

## Artículo de investigación

# Assessing the degree of inequality in the distribution of national income and its macroeconomic consequences in Azerbaijan

Evaluación del grado de desigualdad en la distribución del ingreso nacional y sus consecuencias macroeconómicas en Azerbaiyán

Avaliar o grau de desigualdade na distribuição da renda nacional e suas consequências macroeconômicas no Azerbaijão

Recibido: 20 de septiembre de 2018. Aceptado: 11 de octubre de 2018

Written by:

Mayis Gulaliyev<sup>21</sup>

Ali Aga Ismayilzade<sup>22</sup>

Anar Azizov<sup>23</sup>

Fail Kazimov<sup>24</sup>

Rahim Mir-Babayev<sup>25</sup>

## Abstract

The article examines the level of inequality of income distribution using the Gini, Atkinson and Theil indices over the past 8 years. It was taken household income as research data. The authors came to the conclusion that household incomes in Azerbaijan are very different, and inequalities in their incomes are very high. With the increase in average and of all strata of households incomes, inequalities between them did not noticeably decrease. The article also explores some macroeconomic effects of household income inequality.

The analysis shows that the level of economic development of Azerbaijan and country's revenues from the oil sector, along with an increase in the average income among the population, have significantly increased inequality. The facts are substantiated that the level of household income distribution does not characterize the level of economic development. The dependence of the level of inequality of

## Resumen

El artículo examina el nivel de desigualdad en la distribución del ingreso utilizando los índices de Gini, Atkinson y Theil en los últimos 8 años. Se tomó el ingreso del hogar como datos de investigación. Los autores llegaron a la conclusión de que los ingresos de los hogares en Azerbaiyán son muy diferentes, y las desigualdades en sus ingresos son muy altas. Con el aumento en el promedio y en todos los estratos de ingresos de los hogares, las desigualdades entre ellos no disminuyeron notablemente. El artículo también explora algunos efectos macroeconómicos de la desigualdad en el ingreso de los hogares.

El análisis muestra que el nivel de desarrollo económico de Azerbaiyán y los ingresos del sector petrolero del país, junto con un aumento en el ingreso promedio de la población, han aumentado significativamente la desigualdad. Los hechos se sustentan en que el nivel de distribución del ingreso de los hogares no

<sup>21</sup> Mayis Gulaliyev, PhD. Head of department of the Institute of Economics of Azerbaijan National Academy of Sciences, Baku, Azerbaijan. E-mail: [mayis\\_gulaliyev@yahoo.com](mailto:mayis_gulaliyev@yahoo.com)

<sup>22</sup> Ali Aga Ismayilzade, PhD. Associated professor of the Azerbaijan State University of Economics (UNEC). Email: [aliaga68@mail.ru](mailto:aliaga68@mail.ru)

<sup>23</sup> Anar Azizov, PhD. Assoc. Prof. of Azerbaijan University of Cooperation. Email: [anar.azizov.71@mail.ru](mailto:anar.azizov.71@mail.ru)

<sup>24</sup> Fail Kazimov, PhD. Head of department of The Azerbaijan National Academy of Sciences. Email: [fail\\_kazimov@yahoo.com](mailto:fail_kazimov@yahoo.com)

<sup>25</sup> Rahim Mir-Babayev, Candidate for PhD degree, Shanghai University, Shanghai, China. E-mail: [ragim1999@yahoo.com](mailto:ragim1999@yahoo.com)

household incomes on the level of state intervention in the economy through fiscal policy, the interrelation of income inequality to economic growth in the country, the impact of the level of inequality in the distribution of national income on the effectiveness of fiscal policy were evaluated. As a quantitative assessment of fiscal policy, the level of public finance was used - a composite index of the state budget and tax burden. To compare the levels of income inequality were used Gini, Atkinson and Theil indexes.

The authors came to the conclusion that a high level of income inequality is associated primarily with a high level of wage inequality in various spheres of economic activity and the liberality of fiscal policy. The authors proposed a model for determining the dependence of the volume of GDP or GDP per capita on the volume of public expenditures, the Gini index, and the sub-index of government finances. A model has also been proposed for determining the interrelation between fiscal policy, the Gini index, industrial output and population size. Analyzes show that hypothesis  $H_1$  is correct for determining the dependence of the volume of GDP on the Gini index and the sub-index of public finance. The authors also came to the following conclusions: the level of inequality of household incomes in Azerbaijan is very high in various methods, and the role of fiscal policy in the redistribution of income is not high.

**Keywords:** national income, inequality of national income, Gini index, Atkinson index, Theil index, financial policy, government finance index.

caracteriza el nivel de desarrollo económico. La dependencia del nivel de desigualdad de los ingresos familiares en el nivel de intervención estatal en la economía a través de la política fiscal, la interrelación de la desigualdad de ingresos con el crecimiento económico en el país, el impacto del nivel de desigualdad en la distribución del ingreso nacional en el país. Se evaluó la efectividad de la política fiscal. Como evaluación cuantitativa de la política fiscal, se utilizó el nivel de las finanzas públicas, un índice compuesto del presupuesto estatal y la carga fiscal. Para comparar los niveles de desigualdad de ingresos se utilizaron los índices de Gini, Atkinson y Theil. Los autores llegaron a la conclusión de que un alto nivel de desigualdad de ingresos se asocia principalmente con un alto nivel de desigualdad salarial en diversas esferas de la actividad económica y la liberalidad de la política fiscal. Los autores propusieron un modelo para determinar la dependencia del volumen del PIB o del PIB per cápita en el volumen de los gastos públicos, el índice de Gini y el subíndice de las finanzas públicas. También se ha propuesto un modelo para determinar la interrelación entre la política fiscal, el índice de Gini, la producción industrial y el tamaño de la población. Los análisis muestran que la hipótesis  $H_1$  es correcta para determinar la dependencia del volumen de PIB en el índice de Gini y el subíndice de las finanzas públicas. Los autores también llegaron a las siguientes conclusiones: el nivel de desigualdad de los ingresos de los hogares en Azerbaiyán es muy alto en varios métodos, y el papel de la política fiscal en la redistribución de los ingresos no es alto.

**Palabras claves:** Ingreso nacional, desigualdad del ingreso nacional, índice de Gini, índice de Atkinson, índice de Theil, política financiera, índice de finanzas públicas.

## Resumo

O artigo examina o nível de desigualdade de distribuição de renda utilizando os índices de Gini, Atkinson e Theil nos últimos 8 anos. Foi tomada a renda familiar como dados de pesquisa. Os autores chegaram à conclusão de que as rendas familiares no Azerbaijão são muito diferentes e as desigualdades em suas rendas são muito altas. Com o aumento da média e de todos os estratos de rendimento dos agregados familiares, as desigualdades entre eles não diminuíram visivelmente. O artigo também explora alguns efeitos macroeconômicos da desigualdade de renda familiar.

A análise mostra que o nível de desenvolvimento econômico do Azerbaijão e as receitas do país do setor petrolífero, juntamente com um aumento na renda média da população, aumentaram significativamente a desigualdade. Os fatos são comprovados de que o nível de distribuição da renda familiar não caracteriza o nível de desenvolvimento econômico. A dependência do nível de desigualdade das rendas familiares no nível de intervenção estatal na economia através da política fiscal, a inter-relação da desigualdade de renda com o crescimento econômico no país, o impacto do nível de desigualdade na distribuição da renda

nacional na economia. a eficácia da política fiscal foi avaliada. Como uma avaliação quantitativa da política fiscal, foi utilizado o nível de finanças públicas - um índice composto do orçamento do Estado e da carga tributária. Para comparar os níveis de desigualdade de renda foram utilizados os índices de Gini, Atkinson e Theil.

Os autores chegaram à conclusão de que um alto nível de desigualdade de renda está associado principalmente a um alto nível de desigualdade salarial em várias esferas da atividade econômica e à liberalidade da política fiscal. Os autores propuseram um modelo para determinar a dependência do volume do PIB ou do PIB per capita sobre o volume de gastos públicos, o índice de Gini e o subíndice de finanças do governo. Um modelo também foi proposto para determinar a inter-relação entre a política fiscal, o índice de Gini, a produção industrial e o tamanho da população. As análises mostram que a hipótese  $H_1$  é correta para determinar a dependência do volume do PIB no índice de Gini e no sub-índice das finanças públicas. Os autores também chegaram às seguintes conclusões: o nível de desigualdade de renda familiar no Azerbaijão é muito alto em vários métodos, e o papel da política fiscal na redistribuição de renda não é alto.

