

**Providing The Living Standards And Life Expectancy Of The Population In Globalization: Economic Analysis And Mathematical Modeling**

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**Abstract**

The Article Considers The Role Of The Service Sector Based On Mathematical Modeling Of The Relation Between The Relative Gross Domestic Product Of A Country And The Average Life Expectancy Of Its Population.

The Topic Of The Article Is Relevant In Modern Conditions And Is Important In Assessing The Development Level Of The National Economy And Increasing Life Expectancy Of The Country's Population. The Research Topic Is Particularly Relevant Due To The Fact That The Authors Have Identified And Determined The Dependency Of The Elasticity Of Average Life Expectancy On The Relative Gross Domestic Product. Based On This, The Content Of Global Comparative Studies Classifies Highly, Medium And Underdeveloped Countries Of The World. The Authors See The Purpose Of The Study In Introducing Proposals For Finding Ways To Develop Countries, To Provide Living Standards And Life Expectancy Of Citizens. The Authors Of The Article Analyzed Three Groups Of Countries And Identified The Dependency Of The Development Of Well-Being Level And Life Expectancy Of The Population On A Number Of Key Factors.

The Analysis Made It Possible To Conclude That There Is A Positive Correlation Between The Development Of The Service Sector And The Increase In The Level And Life Expectancy Of The Country's Population. This Confirms The Practical Significance Of The Study.

**Keywords:** National Economy, Gross Domestic Product, Structure Of Gross Domestic Product, Service Sector, Life Expectancy.

**Introduction**

Life Expectancy Varies Significantly From One Country To Another. For Example, The Average Life Expectancy In Japan Is 83.6 Years, And In Afghanistan, It Is 49.1 Years. [1]

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There Has Been Long Talks About How Many People Can Live On The Earth, Since Its Resources Are Limited. In The 19<sup>th</sup> And Early 20<sup>th</sup> Century, The Solution To This Problem Was Proposed As The Ideas Of Malthusianism / Neo-Malthusianism. In The Middle Of The Twentieth Century, The Theory Of The "Golden Billion" Appeared, The Meaning Of Which Was That The Restriction Of The Planet's Resources Imposes Certain Restrictions On The Number Of Living People. According To The Developers Of This Theory, One Billion People Can Live On The Earth. The Question Immediately Arose As To Who The "Lucky Ones" Were. [3,5]

The Authors Of The "Golden Billion" Theory Themselves Divided All Of Humanity Into "Pure" (And These Are Mainly Highly Developed Countries-The United States, Canada, Japan, Etc.) And "Impure" - All Other Countries, Including Russia. [4,7]

The Compelling Argument Of The Authors Of The "Golden Billion" Theory Is The Thesis That Only They Develop Humankind, Science, Art, And Economy. As A Result, These Countries Have The Highest Life Expectancy. [6]

### Theoretical Basis For The Research

Obviously, The Key Factor That Directly Affects The Life Expectancy Of The Population In Certain Countries Is The Level And Quality Of Economic Growth [10]. At The Same Time, The Development Of The National Economy Is Most Often Estimated As Gdp, Production And Consumption Of The Gross Domestic Product (Both In General And Per Capita). It Must Be Mentioned That Some Economists Believe That This Indicator Is Not Quite Correct, That It Has Certain Disadvantages. Thus, It Is Cost / Value; It Does Not Take Into Account: The Structure Of Distribution / Re-Distribution, The Environmental Component Of Social Reproduction, Crime, And Free Time Parameters. [2, 9]. However, A More Informative Indicator Of Economic Development In The World, Including Russia, Has Not Been Created So Far. If We Proceed From The Dimensional Capabilities Of This Indicator, Then In Our Opinion, The Most Correct Estimate Of The National Economy Advancement Is Relative Gdp, That Is, Gdp Per Person, And Calculated According To The Purchasing Power Parity Of The National Currency.

### Methodology Of The Research

What Is The Relation Of The Material Content Of This Indicator With One Of The Critical Qualities Of Human Existence, Lifetime, As The Primary Basis Of His Well-Being And Wealth?

