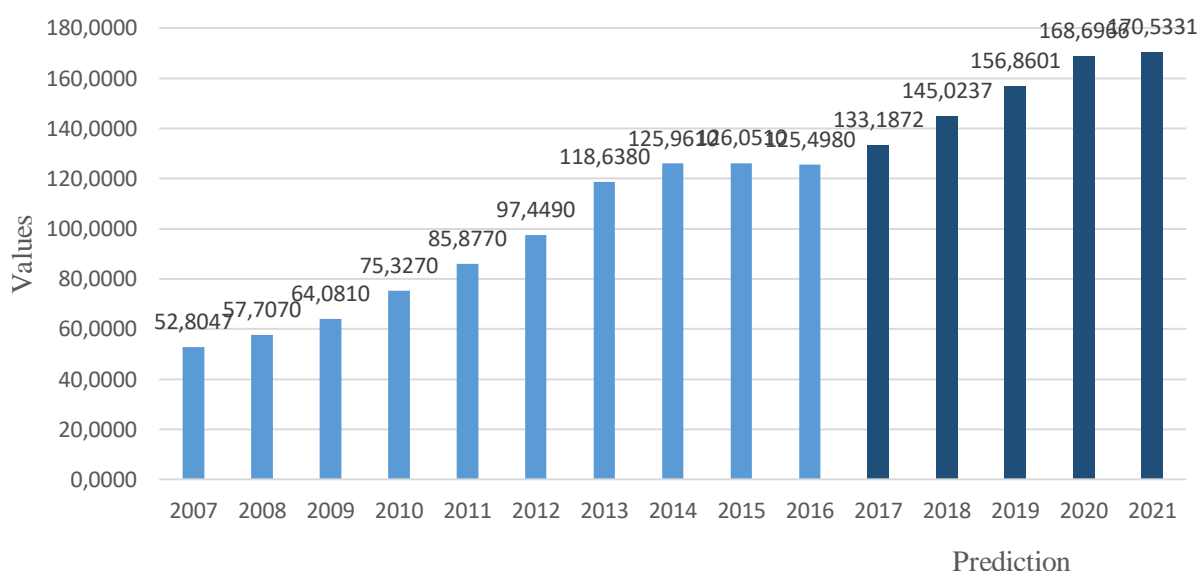


Figure 16 – Predicted values for the gross regional product, 2017 - 2021

After modeling and forecasting using regression equations of basic macroeconomic indicator of regional development, that is gross regional product, we are ready to make a conclusion that the prediction based on the constructed model suggests that in spite of challenges and negative consequences caused by the world economic and financial crisis, the gross regional product of the Republic of North Ossetia Alania will change with a tendency to gradual increase with linear subsection during the period 2017 - 2021.

It is possible to state that agriculture as well as manufacturing undoubtedly plays an important role in the economic growth of the Republic of North Ossetia – Alania. Furthermore, they do contribute to the economy of the North Caucasian Federal District which, in its turn, adds value to the national economy. Therefore, investments to these sectors will influence positively on the gross domestic product formation. Whereby, local authorities should use resources dedicated for development of these sectors as efficient as possible taking into account a strong relationship between above-mentioned sectors of economy and gross regional product.

Of course, one of the biggest limitation of forecasts built on time-series is their «blindness» to possible unexpected events for the predicted period, thus, the achieved results (prediction) are true provided the socio-economic situation will not change to the worst. When implementing any regional strategy, policy makers and authorities should, first of all, be motivated in order to implement effective socio-economic policies, which taken together with optimization of a regional strategy formation will give tangible results in practice and provide sustainable development of the region.

## CONCLUSION

Priorities in the development of the world economic community today are as follows that the position of each country, the level of its power are determined not only by the ownership of basic types of strategic resources, but directly depends on the achievement of state policy in the regional economy. Accordingly, strategic development and updating of the main directions for development of the regions are some of the most pressing issues confronting regional authorities. Exactly competitive regional development strategies directly contribute to both regional and national development. The effective strategy to meet the challenges facing the region, containing projects and activities aimed at sustainable socio-economic development and welfare of the residents, is an indispensable instrument of regional management.

Our current Era of regional competitiveness, which began in the late 1990s, emphasizes identifying each region's competitive advantages and then prioritizing public and private investments necessary to exploit those advantages. Thus, a regional development strategy will then be competitive when it will be based on a competitive advantage(s) or a region. That's why, in «healthy» regions, competitiveness and innovation are concentrated in clusters, or interrelated industries, in which the region specializes.

However, one of the most common bottlenecks in most policies is lack of coordination interests among the interested parties (stakeholders) and the issue of determination of key potentials for economic development of territorial socio-economic systems. Practice shows that public authorities and local governments have neither the expertise of quality strategic planning, nor technology for its implementation with the use of scientific techniques. Of primary importance is to understand whether or not the economic interests are implemented by setting goals and objectives which are expressed in performance indicators.