**Palavras-chave:** Renda nacional, desigualdade da renda nacional, índice de Gini, índice de Atkinson, índice de Theil, política financeira, índice de finanças do governo.

## Introduction

The economic implications of monetary and fiscal policies vary widely across countries, because each country has its own economic characteristics. In determining the contours of fiscal and monetary policy, it is important to consider these features. One of the features inherent in national economies is the structure of the distribution of national income in the country. The impact of the distribution of national income on social security depends largely on how fiscal policy is prone to social equality. There are two aspects of the interrelation between national income and fiscal policy: the impact of the distribution of national income on fiscal policy and the impact of fiscal policy on the division and redistribution of national income. Studying both aspects of this interaction can create conditions for the implementation of an optimal social security policy in society.

The determination of taxes and budget revenues depends on the distribution of national income. On the other hand, budget expenditures provide for the redistribution of national income. There is little research in the economic literature on the results of the effects of the distribution of national income on government spending (fiscal policy). In particular, studies on the impact of the national income distribution in developing economies on fiscal policy and vice versa - is not enough.

Each state tries not only to raise the level of welfare of the society, but also to reduce the difference in the living standards of the

population. But to exclude such a difference is impossible due to several objective reasons. First of all, people differ in their ability levels. Wages of highly skilled and low-skilled workers also differ. On the other hand, there are unemployed people in the society, holders of an annuity, schoolchildren, students and other groups of the population, who mostly have less income. And families differ in income due to the number of employees. Therefore, states are forced to intervene in the economy for the distribution and redistribution of income.

The state has a fiscal instrument for the implementation of income distribution. But an analysis of the interrelation between fiscal policy and income inequality in various countries proves that there is no one-to-one interrelation between these indicators. Fiscal policy plays a special role in the redistribution of national income. But if the level of inequality in income distribution is high, then the average household expenditure does not adequately reflect the real impact of fiscal policy. Keynes's demand policy suggests the redistribution of national income among low-income households. The policy of proposing stimulates economic growth increases inequality.

The implementation of equitable social security through income distribution policies has always attracted attention. And this requires intervention by the state, which can sometimes lead to the infringement of the rights of business structures. The contradiction between solving urgent social problems of the population and

creating a favorable environment for business development requires finding a balanced level of government intervention in the economy as a whole, or in its individual spheres.

### Literature review

In the economic literature, the interrelation between the “division of national income” and “fiscal policy” is seen as the interrelation between two measurable quantities - the “level of income inequality” and “government spending.”

Despite the widespread use of the Gini coefficient in economic research, some researchers note that it is unsuccessful to use it to measure various types of inequalities (Atkinson, 2000; Cowell, 1995). Many researchers note that this deficiency, the Gini coefficient in particular, makes it difficult to determine the average aggregate fraction of the population’s income, as well as when comparing the population with a different income group (Ellison, 2002; Hey & Lambert, 1980).

It is more appropriate to apply methods that meet each of these six criteria, using measurement methods used to measure income inequality. The most common method of such measurements is Theil indices.

In addition to the Gini index, the Atkinson index is also used to measure disparities in income distribution. The Atkinson index allows us to eliminate the aforementioned deficiency of the Gini index (Atkinson & Micklewright, 1992). Atkinson notes in his work *The Economics of Inequality* that inequality cannot be measured completely without taking social decisions into account. He believes that measurements, such as the Gini coefficient, are not “statistical”, and they point to hidden assumptions about weight in order to be attributed to inequality in different positions on the income scale.

The impact of income distribution on the macroeconomic state of the country was studied by Kuznets in 1955. This study analyzed the interrelation between economic growth and income inequality by Alesina and Rodrik (Alesina & Rodrik, 1994a), as well as by Perotti (Alesina & Perotti, 1996b) and others. Based on the theory of endogenous growth, determined by research that the interrelation between economic growth and income inequality is not monotonous and definite.

Some researchers believe that fiscal policy in developing countries, in contrast to developed and high-income countries, has a cyclical effect on GDP. Peter Lambert and William Pfähler (Lambert & Pfähler, 1997a) analyzed the interrelation between income distribution and market demand, and concluded that this interrelation is not unique and depends on many parameters in the market. Thus, they did not determine the clear impact of income distribution on the effectiveness of monetary and fiscal policy.

Another important fact is the empirical definition of the formation of fiscal policy, its implementation, and impact on the economy. Empirical studies by (Gulaliev, 2017), (Gavin & Perotti, 1997), (Guerson, 2003), (Caballero & Krishnamurthy, 2004), (Talvi & Végh, 2005), (Mendoza, 1995) and others prove that fiscal policy in developing countries is expansionary unlike developed countries. However, these studies have not studied the effect of income distribution on the economy.

The distribution of national income is important for the formation of fiscal policy. Because if there is a high level of inequality in the distribution of income, then the average expenditure of households cannot reflect the real effects of fiscal policy. The Keynes- Duesenberry demand policy provides for the redistribution of national income in low-income households. The policy of the proposal, while promoting economic growth, increases inequality. Recently, with income sharing policies, there has been increased interest in implementing more equitable social security. The solution of social problems of the population through state intervention in the economy requires the establishment of a certain balance between economic liberalism and dirigisme. In particular, after the economic crisis of 2008, the important role of state intervention in the economy emerged.

Thus, the connection between optimal fiscal policy and the distribution of national income can be determined using the interrelation between aggregate demand and income inequality. This approach is based on the Baumol-Tobin model. The distribution of income in this model is included in the demand for money. Lambert P.J. and Pfähler W. (1997a), (Pfähler & Wiese, 1990), as well as (Das & Fombi, 2004) widely used this model in their studies, where the demand for money was analyzed at the micro level and applied to the economy of the country as a

whole. In these studies, including variables of the Lorenz curve in estimating the aggregate demand of the country's economy, the result is that the smaller inequality in household incomes, the higher the aggregate demand will be. It should be noted that such studies were conducted mainly in developed countries with a high degree of income. In studies conducted by M. Das and others, the optimal demand for money over long and short period of time is determined for households. They argue that M1 and M2, there is a positive connection between the demand for money and income inequality.

Some studies, such as (Cecilia & Turnovsky, 2006). show that there is a link between economic growth and income inequality. Fiscal policy creates a link between inequality in income distribution and income growth.

The interrelation between the distribution of national income and some macroeconomic indicators became a serious research object in the middle of the century. Kuznets, the author of the first research on this issue, notes that such interrelations are important and contradictory (Kuznets, 1955). The controversy was that it was difficult to substantiate the theoretical basis of this connection. On the other hand, it was difficult to obtain sufficient information to prove that such interrelation exists empirically. Empirical studies conducted by Lundberg and Squire (2003) also did not give unambiguous results. (Alesina & Rodrik, 1994), (Persson & Tabellini, 1994), (Perotti, 1996) and other researchers studied the positive or negative impact on the growth of inequality. Some studies have confirmed that the interrelation between these two indicators is negative and some positive. Studies confirming the existence of negative effects, including theoretical studies conducted by (Galor & Zeira, 1993), (Gylfason & Zoega, 2003), (Aghion & Bolton, 1997) and others, explain that income inequality negatively affects investments in the physical and human capital. And from studies conducted by (Li & Zou, 1998), (Forbes, 2000) and (Barro, 2000) it turns out that the interrelation between these indicators is positive. In the Baron's research, even rich countries differed from the poorer countries in their research results. As in poor countries, there is a negative interrelation between inequality and economic growth, and in rich countries is positive. In studies conducted by Saint-Paul G. and Verdier T., as a reason for the positive interrelation between inequality and economic growth in richer countries,

accompanying inequality with high taxes and redirecting additional savings to education and human capital development is shown (Saint-Paul & Verdier, 1993).