To Specify The Relation And Interconnection Of This Content, We Will Use The Un Data.

Based On This Information, We Will Show The Average Life Expectancy Of The Population In Various Countries Related To Gdp Per Capita (Thousand Dollars):

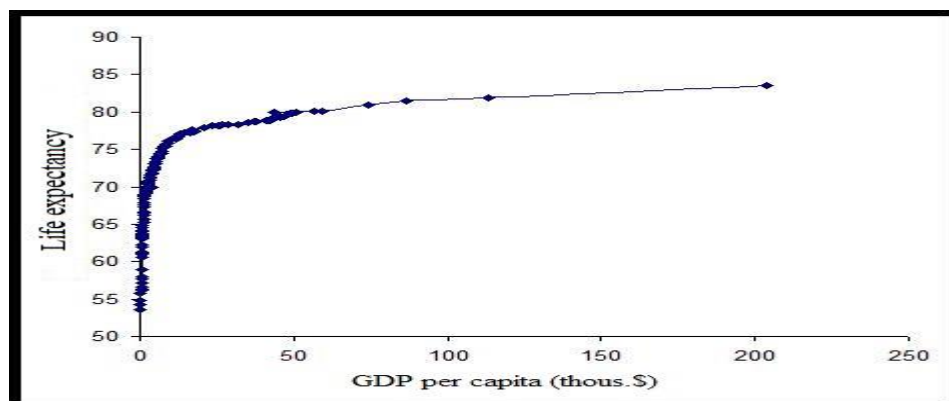


Figure 1 - Average Life Expectancy Of The Population In Various Countries Related To Gdp Per Capita (Thousand Dollars)

The Graph Shows That The Dependency Of The Average Life Expectancy In Different Countries Is Non-Linear. It Can Be Seen That At First, The Average Life Expectancy Of The Population Grows Rapidly With An Increase In Relative Gdp, But Then The Impact Of Gdp Drops Sharply.

To Show The Relation Between The Above Indicators More Clearly, Let Us Consider The Dependency Of Life Expectancy Elasticity On Relative Gdp (Figure 2):

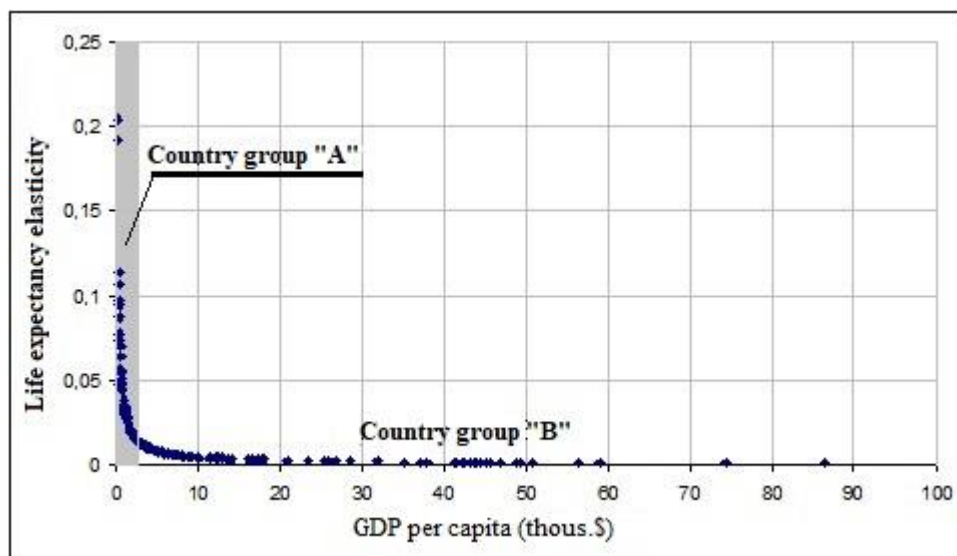


Figure 2 - Elasticity Of The Average Life Expectancy Related To The Relative Gdp Per Capita (Thousand Dollars)

As Follows From The Analysis Of The Graph, Two Zones Are Clearly Seen On It:

- Zone Of High Elasticity Of Life Expectancy From Relative Gdp - Zone " A »;
- Zone Of Low Elasticity Of Life Expectancy From Relative Gdp - Zone " B".