Despite the active development of tools and methods for strategic planning, Russian federal, regional, and municipal authorities still have no clear understanding of the role, limits

of application, and content value of strategic documents. The methodological principles of the concept of implementation of strategic planning having discussed in this work could be helpful to create the methodological basis for the development of documents on the long-term prospects of territories' development and develop a set of prompt tactical measures.

The competitiveness of the region is also determined by the presence of certain key industries as well as by the ability of regional authorities to create conditions for regional enterprises to be able to achieve and retain a competitive advantage in certain areas, so, within the Chapter 2 we moved from the macro level to the micro level on the example of one of the successfully developing industrial enterprises of the Russian Federation's subjects, namely, the Republic of North Ossetia-Alania. The analytical part of our study is presented in the form of analysis of financial and economic activity of OJSC "Kavdolomit".

Sustainability and socio-economic development of Russia directly depends on the level of development of its regions, including the most "weak links" that are the subsidized regions, among which there is the Republic of North Ossetia. Exactly for such areas to be of primary importance the questions of operational monitoring and optimal drawing up of plans for social and economic development.

Gross regional product, being the basic macroeconomic indicator of regional development, is widely used as a measure of competitive advantage since it most fully reflects the level of productivity of a region. It is exactly the volume and growth rate of the gross regional product (GRP) that are the target indicators when formulating social and economic policy of certain constituent entities of the state. This indicator is directly used in the process of distribution of intergovernmental transfers and when making decisions that affect the lives of people in the country. In this regard, it was therefore important to conduct economy assessment at the regional level on the example of the Republic of North Ossetia Alania within the North Caucasian Federal District based on the overall analysis of its socio-economic development including the analysis of its key economic sectors.

One of the main goals of creating econometric modelling research is building forecasts with a sufficient accuracy. As an example of multiple linear regression model we considered a model in which we analyzed the dependence of the volume of gross regional product on the contribution to it an agriculture and manufacturing in order to make a prediction for gross regional product (2015 – 2019). Finally, we obtained the equation for multiple linear regression model with coefficient of determination close to 1 that showing close linear relationship between the variables.

In addition to the presented study of gross regional product of the Republic of North Ossetia-Alania, we proposed a cluster analysis of two mentioned economic sectors on the example of three North Caucasian republics (The Republic of North Ossetia, the Karachay-Cherkess Republic and the Kabardino-Balkar Republic). Such kind of Panel data model can be considered as helpful economic tool in drawing up ratings of republics and determine, whether the position of one republic is among leaders or, versus, outsiders with the respect to others in order to develop the right strategies in the future – more mild for leaders and more intensive for lagging ones.

The prediction made for the gross regional product of the Republic of North Ossetia suggests that despite the negative consequences of the world financial and economic crisis, it will change with a tendency to gradual increase with linear subjection during the period 2017 – 2021.

Undoubtedly, one of the biggest limitation of forecasts built on time-series is their «blindness» to possible unexpected events for the predicted period, thus, the achieved results (prediction) are true provided the socio-economic situation will not change to the worst. When implementing any regional strategy, policy makers and authorities should, first of all, be motivated in order to implement effective socio-economic policies, which taken together with optimization of a regional strategy formation will give tangible results in practice and provide sustainable development of the region.



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Appendix A - Panel Data Model of regional development basic macroeconomic indicator for three competing republics within the Northern Caucasus Federal District

Id	Time	Variable	Individual mean	Overall mean	Overall deviation	Between deviation	Within deviation	Between deviation
i	t	$x_{it}$	$x_{i \text{ aver.}}$	$x \text{ aver.}$	$x_{it} - x \text{ aver.}$	$x_{i \text{ aver.}} - x \text{ with bar}$	$x_{it} - x_{i \text{ aver.}}$	$x_{it} - x_{i \text{ aver.}} + x \text{ aver.}$
1	2010	75,32	19,90	5,72	69,60	14,18	55,42	61,15
1	2011	85,88	19,90	5,72	80,159	14,18	65,97	71,69
1	2012	97,45	19,90	5,72	91,72	14,18	77,54	83,27
1	2013	118,63	19,90	5,72	106,41	14,18	92,23	97,96
1	2014	125,96	19,90	5,72	121,10	14,18	106,92	112,65
2	2010	43,65	11,48	5,72	37,93	5,75	32,18	37,89
2	2011	49,25	11,48	5,72	43,53	5,75	37,78	43,49
2	2012	58,71	11,48	5,72	52,99	5,75	47,24	52,96
2	2013	66,11	11,48	5,72	60,38	5,75	54,63	60,35
2	2014	69,19	11,48	5,72	63,47	5,75	57,71	63,44
3	2010	77,09	20,14	5,72	71,36	14,41	56,94	62,67
3	2011	90,59	20,14	5,72	84,87	14,41	70,45	76,18
3	2012	106,71	20,14	5,72	100,99	14,41	86,57	92,29
3	2013	110,97	20,14	5,72	105,25	14,41	90,83	96,56
3	2014	118,13	20,14	5,72	112,41	14,41	97,99	103,72

Table 1.1 – Panel Data Model for three competing republics according to their gross regional product (in current prices, mln. rub.)