The effect of income growth on inequality can be realized through various mechanisms. One of these mechanisms is technological and structural change. As technology develops, so does national income. Technological development can increase or decrease the inequality between incomes in accordance with the required knowledge and skills. The expansion of globalization also affects inequality. Expanding cross-border economic integration affects the flow of people with a higher level of knowledge and skills from one country to another (Feenstra & Hanson, 1996). The expansion of trade can lead to a decrease in employment, which can also lead to income inequality (Helpman, Itskhoki & Redding, 2010). Another mechanism may be associated with reforms in the governance of the country. Since, various government interventions in the economy, including effective fiscal policy, can influence income distribution through the development of the education system and other social spheres.

### Materials and Methods

It should be noted, that the World Bank already calculated income inequality in Azerbaijan (Gini index) over several years. The last calculation covers the 2008 year. Since these indicators are not enough to determine the interrelation between fiscal policy and the objectives shown in the study, especially income distribution, we found it important to calculate the Gini index over the last 10 years in accordance with the Gini formula.

There are various methodologies for measuring income inequality. The most common of these methodologies is the Gini coefficient, the Tail index and the Atkinson index. It is necessary to assess the degree of inequality in the distribution of national income through all three methods to study the interaction of national income and fiscal policy. It should be noted that when we speak about inequalities in the distribution of income during the study, we take into account the differences between household incomes and not individuals.

When applying these methodologies, we refer to the data of the State Statistical Committee of the Republic of Azerbaijan and, therefore, we will take households as well as individuals as a group

of the population. In this case, the Gini coefficient will be calculated using the Brown formula as follows:

$$G = |1 - \sum_{k=2}^n (X_k - X_{k-1})(Y_k + Y_{k-1})| \quad (1)$$

Where:  $X_k$  - the cumulative part (of households or groups of persons "k") of households (groups of persons) predetermined for increasing income,  $Y_k$  - the fraction of incomes of a group

of households (or groups of persons) "k", in the total income of households or population.

To calculate the Gini coefficient using the Gini formula, formula (2) is applied:

$$G = \frac{\sum_{i=1}^n \sum_{j=1}^n |y_i - y_j|}{2 * \bar{y} * n^2} \quad (2)$$

In this case,  $n$  is the number of households (or groups of individuals),  $y_i$  and  $y_j$  are, respectively, the fraction of a group of households (or groups of individuals) in gross income,  $\bar{y}$  is the average number of household incomes (or groups of individuals).

An assessment of some macroeconomic consequences, including the effects on economic growth in Azerbaijan of income inequality, is also of scientific and practical importance. Using the methods used in the aforementioned studies to achieve the goal set out in the thesis, we consider the interrelation between inequality of income distribution in Azerbaijan with fiscal policy (government spending or the fraction of these

costs in GDP). Let's try to clarify some of the methods that are used for this purpose.

It should be noted that for the economy of Azerbaijan there is a need to clarify several issues. Firstly, how does the level of inequality in the economy of Azerbaijan depend on the level of intervention of fiscal policy in the economy? Secondly, what is the interrelation of income inequality in the economy of Azerbaijan with economic growth? Thirdly, does the level of inequality in the distribution of national income in Azerbaijan affect the effectiveness of fiscal policy positively or negatively?

Adding the state financial sub-index  $X4$  to equation (3), we can express the relation equation of fiscal policy and revenue sharing for a long period in the country as follows:

$$Y1_t = \beta_0 + \beta_1 * X1_t + \beta_2 * X2_t + \beta_3 * X3_t + \beta_4 * X4_t + \varepsilon_t \quad (3)$$

Where:  $t = 1, 2, 3 \dots T$ ,  $Y1$  - GDP in Azerbaijan,  $X1$  is the volume of government spending in Azerbaijan,  $X2$  is a variable income distribution (Gini coefficient or Theil index and Atkinson index), and  $X3$  is a variable characterizing the period of interaction and characterized as  $X3 = X1 * X2$ , and  $X4$  - state financial subindex of Azerbaijan,  $\varepsilon_t$  - random errors,  $T$  - characterizes the time. Note that the model included in the model -  $X4$  (state financial sub-index), was calculated in accordance with the methodology of the "Left (right) index of the economy" - LIE (RIE) developed at the Institute of Economics of the National Academy of Sciences of Azerbaijan (Lambert, & Pfähler, 1997).

One of the components of the sub-index LIE (RIE), a sub-index of public finance (PF), indicates the level of redistribution of income through state intervention in the economy and, in turn, is calculated as the mathematical middle of two sub-indices - budget expenditures (BE) and tax burden of enterprises (TB). According to the methodology, the sub-index of budget expenditures is calculated on the basis of the percentage fraction of budget expenditures in GDP, and the necessary information is taken from the IMF statistical base. The second sub-index of the public finance sub-index, the tax burden, is calculated on the basis of the ratio of tax paid by a model private company for the year and annual income, and the necessary



information is taken from the report of the Doing Business Group of the World Bank (Official site of the State Statistic Committee of Azerbaijan Republic).

## Results and Discussion

Let us try to calculate the Gini coefficient for Azerbaijan in 2015, based on the income of households or individuals. The State Statistics Committee of the Republic of Azerbaijan (SSCRA) in 2015 allocated 23 groups of households according to their per capita incomes. We take into account that the average size of households in 2015 was 4.72.

**Table.1.** Grouping by income of household groups (GHG) and individuals (2015)

Monthly income per capita	Average monthly income in GHG	Fraction of GHG in households	Total, size GHG	The fraction of a group of persons in the total population	Total, size groups of persons
Up to 105 manat <sup>26</sup>	Up to 495.6	0.0	0.0	0.0	0.0
105,1 - 110,0	505.512	0.2	0.2	0.2	0.2
110,1 - 115,0	533.832	0.4	0.6	0.5	0.7
115,1 - 120,0	552.712	0.6	1.2	0.8	1.5
120,1 - 125,0	581.032	0.7	1.9	0.8	2.3
125,1 - 130,0	599.912	1.3	3.2	1.6	3.9
130,1 - 135,0	628.232	1.6	4.8	1.9	5.8
135,1 - 140,0	647.112	2.4	7.2	2.9	8.7
140,1 - 145,0	675.432	2.6	9.8	3.1	11.8
145,1 - 150,0	694.312	2.8	12.6	3.2	15
150,1 - 155,0	722.632	3.4	16.0	3.8	18.8

<sup>26</sup> Manat is the national currency of Azerbaijan. Before the 2015 devaluation, 1 manat = 1.25 US dollars. After the devaluation of 2015, 1 manat = 0.588 US dollars.

155,1 - 160,0	741.512	4.0	20.0	4.4	23.2
160,1 - 170,0	769.832	9.1	29.1	10.0	33.2
170,1 - 180,0	826.472	9.3	38.4	10.1	43.2
180,1 - 190,0	873.672	8.5	46.9	9.0	52.2
190,1 - 200,0	920.872	7.4	54.3	7.6	59.8
200,1 - 210,0	968.072	6.8	61.1	6.9	66.7
210,1 - 220,0	1015.272	5.9	67.0	5.8	72.5
220,1 - 230,0	1062.472	4.9	71.9	4.8	77.3
230,1 - 240,0	1109.672	4.1	76.0	3.9	81.2
240,1 - 250,0	1156.872	3.6	79.6	3.3	84.5
250,1 - 300,0	1322.632	10.7	90.3	9.2	93.7
300 or more	more than 1416	9.7	100.0	6.3	100

Source: Compiled on the basis of data from the State Statistics Committee of the Republic of Azerbaijan (Official site of the State Statistic Committee of Azerbaijan Republic).

Researches show that in 2015, households with a per capita income of up to 105 manat almost did not exist. Due to the increase in incomes of the population, the grouping of households by income also changed dynamically. For example, in 2009, when households were grouped by

income, households with income up to 70.1 manat accounted for 1.8% of the total number of households, whereas by 2010 this number was reduced to 1%.

In 2011, households with such income no longer existed. Studies show that over the past ten years, the number of households and household income has increased, as well as the average per capita income of households.