It Is Obvious That The Countries Of The So-Called "Golden Billion" Make The List Of Zone "B". They Are Luxembourg, Denmark, Switzerland, Kuwait, San Marino, The Netherlands, Sweden, Austria, Finland, Belgium And Ireland.

All Other Countries Of The World Are In Zone "A": Philippines, Mongolia, Bolivia, Guyana, Djibouti, Sudan, India, Cameroon, Nigeria, Uzbekistan And Ivory Coast.

According To The Analysis Of Both, The Relative Gdp And The Average Life Expectancy Of The Population, Zone "B" Includes Highly Developed Countries With A Strong Economy And, As A Rule, With Strong Armed Forces. In Addition, The Countries Of The "Golden Billion" Are Characterized By A Low Dependency Of Life Expectancy Increase On The Increase In Relative Incomes.

For All Other Countries, This Dependency – Life Expectancy On Relative Gdp - Is Already Highly Elastic: That Is, Even A Small Increase In Relative Gdp Leads To A Sharp Increase In The Life Expectancy Of The Population In Such Countries. We Must Say That Most Of Them Are The Countries With A Resource-Based Economy, With Low Living Standards And Weak Armed Forces.

### Analysis Result

What Can Explain This Difference In The Economic Development Of Different Countries And, As A Result, The Low Average Life Expectancy Of The Population?

It Is Obvious That After Using The Quantitive Evaluation Of The Relative Gdp, It Is Necessary To Turn To Its Characteristics, Such As Its Structure, In Order To Identify And Measure Its Functional Role In Terms Of Its Impact On The Average Life Expectancy Of The Population.

In This Regard, The Economy Of Various Countries Is Represented As A System Consisting Of Industries. Firstly, Each Of Them Is Connected To Other Industries Through Flows – Material, Financial, Information, And Others. Secondly, We Will Consider This System As A Three-Sector Model Of The Economy, Which Includes Industrial Production, Agriculture, And Services.

Based On This Theoretical And Methodological Message, On The Database Of The Internet, We Present A Table That Reflects The Current Structure Of The Economies In Various Countries (Based On The Hypothesis Proposed Above):

Table 1 - Economic Structure Of Various Countries

	Country	Gdp At Purchasing Power Parity, Million	Agriculture %	Manufacturing Industry, %	Production, %	Service Industry, %	Gdp Per Capita At Purchasing Power Parity, \$
	Globally	60710000	4,0	32,0	36,0	64,0	9500,0
1	Commonwealth Of Australia	640100	3,8	26,2	30,0	70,0	31900,0
2	Vanuatu	580	26,0	12,0	38,0	62,0	2900,0
3	Timor-Leste	370	25,4	17,2	42,6	57,4	400,0
4	Kiribati	79	30,0	7,0	37,0	63,0	800,0
5	Cook Islands (New Zealand)	105	17,0	7,8	24,8	75,2	5000,0

According To This Table, We Make A Three-Dimensional Graph Where The Proportion Of Industrial Production In The Structure Of The Country's Economy Is Laid Off Along The X-Axis, And The Share Of The Service Sector Is Laid Off Along The Y-Axis (Today These Are The Key Parameters In The Structure Of The National Economy). The Area Of The Circle Corresponds To The Number Of Countries That Are Included In This Interval. As A Result, We Get The Following General Picture Of The World Economy (Fig.3).