- 1 – The Republic of North Ossetia-Alania
- 2 – The Karachay-Cherkess Republic
- 3 – The Kabardino-Balkar Republic

Appendix B - Panel Data Model of one of the priority sectors of regional development for three competing republics within the Northern Caucasus Federal District

Id	Time	Variable	Individual mean	Overall mean	Overall deviation	Between deviation	Within deviation	Between deviation (modified)
i	t	$x_{it}$	$\bar{x}_i$	$\bar{x}$	$x_{it} - \bar{x}$	$\bar{x}_i - \bar{x}$	$x_{it} - \bar{x}_i$	$x_{it} - \bar{x}_i - \bar{x} + \bar{x}$
1	2010	21,464	4572,36	24327,27	-6526,27	-19754,91	13228,64	37555,91
1	2011	23,448	4572,36	24327,27	-2863,27	-19754,91	16891,64	41218,91
1	2012	25,877	4572,36	24327,27	-879,27	-19754,91	18875,64	43202,91
1	2013	25,719	4572,36	24327,27	1549,73	-19754,91	21304,64	45631,91
1	2014	26,653	4572,36	24327,27	1391,73	-19754,91	21146,64	45473,91
2	2010	16,225	4056,44	24327,27	-8102,27	-20270,83	12168,56	36495,83
2	2011	19,197	4056,44	24327,27	-5130,27	-20270,83	15140,56	39467,83
2	2012	19,722	4056,44	24327,27	-4605,27	-20270,83	15665,56	39992,83
2	2013	22,430	4056,44	24327,27	-1897,27	-20270,83	18373,56	42700,83
2	2014	23,837	4056,44	24327,27	-490,27	-20270,83	19780,56	44107,83
3	2010	24,136	5967,56	24327,27	-191,27	-18359,71	18168,44	42495,71
3	2011	25,738	5967,56	24327,27	3410,73	-18359,71	21770,44	46097,71
3	2012	27,286	5967,56	24327,27	5958,73	-18359,71	24318,44	48645,71
3	2013	29,699	5967,56	24327,27	8371,73	-18359,71	26731,44	51058,71
3	2014	30,330	5967,56	24327,27	10002,73	-18359,71	28362,44	52689,71

Table 2.1 - Panel Data Model for three competing republics according to their agriculture sector (in current prices, mln. rub.)

- 1 – The Republic of North Ossetia-Alania
- 2 – The Karachay-Cherkess Republic
- 3 – The Kabardino-Balkar Republic

Appendix C - Panel Data Model of one of the priority sectors of regional development for three competing republics within the Northern Caucasus Federal District

Id	Time	Variable	Individual mean	Overall mean	Overall deviation	Between deviation	Within deviation	Between deviation (modified)
i	t	x it	xi aver.	x aver.	$x_{it} - x_{aver.}$	$x_{i\text{ aver.}} - x_{\text{with bar}}$	$x_{it} - x_{i\text{ aver.}}$	$x_{it} - x_{i\text{ aver.}} + x_{\text{aver.}}$
1	2010	15,522	14613,72	62376,2	-8004,2	-47762,48	39758,28	102134,48
1	2011	15,564	14613,72	62376,2	4986,8	-47762,48	52749,28	115125,48
1	2012	16,639	14613,72	62376,2	14113,8	-47762,48	61876,28	124252,48
1	2013	16,561	14613,72	62376,2	21843,8	-47762,48	69606,28	131982,48
1	2014	20,227	14613,72	62376,2	20521,8	-47762,48	68284,28	130660,48
2	2010	17,284	6552,24	62376,2	-34731,2	-55823,96	21092,76	83468,96
2	2011	23,424	6552,24	62376,2	-31340,2	-55823,96	24483,76	86859,96
2	2012	34,094	6552,24	62376,2	-28787,2	-55823,96	27036,76	89412,96
2	2013	37,600	6552,24	62376,2	-27655,2	-55823,96	28168,76	90544,96
2	2014	29,999	6552,24	62376,2	-25561,2	-55823,96	30262,76	92638,96
3	2010	22,267	16259,76	62376,2	484,8	-46116,44	46601,24	108977,44
3	2011	27,704	16259,76	62376,2	10734,8	-46116,44	56851,24	119227,44
3	2012	34,268	16259,76	62376,2	18172,8	-46116,44	64289,24	126665,44
3	2013	24,126	16259,76	62376,2	27478,8	-46116,44	73595,24	135971,44
3	2014	29,521	16259,76	62376,2	37741,8	-46116,44	83858,24	146234,44

Table 3.1 – Panel Data Model for three competing republics according to their manufacturing sector (in current prices, mln. rub.)