**Table.2.** Some indicators of GHG for 2015.

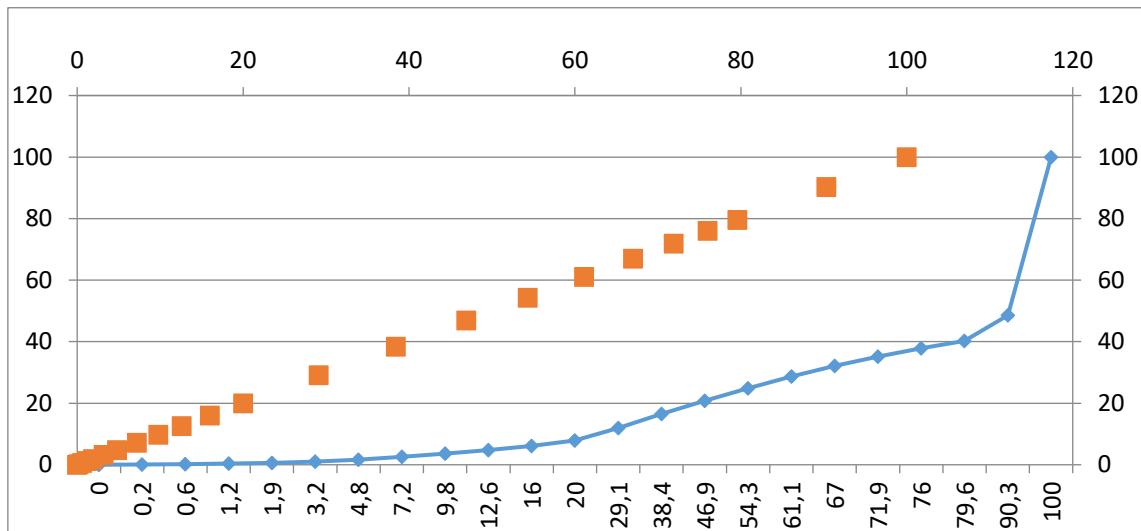
GHG percent	Average month per capita income in GHG	GHG monthly income	GHG annual income	Number of households in GHG	Gross income group GHG (thousand manat)	Fraction in total income of GHG	Fraction GHG in gross income	Cumulative amount of GHG
0	105 manat	0	0	0	0	0	0	0
0.2	107.1	505.5	6066.1	4065	24657.8	0.0006	0.06	0.2
0.4	113.1	533.8	6406.0	8130	52078.5	0.0012	0.12	0.6
0.6	117.1	552.7	6632.5	12194	80880.5	0.0019	0.19	1.2
0.7	123.1	581.0	6972.4	14227	99195.4	0.0024	0.24	1.9
1.3	127.1	599.9	7198.9	26421	190206.2	0.0046	0.46	3.2
1.6	133.1	628.2	7538.8	32519	245151.0	0.0059	0.59	4.8
2.4	137.1	647.1	7765.3	48778	378777.7	0.0091	0.91	7.2
2.6	143.1	675.4	8105.2	52843	428300.6	0.0103	1.03	9.8
2.8	147.1	694.3	8331.7	56908	474139.8	0.0114	1.14	12.6
3.4	153.1	722.6	8671.6	69102	599224.8	0.0144	1.44	16
4	157.1	741.5	8898.1	81297	723388.9	0.0173	1.73	20
9.1	163.1	769.8	9238.0	184950	1708563.2	0.0409	4.09	29.1
9.3	175.1	826.5	9917.7	189015	1874583.5	0.0449	4.49	38.4
8.5	185.1	873.7	10484.1	172755	1811177.6	0.0434	4.34	46.9
7.4	195.1	920.9	11050.5	150399	1661975.7	0.0398	3.98	54.3
6.8	205.1	968.1	11616.9	138204	1605499.8	0.0385	3.85	61.1
5.9	215.1	1015.3	12183.3	119913	1460925.6	0.0350	3.50	67
4.9	225.1	1062.5	12749.7	99588	1269718	0.0304	3.04	71.9
4.1	235.1	1109.7	13316.1	83329	1109614.6	0.0266	2.66	76
3.6	245.1	1156.9	13882.5	73167	1015737.5	0.0243	2.43	79.6
10.7	280.1	1322.1	15864.9	217468	3450107.1	0.0826	8.26	90.3
9.7	300	9080.0	108960.3	197144	21480896	0.5146	51.46	100

Source: Calculated and compiled by the authors based on the SSCRA data.

The Lorenz curve, which characterizes the inequality of household incomes in 2015, is described in Diagram 1. The diagram illustrates that the differences between household incomes do not change sharply, except for the last element of the group. It is very close to a straight 45 degrees. However, the last element is a group of households with incomes of more than 300 manat, have more than 55% of income, although

they constitute only 9.7% of the total number of households. This means that 197,144 households have more than 55% of total national income, or about 21 billion manat of income. Respectively households included in this group, on average, have more than 100,000 manat of income. Such inequality of household incomes is reflected in the Lorenz curve in diagram 2.1.

Diagram.1. Lorenz curves for household income group (GHG) in Azerbaijan (minimum 105 manat).



Studies show that the Lorenz curves, which characterize income inequality in the households of Azerbaijan during the period between 2009 and 2015, are very similar to each other. Classification of households with small differences in income (10-20-50 manat) in about 20 groups allow to distinguish households in Azerbaijan into five groups, such as "low", "low average", "average", "upper middle" and "upper". Here the average social group makes up a significant part of the population (about 50%). The similarity between Lorenz curves in different years indicates that the ratio between social groups has not changed sharply. Thus, despite the increase in incomes of each group with an increase in gross national income, the ratio between the volume of social groups and social

groups has been maintained. Of course, in this case, the Gini index changed slightly.

The increase in incomes has definitely affected the average profitability of farms in GHG. Since, for example, in 2009 households with a per capita income of 100.1-105 manat, accounted for only 5% of the total number of households, in subsequent years their fraction decreased to 4.6% (2010), 4, 7% (2011), 0.1% (2012), 0.9% (2013), 0.2% (2014), 0% (2015).

Lorenz curves for household income group (GHG) in Azerbaijan (Y-axis is the cumulative fraction of GHG in gross income, and X-axis is the cumulative fraction of GHG in total households).

Diagram.2.

2009 (minimum 70 azn)