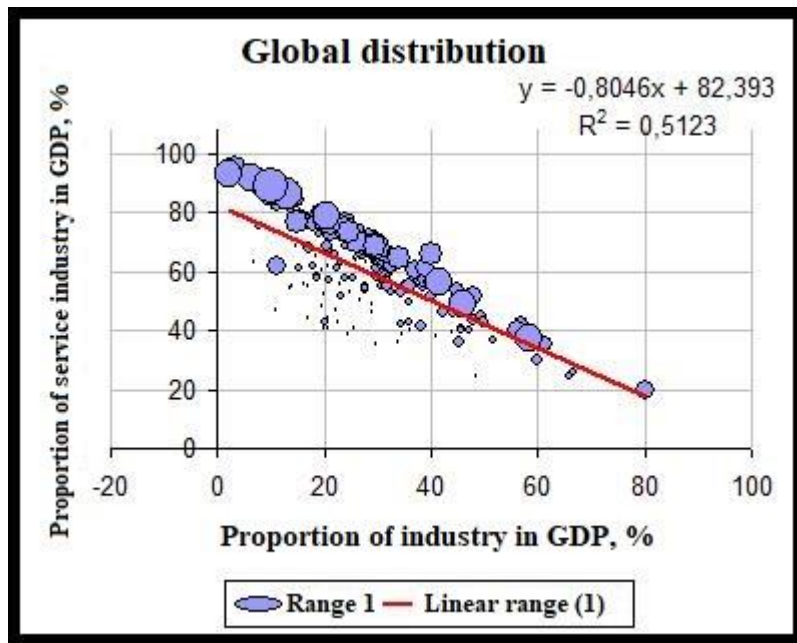


Figure 3 - Global Distribution Of Countries Depending On The Structure Of The Economy And The Proportion Of Industry In Gdp

For Research Purposes, It Is More Convenient To Consider Not The Absolute Value Of The Relative Gdp Of Various Countries, But Its Logarithm. To Do This, We Construct And Consider The Distribution Of Relative Gdp Logarithm Of Various Countries (Fig. 4):

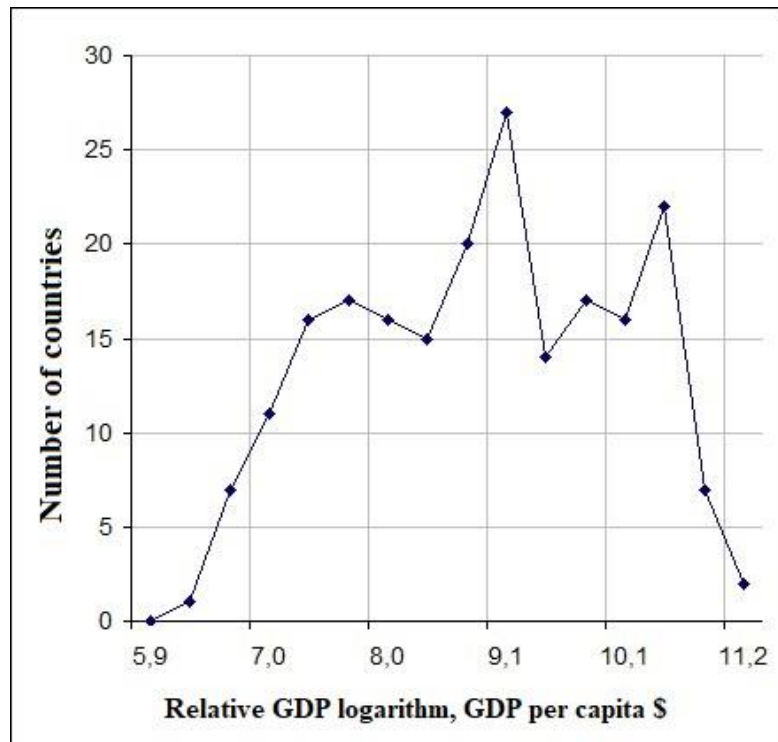


Figure 4 - Distribution Of World Countries By Gdp

Graphical Analysis (Figure 4) Shows That This Distribution Can Be Represented As A Combination Of Three Standard Normal Distributions (Figure 5): The Logarithm Of Relative Gdp, The Number Of Countries, And The Source Data / Sum.