1 – The Republic of North Ossetia-Alania

2 – The Karachay-Cherkess Republic

3 – The Kabardino-Balkar Republic

Appendix D - Territorial socio – economic systems (TSES) development strategy

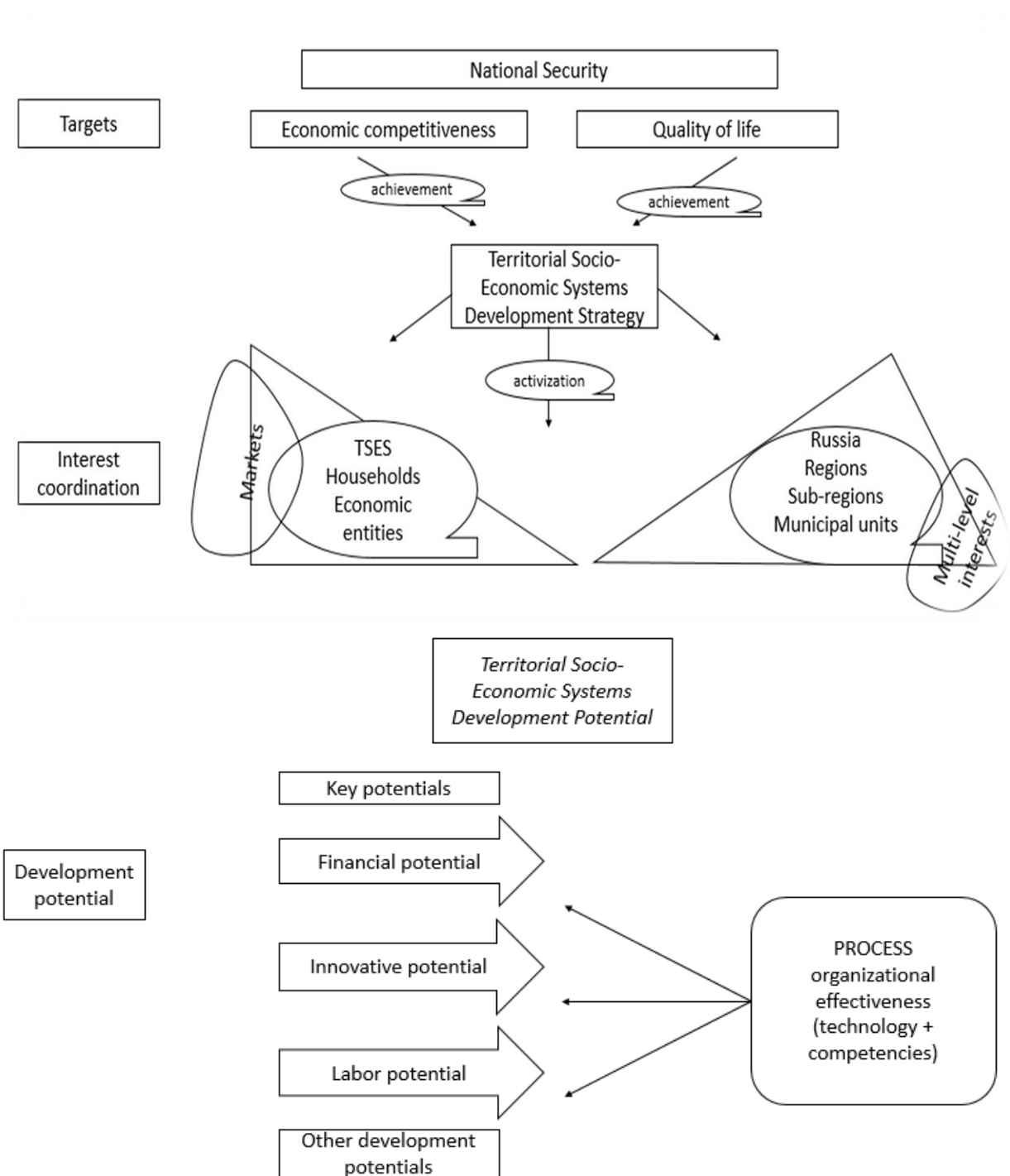


Figure 1.1 - Concept of strategic management of key territorial socio – economic systems development potential