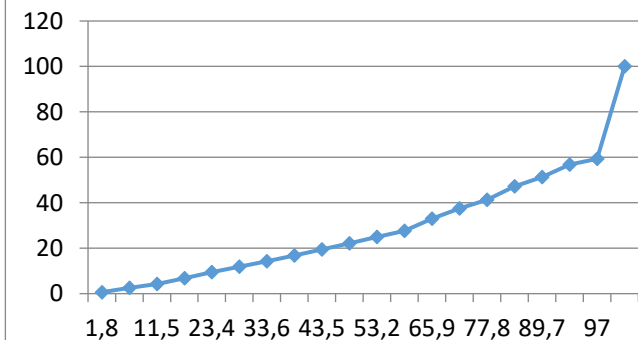
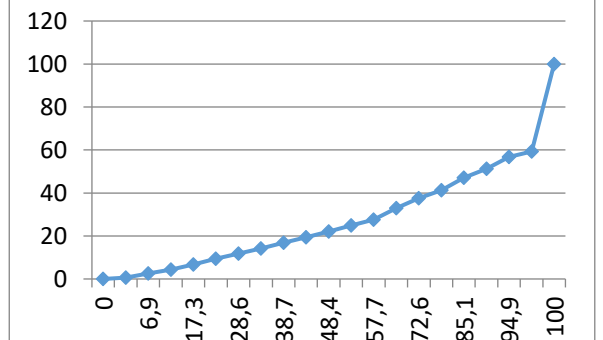
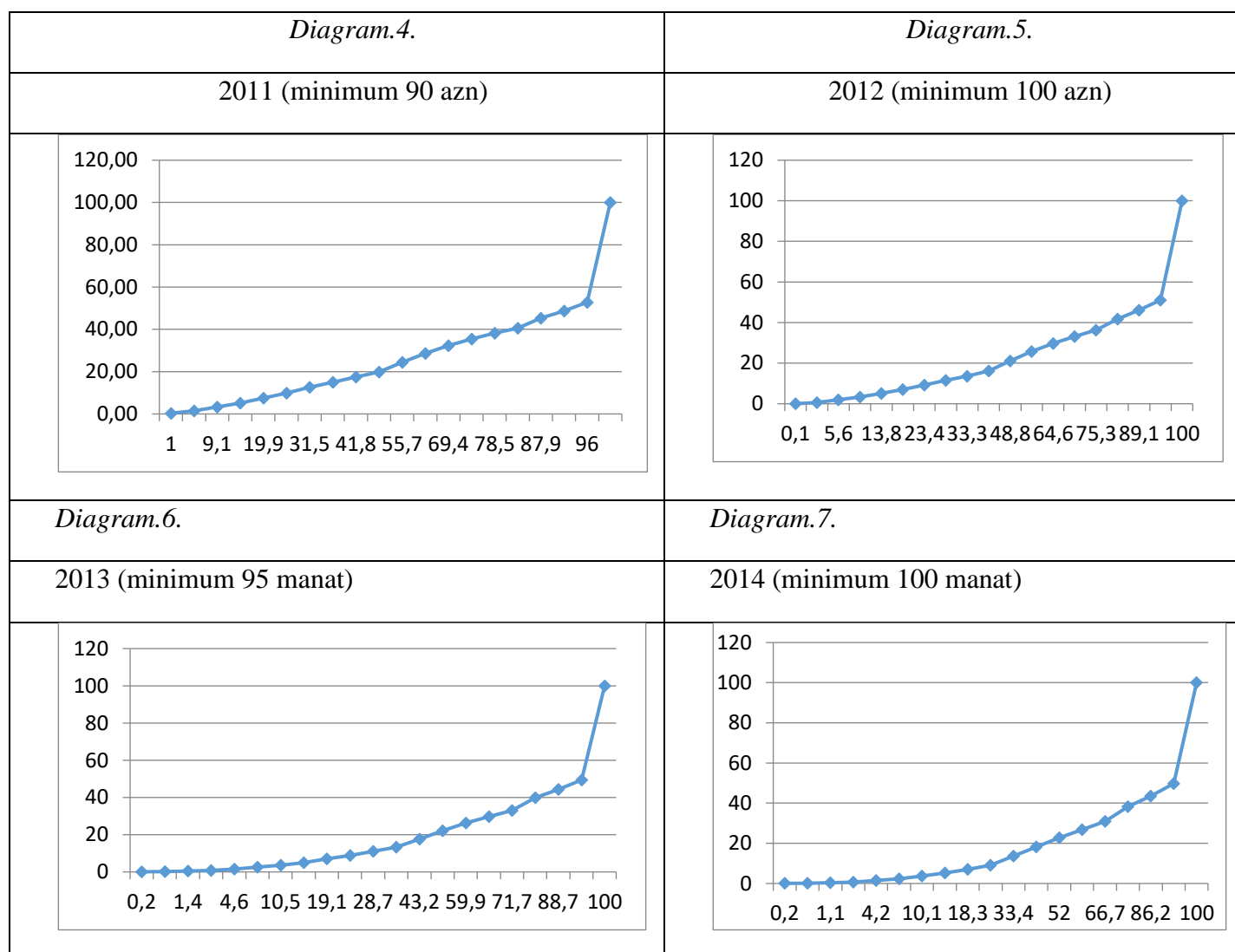


Diagram.3.

2010 (minimum 70 azn)





As household incomes change, the weight of a group of households that can be considered as “middle class” tends to decrease. Comparison of diagrams 2.-7 suggests that: 1) the bends at the end of the Lorenz curve begin to grow at a lower level. For example, in 2009 and 2010, these bends account for about 60% of total revenues, whereas in 2013-2014 such bends were about

45%. However, for all the years surveyed, 40–55% of national income accounts only for 3-5% of households. This “fallout” of the Lorenz curve indicates that inequality in the distribution of national income in Azerbaijan is serious. This is evidenced by the Gini coefficient, calculated using the Gini formula for 2009-2015.

**Table.3.** Gini coefficient in Azerbaijan (2009-2016).

	$\sum_{i=1}^n \sum_{j=1}^n  y_i - y_j $	$n^2$	$\bar{y}$	$G = \frac{\sum_{i=1}^n \sum_{j=1}^n  y_i - y_j }{2 * \bar{y} * n^2}$
2005				<b>0.5722</b>
2009	1861.572	400	5	<b>0.4654</b>

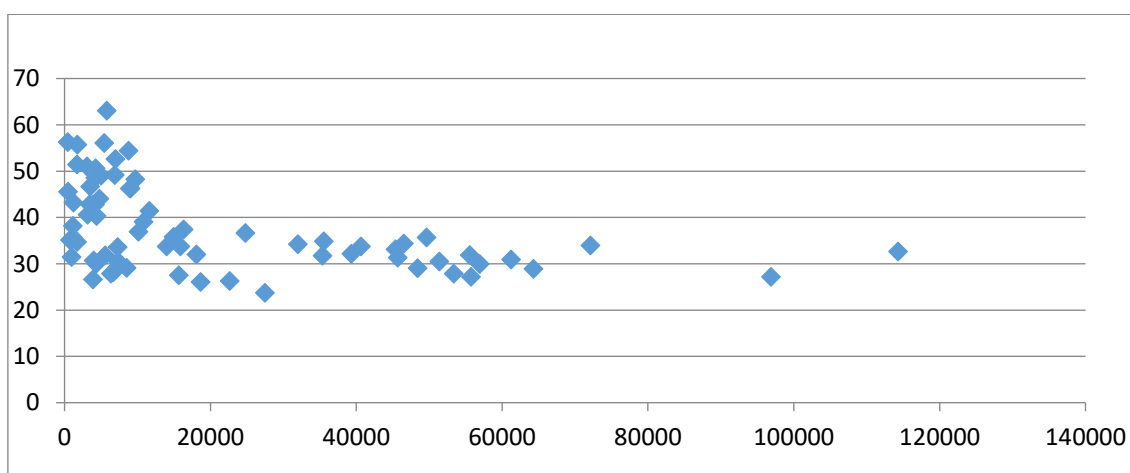
2010	2234.867	400	5	<b>0.5587</b>
2011	2047.534	400	5	<b>0.5119</b>
2012	2163.084	361	5.26	<b>0.5692</b>
2013	2688.544	441	4.76	<b>0.6401</b>
2014	2460.618	361	5.26	<b>0.6475</b>
2015	1989.712	484	4.55	<b>0.4522</b>
2016	3417,817	529	4,35	<b>0,7430</b>

Note: Calculated and compiled by the authors.

Thus, economic development in Azerbaijan and revenues from the oil sector into the country, along with an increase in average income among the population, significantly increased inequality. It should be noted that the sharp change in the Gini coefficient reflects the difference between the distributions of incomes of the population, but does not characterize the level of economic development and social welfare. However, there is a definite interrelation between economic development and the Gini coefficient. Studies show that the Gini coefficient in developed countries is relatively small compared with developing countries, i.e. income inequality is lower. In other words, economic development is a prerequisite for reducing the Gini coefficient,

i.e., the level of income inequality. But to assume the opposite is impossible. That is, reducing inequality does not provide economic development. The best proof of this is the former socialist countries. For example, the inequality between the incomes of the population of the USSR was small, but economic development was not ensured. As can be seen from chart 8, in some economically underdeveloped countries, the Gini index is even lower than in some developed countries. For example, in Luxembourg, which is one of the countries with the highest income level in the world in 2008, the Gini coefficient is 0.3261, whereas in Ukraine or Belarus it is 0.2664 and 0.2783, respectively.

Diagram.8. The interrelation between the Gini coefficient and GDP per capita.