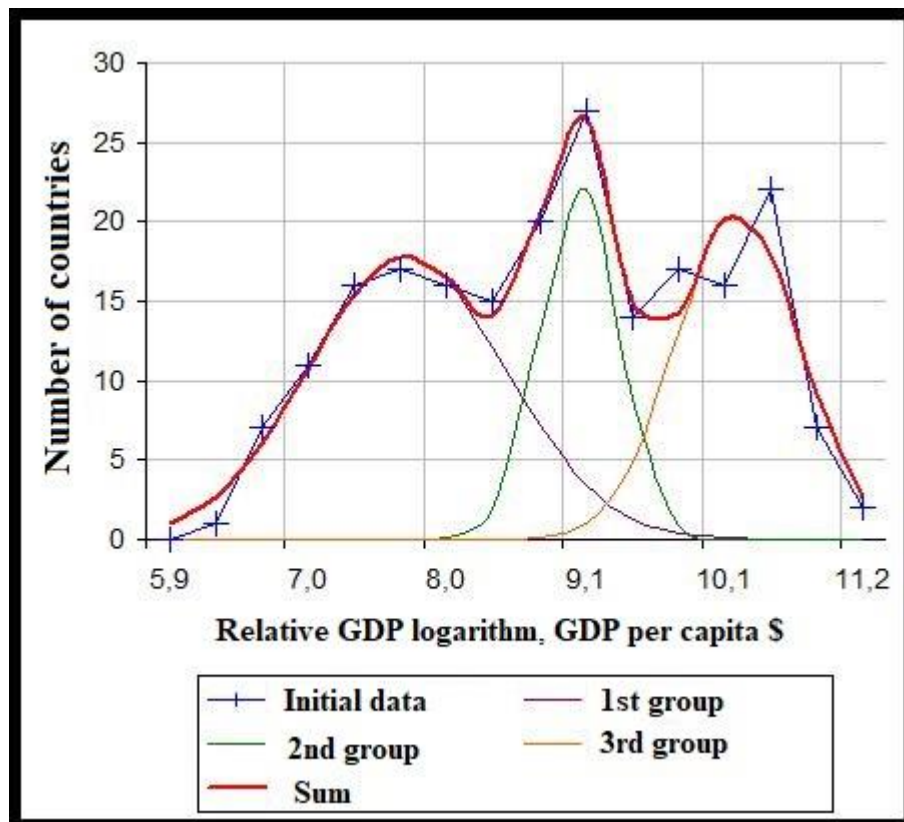


Figure 5 - Approximation Of The World's Gdp Distribution By Three Normal Distributions

The Three Components Of The Normal Distribution Have The Following Characteristics (Table 2):

Table 2 - Statistical Characteristics Of The Normal World's Gdp Distributions

Name	Normal Distribution		
	First	Second	Third
Multiplier	33,585286	16,557654	24,444164
Average Number	7,715709	9,030030	10,242809
Standard Deviation	0,753505	0,296029	0,474711

At The Same Time, It Should Be Emphasized That The Approximation Of The Initial And Combined (Total) Distribution Of Countries By Relative Gdp Was Checked Using The Criterion  $X^2$ .

Using The Same Discriminant Analysis, We Found The Points Between Groups Of Countries Belonging To The First, Second Or Third Ones: 8.749186 And 9.484755.

Since Industrial, Agricultural Production, And Services Together Sum Up To 100%, And Based On The Above Calculations, We Determine That The First Group Includes Such Countries As (Table 3):

Table 3 - Countries Which Belong To The First Group Of Countries By Relative Gdp  
(Part Of The List)

	Country	Gdp At Purchasing Power Parity, Million	Agriculture %	Manufacturing Industry,%	Service Industry,%	Gdp Per Capita At Purchasing Power Parity, \$
	2	3	4	5	6	7
1	Lebanon	23690	12,0	21,0	67,0	6200,0
2	Cape Verde	2990	12,1	21,9	66,0	6200,0
3	Reunion	4790	8,0	19,0	73,0	6200,0
4	Venezuela	153700	4,0	41,9	54,1	6100,0
5	Palestine (The Gaza Strip)	768	9,0	28,0	63,0	600,0
6	Comoro Islands	441	40,0	4,0	56,0	600,0
7	Malawi	7524	34,2	15,8	49,9	600,0
8	Somali	4809	65,0	10,0	25,0	600,0
9	Timor-Leste	370	25,4	17,2	57,4	400,0

Let Us Construct A Three-Dimensional Graph Of The Distribution Of The First Group Of Countries By The Proportion Of Industrial Production And Service Sector (Fig. 6):

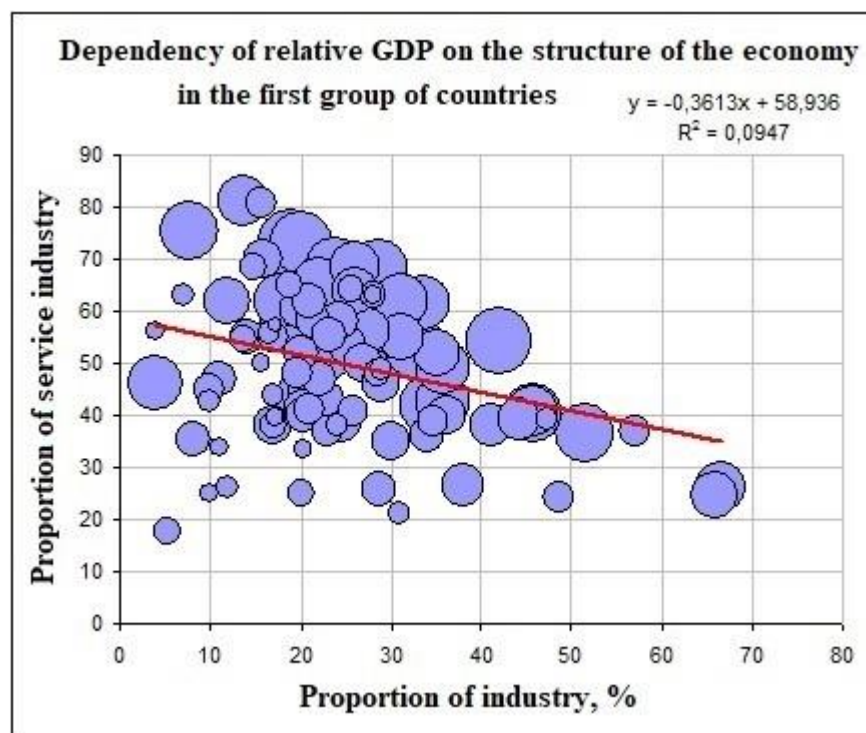


Figure 6 - Distribution Of Countries Depending On The Structure Of The Economy In The First Group

The Graph Shows The Number Of Countries By The Area Of The Circle. From The Above Figure And Graph (Fig. 6), It Follows That The Relative Gdp Of The First Group Of Countries Is Weakly Dependent On The Structure Of The Economy.

We Will Do The Same With The Second Group Of Countries. As A Result, We Get That The Second Group Which Includes Such Countries As (Table 4):

Table 4 - Countries Which Belong To The Second Group Of Countries By Relative Gdp

	Country	Gdp At Purchasing Power Parity, Million	Agriculture %	Manufacturing Industry,%	Service Industry,%	Gdp Per Capita At Purchasing Power Parity, \$
1	2	3	4	5	6	7
1	Argentina	518100	9,5	35,8	54,7	13100,0
2	Mauritius	16090	5,9	29,8	64,3	13100,0
3	Saudi Arabia	338000	3,3	61,3	35,4	12800,0
4	Malaysia	290200	8,4	48,0	43,6	12100,0
5	South Africa	533200	2,5	30,3	67,1	12000,0
6	China	8859000	12,5	47,3	40,3	6800,0
7	Belize	1778	14,2	15,2	61,2	6800,0
8	Gabon	9535	6,1	59,2	34,8	6800,0
9	Bosnia And Herzegovina	22890	14,2	30,8	55,0	6800,0

Graphical Analysis Of Information About The Second Group Of Countries Shows A Stronger Influence Of The Economy On The Relative Gdp Of These Countries (Figure 7).