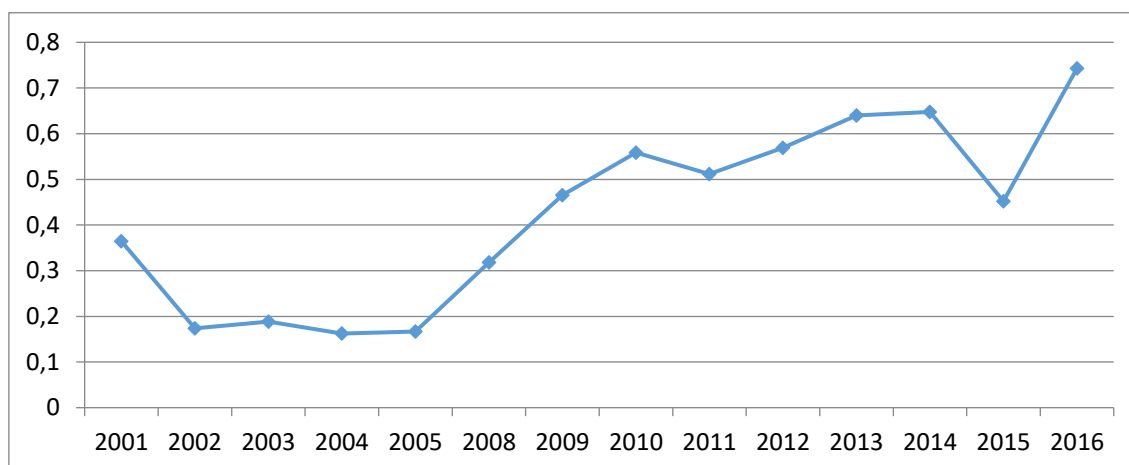
The dynamics of the Gini coefficient in Azerbaijan over the past 15 years is shown in diagram 9. The diagram shows that the level of inequality in Azerbaijan decreased slightly from 2002 to 2005,

but sharply increased in subsequent years. After 2014, a decrease is also observed. In 2015, the devaluation of the manat had a significant impact on the income of the population and the

difference between these incomes. Thus, a more active involvement of a wide segment of the population in the agricultural sector in the regions, as well as a decrease in income in the

banking and oil-related sectors have influenced the wages of workers in these sectors and, therefore, the overall level of inequality.

Diagram.9. Dynamics of the Gini Index in Azerbaijan.



Source: Gini Index 2001-2008 was taken from the statistical database of the World Bank (Official site of World Bank). Gini Index for the period 2009-2015 was calculated by the authors. The Gini coefficient can also be calculated using the Brown formula. The Gini index calculated using the Brown formula for the period between

2009 and 2015 is fully consistent with the results obtained using the Gini formula.

One of the measurement methods used to measure income inequality is Theil index ( $T_1$ ;  $T_0$ ). Both indices are based on the idea of calculating entropy in income inequality:

$$T_1 = \frac{1}{N} * \sum_{i=1}^N \left( \frac{X_i}{\bar{X}} * \ln \frac{X_i}{\bar{X}} \right) \quad (3)$$

$$T_0 = \frac{1}{N} * \sum_{i=1}^N \left( \ln \frac{\bar{X}}{X_i} \right) \quad (4)$$

Where:  $X_i$  - income of an individual (or population group)  $i$ ,  $\bar{X}$  - average income, and  $N$  - population (or individuals in a group).

Calculations show that for 2015, the Theil index  $T_1 = 0.569189833$ .

**Table.4.** Income inequality in Azerbaijan by Theil index (2015).

The fraction of income groups of the population in the total population	Population size in the group	Monthly income per capita population in a group	Annual income per capita population groups	Average annual per capita income in the country	Theil index
(%)	$N_i$	$x_i$	$X_i$	$\bar{X}$	$\frac{X_i}{\bar{X}} * \ln \frac{X_i}{\bar{X}}$
0		Up to 105 manat	0	0	0
0.2	19186	107.1	1285.2	4351.506307	-6910.92
0.4	38372	113.1	1357.2	4351.506307	-13943.80
0.6	57558	117.1	1405.2	4351.506307	-21009.43

0.7	67151	123.1	1477.2	4351.506307	-24627.83
1.3	124709	127.1	1525.2	4351.506307	-45825.85
1.6	153488	133.1	1597.2	4351.506307	-56464.93
2.4	230232	137.1	1645.2	4351.506307	-84665.38
2.6	249418	143.1	1717.2	4351.506307	-91518.99
2.8	268604	147.1	1765.2	4351.506307	-98309.97
3.4	326162	153.1	1837.2	4351.506307	-118740.31
4	383720	157.1	1885.2	4351.506307	-139056.74
9.1	872963	163.1	1957.2	4351.506307	-313719.93
9.3	892149	175.1	2101.2	4351.506307	-313620.59
8.5	815405	185.1	2221.2	4351.506307	-279896.34
7.4	709882	195.1	2341.2	4351.506307	-236743.24
6.8	652324	205.1	2461.2	4351.506307	-210256.17
5.9	565987	215.1	2581.2	4351.506307	-175340.25
4.9	470057	225.1	2701.2	4351.506307	-139132.16
4.1	393313	235.1	2821.2	4351.506307	-110504.79
3.6	345348	245.1	2941.2	4351.506307	-91432.45
10.7	1026451	280.1	3361.2	4351.506307	-204733.82
9.7	930521	300 manat and more	23083.9	4351.506307	8236691.96

Note: Calculated by the authors.

By calculating the Theil index for 2009–2015, one can compare its dynamics with the dynamics of the Gini indices. Both the Gini and Theil indices characterize the distribution of income, and differ significantly from each other. The index can vary in the interval (0–lnN), which theoretically can increase from the equal

distribution of income (“0”) to the absolute inequality (lnN). Table 5 shows that the Theil index for Azerbaijan is also on this interval, well below the value of lnN (approximately 15–16). In other words, income inequality is high, but not sharp.

**Table.5.** The Theil index in Azerbaijan (2009-2015).

	Population (thousand people)	Population income (million manat)	Average income (manat)	Theil index
2009	8897.0	22601.1	2540.306	<b>0.8086</b>
2010	8997.6	25607.0	2845.981	<b>0.6588</b>
2011	9111.1	30524.6	3350.265	<b>0.8829</b>
2012	9235.1	34769.5	3764.929	<b>0.7985</b>
2013	9356.5	37562.0	4014.535	<b>0.8543</b>
2014	9477.1	39472.2	4165.008	<b>0.7730</b>

2015	9593.0	41744.8	4351.59	<b>0.5692</b>
------	--------	---------	---------	---------------

Note: Calculated and compiled by the authors.

It should be noted that both the Gini coefficient and the Theil index tend to decrease since 2014. Taking into account the change in revenues as a result of devaluation, the lack of influence on the price of the index when calculating the Tale index, one should look for the reasons for this decline, most likely in improving profitability in the least profitable areas or in the efficiency of redistribution of income as a result of fiscal policy.

Another widely used method for estimating income inequality is the Atkinson index. The Atkinson index can be considered the normalized version of the Theil index for calculating the entropy, which characterizes the distribution of income. This index also uses the weight parameter. As a rule, the Atkinson index is calculated by the following formula:

$$A_{\varepsilon} = 1 - \left[ \frac{1}{N} * \sum_{i=1}^N \left( \frac{X_i}{\bar{X}} \right)^{1-\varepsilon} \right]^{1/(1-\varepsilon)}, \varepsilon \neq 1$$

$$A = 1 - \frac{\prod_{i=1}^N (X_i^{1/N})}{\bar{X}} \quad \varepsilon = 1$$

Where:  $X_i$  - income of an individual or group. N is the population (or income groups),  $\bar{X}$  - average income of the population. The Atkinson index expresses social inequality because it is based on

the function of social welfare and utility. However, in the Atkinson index, the individual utility function depends only on income. Therefore, social inequality in the Atkinson approach is implied as income inequality.