For The Second Group Of Countries, We Will Also Construct A Graph Of Distribution Depending On The Structure Of The Economy:

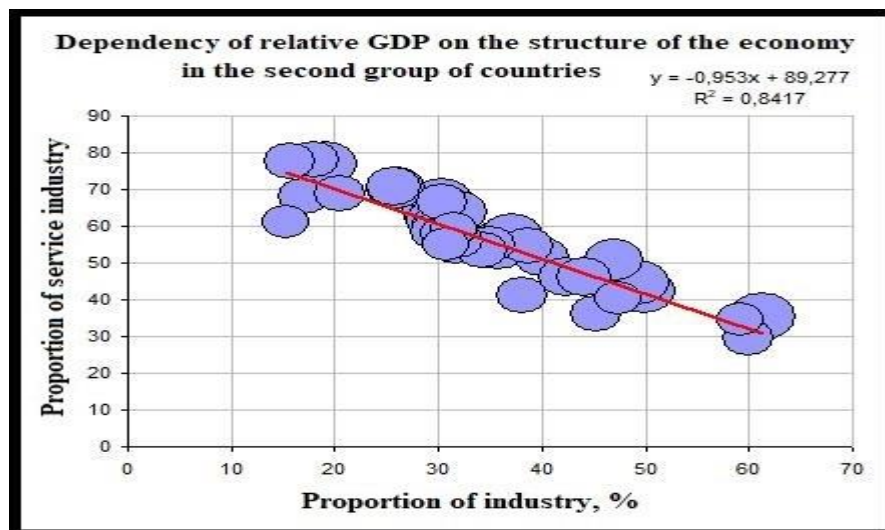


Figure 7 - Distribution Of Countries Depending On The Structure Of The Economy In The Second Group



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For The Above Relation, We Construct A Adequate Regression Model (Correlation Coefficient 0.92) That Shows The Influence Of The Economy Structure On The Relative Gdp In The Country. As You Can See, The Spread (Variance) Is Much Smaller Than For The Countries Of The First Group.

Finally, We Will Do The Same For The Third Group Of Countries (Table 5).

Table 5 - Countries Which Belong To The Third Group Of Countries By Relative Gdp

№	Country	Gdp At Purchasing Power Parity, Million	Agriculture %	Manufacturing Industry,%	Service Industry,%	Gdp Per Capita At Purchasing Power Parity, \$
1	2	3	4	5	6	7
1	Bermuda Islands	4500	1,0	10,0	89,0	69900,0
2	Luxembourg	30740	1,0	13,0	86,0	55600,0
3	Uae	111300	4,0	58,5	37,5	43400,0
4	Norway	194100	2,1	41,5	56,4	42300,0
5	Usa	1,2e+07	1,0	20,4	78,7	41800,0
6	Ireland	164600	5,0	46,0	49,0	41000,0
7	Poland	514000	5,0	31,1	64,0	13300,0
8	Oman	39650	2,7	39,0	58,3	13200,0
9	Latvia	30290	4,0	26,1	69,9	13200,0

On This Basis, We Present A Three-Dimensional Graph For This Group Of Countries (Fig. 8):

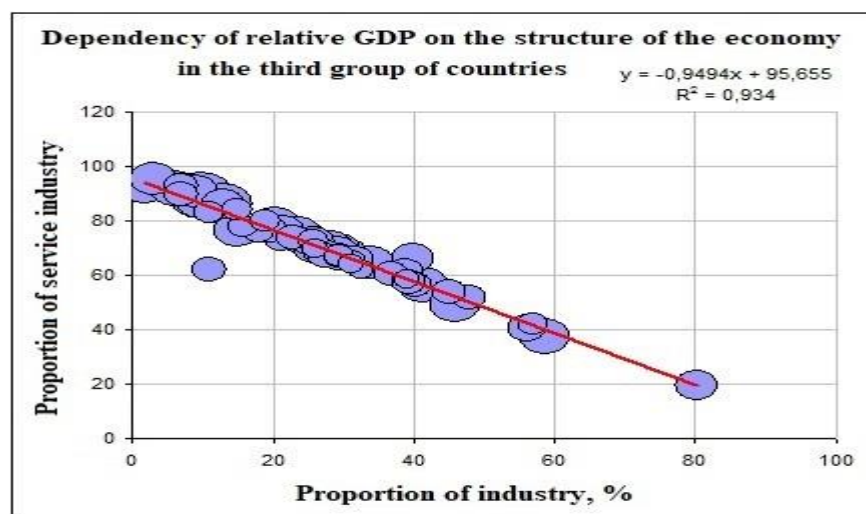


Figure 8 - Distribution Of Countries In The Third Group Depending On The Structure Of The Economy

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This Graph Shows A Completely Different Picture – There Is A Strong Dependency Of The Relative Gdp Of Countries On The Structure Of The Economy (The Correlation Coefficient Is 0.96). Moreover, In The Latter, The Vast Majority Is Occupied By The Service Sector.

Almost All Countries With The Highest Average Life Expectancy Have A Very Low Proportion Of Agricultural Products, Meaning That The Focus Is On The Service Sector.

Those Countries That Provide Services, Mainly Financial Ones, Are The Countries With The Highest Gdp And, As A Result, The Highest Average Life Expectancy Of The Population. Those Countries That Produce Vital Products For The Population - Primarily Agricultural Ones - Are The Poorest Countries. In Other Words, We Clearly Have A Price Disparity When Vital Products Such As Food And Clothing Are Valued Relatively Lower Than Financial Services Provided By The Highly Developed Countries Of The Third Group. It Turns Out That The Countries Of The Third Group (The "Golden Billion") Are The Rest Of The World.

Attempts By The Countries Of The First And The Second Groups To Correct The Situation Somehow, For Example, By Raising Prices, Are Nipped In The Bud By Military Force. There Are Many Examples In This Regard: Libya, Iraq, Argentina, Nicaragua, And Others. There Is The Explanation Why 18 Of The 48 Countries In The Third Group Are Members Of Nato. In Addition, The Rest Are Either Oil Producing (Qatar, Kuwait, Etc.) Or Such As Monaco Or Switzerland, Whose Economies Are Based On Gambling Or Financial (Retail) Business.

### **Conclusions**

Conclusions That Can Be Drawn From The Above:

1. In Highly Developed Countries (The "Golden Billion"), The Main Sector Of The Economy Is The Services, Mainly Financial.

2. The Wealth (The "Golden Billion") Is Based Mainly On Price Disparity, Since Raw Materials, Industrial And Agricultural Goods Are Valued Relatively Low, And Financial Resources Are Unfairly High.

3. Unfortunately, The Current Situation In The World Is Traditionally Sustained By Military Force And, In Particular, By Nato. All Attempts To Change The Current State Are Met With Forceful Opposition From The "Golden Billion".

Taking Russia In Consideration In This Regard, There Are Three Ways:

1. The "Golden Billion" Way. Under The Leadership Of The United States, Significantly Or Completely Losing Its Sovereignty (As In The 90s) To Integrate Into The Western (American) Economy. However, Firstly, The United States Will Not Allow It To Take Its Rightful Place In The "Family Of Civilized Countries". Secondly, Usury Does Not Correspond To The Mentality Of The Russian People.

2. China's Way. It Means Industrial Development With The Use (Often Theft) Of Western Technologies, The Use Of Technologies That Developed Countries Have Long Abandoned, Both In Industry And In Agriculture, With All The Negative Consequences That Follow.

3. The Third Way Is Energy-Source And Agricultural Economy, Focused On The Export Of Raw Products, Materials, Energy, And Food. Actually All That We Have Now. But, In Modern Conditions, This Is A Short – Term, At Best A Medium-Term Strategy For The Development Of The National Economy.

Thus, There Is Only One Thing Left To Do - To Make A Breakthrough On The Basis Of Mainly Internal Self-Financing And Stimulating Consumption.

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