**Table.6.** Income inequality in Azerbaijan by Atkinson's index (2015).

The fraction of income groups of the population in the total population	Population size in the group	Monthly income per capita in the group	Annual per capita income	Average annual per capita income in the country	Atkinson index
(%)	$N_i$	$x_i$	$X_i$	$N_i * X_i$	$\left( X_i^{1/N} \right)$
0		Up to 105 manat	0	0	0
0.2	19186	107.1	1285.2	24657847.2	2.17
0.4	38372	113.1	1357.2	52078478.4	2.24
0.6	57558	117.1	1405.2	80880501.6	2.29
0.7	67151	123.1	1477.2	99195457.2	2.31
1.3	124709	127.1	1525.2	190206166.8	2.38
1.6	153488	133.1	1597.2	245151033.6	2.41
2.4	230232	137.1	1645.2	378777686.4	2.45
2.6	249418	143.1	1717.2	428300589.6	2.47
2.8	268604	147.1	1765.2	474139780.8	2.48
3.4	326162	153.1	1837.2	599224826.4	2.51



4	383720	157.1	1885.2	723388944.0	2.53
9.1	872963	163.1	1957.2	1708563183.6	2.63
9.3	892149	175.1	2101.2	1874583478.8	2.64
8.5	815405	185.1	2221.2	1811177586.0	2.64
7.4	709882	195.1	2341.2	1661975738.4	2.62
6.8	652324	205.1	2461.2	1605499828.8	2.62
5.9	565987	215.1	2581.2	1460925644.4	2.61
4.9	470057	225.1	2701.2	1269717968.4	2.59
4.1	393313	235.1	2821.2	1109614635.6	2.58
3.6	345348	245.1	2941.2	1015737537.6	2.57
10.7	1026451	280.1	3361.2	3450107101.2	2.71
9.7	930521	300 manat and more	23083.9	21480095986.0	2.95

Note: Calculated and compiled by the authors.

The authors' calculations show that in 2015, the Atkinson index in Azerbaijan was 0.6680. Dynamics of the Atkinson index for Azerbaijan

for 2009-2015 was calculated and included in Table 6.

**Table.7.** Atkinson index in Azerbaijan.

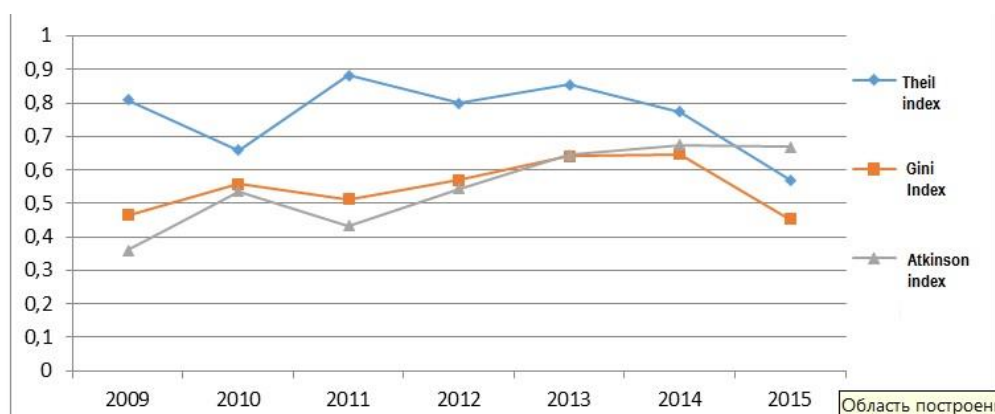
	Population (thousand people)	Population income (million manat)	Average income (manat)	Atkinson index
2009	8897.0	22601.1	2540.306	0.3595
2010	8997.6	25607.0	2845.981	0.5366
2011	9111.1	30524.6	3350.265	0.4332
2012	9235.1	34769.5	3764.929	0.5448
2013	9356.5	37562.0	4014.535	0.6443
2014	9477.1	39472.2	4165.008	0.6750
2015	9593.0	41744.8	4351.59	0.6680

Note: Calculated and compiled by the authors.

Comparing the Gini, Theil and Atkinson indices by year shows that these indices differ significantly. Even the dynamics of these indices sometimes can contradict. For example, from 2009 to 2012, the dynamics of the Theil index

was opposite to the Gini and Atkinson index. But the dynamics of the last two indices were the same, although the values of these indices differ significantly.

Diagram. 10. Comparative dynamics of the Gini, Theil and Atkinson indices for Azerbaijan.



Thus, economic development in Azerbaijan and revenues from the oil sector into the country, along with an increase in average income among the population, significantly increased inequality. It should be noted that the sharp change in the Gini coefficient reflects the difference between the distributions of incomes of the population, but does not characterize the level of economic development and social welfare. However, there is a definite interrelation between economic development and the Gini coefficient. Studies show that the Gini coefficient in developed countries is relatively small compared with developing countries, i.e. income inequality is lower. In other words, economic development is a prerequisite for reducing the Gini coefficient, i.e., the level of income inequality. But to assume the opposite is impossible. That is, reducing inequality does not provide economic development. The best proof of this is the former socialist countries. For example, the inequality between the incomes of the population of the USSR was small, but economic development was not ensured.

The dynamics of the Gini coefficient in Azerbaijan over the past 15 years shows that in the period

from 2002 to 2005, the level of inequality in Azerbaijan decreased slightly, but increased sharply in subsequent years. After 2014, a decrease is also observed. In 2015, the devaluation of the manat had a significant impact on the income of the population and the difference between these incomes. Thus, a more active involvement of a wide segment of the population in the agricultural sector in the regions, as well as a decrease in income in the banking and oil-related sectors have influenced the wages of workers in these sectors and, therefore, the overall level of inequality.

Despite the fact that in recent years, all these three indices, showing the level of income inequality in Azerbaijan, have slightly decreased, but the existing level of inequality is very high. There is an assumption that such high level of income inequality is associated primarily with high levels of wage inequality in various spheres of economic activity and the liberality of fiscal policy. Since the proportion of workers in Azerbaijan who receive salaries is one of the lowest in the world.

**Table.8.** The dynamics of some macroeconomic indicators.

Years	Объем ВВП	GDP per capita (\$)	Volume of government spending (million \$)	Gini index	Theil index	Atkins on index	Variable characterizing the interaction period			Sub-index of state finance
	Y1	Y2	X1	X2=G	X2= T	X2=A	X3=X I*G	X3=X I*T	X3=XI* A	X4
2000	5272.8	655,10	1098.4	-	-	-	-	-	-	0.3362
2001	5707.7	703,67	1065.1	0.3645	-	-	388.23	-	-	0.3253
2002	6235.9	763,10	1725.7	0.1736	-	-	299.58	-	-	0.3704
2003	7276	883,61	2075.2	0.1881	-	-	390.35	-	-	0.3746
2004	8680.4	1045,03	2245.4	0.1623	-	-	364.43	-	-	0.3613
2005	13238.7	1578,37	3001.2	0.1664	-	-	499.40	-	-	0.3454
2006	20983	2473,09	5638.1	-	-	-	-	-	-	0.3664
2007	33050.3	3851,44	8572.6	-	-	-	-	-	-	0.3407
2008	48852.5	5574,60	15205.3	0.3179	-	-	4833.7 6	-	-	0.3601
2009	44297	4950,29	14965.7	0.4654	0.808 6	0.3595	6965.0 4	12101. 3	5380.17	0.3734
2010	52909.3	5842,81	16758.5	0.5587	0.658 8	0.5366	9362.9 7	11040. 5	8992.61	0.3629
2011	65951.6	7189,69	22391.2	0.5119	0.882 9	0.4332	11462. 06	19769. 2	9699.87	0.3743
2012	69683.9	7393,77	25542.6	0.5692	0.798 5	0.5448	14538. 85	20395. 8	13915.61	0.3833
2013	74164.4	7811,62	28159.5	0.6401	0.854 3	0.6443	18024. 90	24056. 7	18143.17	0.3898
2014	75234.7	7886,46	27338.0	0.6475	0.773 0	0.6750	17701. 36	21132. 3	18453.15	0.3807
2015	52996.8	5496,34	20427.1	0.4522	0.569 2	0.3595	9237.1 3	11627. 1	7343.54	0.3917
2016	37843	-	15307.1	-	-	-	-	-	-	0.4012

Note: Calculated and compiled by the authors.

The analysis of the dependence of the volume of GDP (Y1) or GDP per capita (Y2) on the volume of government spending (X1), the Gini index

(X2), the variable characterizing the interaction period (X3) and the sub-index of government finance (X4) suggests that government spending

(X1) and the variable characterizing the interaction period (X3) has a multi-correlation interrelation with the other indicators. Thus, the dependence of the volume of GDP (Y1) or GDP per capita (Y2) on the Gini index and the government finance sub-index will be characterized in the model.

The calculation of the dependence of the volume of GDP on the Gini index and the sub-index of

public finance, using the Ordinary Least Squares, leads to the fact that the hypothesis  $H_0$ - the independence of the GDP volume on these indicators is incorrect. There is a dependency among them. That is, the hypothesis  $H_1$  is true. The coefficients of the interrelation between GDP, and the Gini index and sub-indices of public funding, t-statistics, standard error are shown in table 9.

**Table.9.** Regression relations between GDP, and the Gini index and the government finance sub-index.

Dependent Variable: R\_1\_UDM\_Y1  
Method: Least Squares

Included observations: 13 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
R_4_CINI_X2_G	119162.5	18652.21	6.388653	0.0001
R_7_DOVL_T_MAL_SUB_X4	412799.8	187984.4	2.195925	0.0528
C	-159628.4	66083.45	-2.415558	0.0363
R-squared	0.885351	Mean dependent var		40402.22
Adjusted R-squared	0.862422	S.D. dependent var		28103.27
S.E. of regression	10423.94	Akaike info criterion		21.54077
Sum squared resid	1.09E+09	Schwarz criterion		21.67115
Log likelihood	-137.0150	Hannan-Quinn criter.		21.51398
F-statistic	38.61148	Durbin-Watson stat		1.334905
Prob(F-statistic)	0.000020			

Note: Calculated by the Ordinary Least Squares of the "Eviews" program.

A correlation coefficient of  $R = 0.941$  indicates a high correlation between these variables. Let us consider the economic essence of this conclusion, which at first glance seems somewhat contradictory. As mentioned above, an analysis of the results of various studies shows that there is a definite interrelation between the volume of GDP and the income of the population. Inequality in the distribution of national income at lower levels than this ratio affects GDP growth negatively. After a certain :

$$Y1_t = -159628.4 + 119162.5 * X2_t + 412799.8 * X4_t \quad (4)$$

Note that in equation (4), fiscal policy is reflected in the public finance sub-index.

You can determine the interrelation between GDP and inequality, calculated on the basis of the Theil index and the Atkinson index. We will include three indicators in a model that characterizes the interrelation between GDP and the Theil index. These indicators: Theil index

level of correlation, on the contrary, there is a positive interrelation. In the example of Azerbaijan, inequality in the distribution of national income has a positive interrelation with the volume of GDP. We also see such a interrelation between the sub-index of public finance and the volume of GDP.

Thus, we can establish a model of dependence of GDP volume on the state financial sub-index and Gini index for Azerbaijan

- X2, the variable characterizing the interaction - X3 and the sub-index of public funding - X4. The coefficients of the interrelation between GDP and the Theil index and the public finance sub-index, t-statistics, standard error are shown in table 10.

The calculation of the dependence of the volume of GDP on the Theil index and the sub-index of

public finances by the least squares method leads to the result that the hypothesis  $H_0$  - the independence of the GDP volume from these indicators is incorrect. There is a dependency among them. That is, the hypothesis  $H_1$  is

correct. The coefficients of the interrelation between GDP and the Theil index and the public finance sub-index, t-statistics, standard error are shown in table 10.

**Table. 10.** Regression relations between GDP, and Theil index and sub-government finance index.

Dependent Variable: GDP  
 Method: Least Squares

Sample: 2009 2015  
 Included observations: 7

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Theil index	-63691.17	9556.193	-6.664910	0.0069
Public finance sub-index	-309380.4	81706.66	-3.786477	0.0323
Variable for relationship	3.292985	0.218178	15.09311	0.0006
C	171695.6	33045.05	5.195802	0.0138
R-squared	0.992531	Mean dependent var	62176.81	
Adjusted R-squared	0.985062	S.D. dependent var	12073.82	
S.E. of regression	1475.666	Akaike info criterion	17.72717	
Sum squared resid	6532774.	Schwarz criterion	17.69626	
Log likelihood	-58.04508	Hannan-Quinn criter.	17.34514	
F-statistic	132.8885	Durbin-Watson stat	2.656602	
Prob(F-statistic)	0.001093			

Note: Calculated by the Ordinary Least Squares of the "Eviews" program.

Inequality in national income also affects fiscal policy. If fiscal policy is taken as a ratio of "government spending" or a change in GDP to a

change in government spending ( $\Delta Y1 / \Delta X1$ ) than:

$$\Delta Y1 / \Delta X1 = \beta_0 + \beta_1 * X2 \quad (5)$$

To determine the effect of national income inequality on fiscal policy, let us take as an initial hypothesis ( $H_0$ ) that there are no such effects. If hypothesis  $H_0$  does not justify itself, we will

accept hypothesis  $H_1$ , that is, that there is an interrelation between fiscal policy ( $\Delta Y1 / \Delta X1$ ) and inequality in income distribution ( $X2$ ).

**Table. 11.** Dynamics of changes in GDP and government spending.

	GDP change	Change in government spending	The ratio of changes in GDP to changes in government spending	Gini index	Theil index	Atkinson index
	$\Delta X1$	$\Delta Y1$	$\Delta Y1 / \Delta X1$	X2	X2	X2
2009	8612.3	1792.8	4.803826417	0.4654	0.8086	0.3595
2010	13042.3	5632.7	2.315461502	0.5587	0.6588	0.5366
2011	3732.3	3151.4	1.184330774	0.5119	0.8829	0.4332
2012	4480.5	2616.9	1.712140319	0.5692	0.7985	0.5448
2013	1070.3	-821.5	-1.302860621	0.6401	0.8543	0.6443

2014	-22237.9	-6910.9	3.217800865	0.6475	0.7730	0.6750
2015	-52996.8	-20427.1	2.594435823	0.4522	0.5692	0.3595

Note: The table was compiled by the authors.

If  $X_2 = 0$ , that is, if there is no uneven distribution of income, then the emphasis of fiscal policy is  $\beta_0$ . But in general, fiscal policy depends on the variable  $X_2$ , and the change in  $X_2$  is reflected in the variable fiscal policy. Thus, the period of mutual influence controls the size of

the variable fiscal policy. Increasing income inequality, that is,  $\beta_1 > 0$ , increases the effectiveness of fiscal policy. In contrast, when  $\beta_1 < 0$ , income inequality reduces the effectiveness of fiscal policy.

In equality (4), we can take the Gini, Theil, and Atkinson indices as the variable  $X_2$ .

Diagram. 11.  
The interconnection  
between fiscal policy and the  
Gini index.

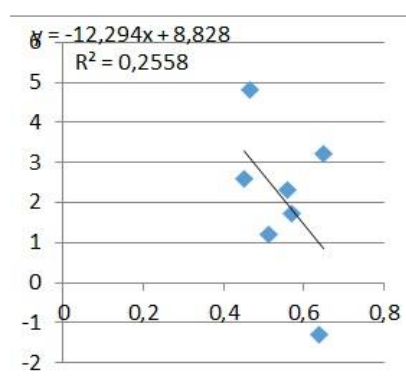


Diagram. 12.  
The interconnection  
between fiscal policy and the  
Theil index.

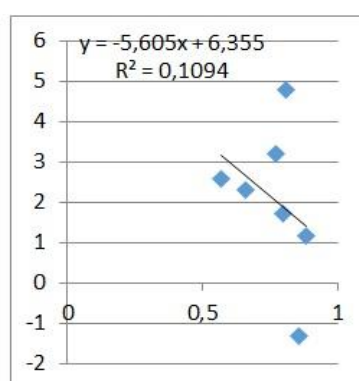
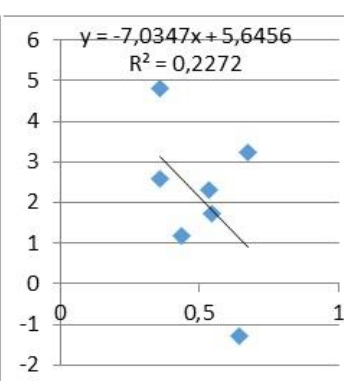


Diagram. 13.  
The interconnection  
between fiscal policy and the  
Atkinson index.



Diagrams 11th, 12th and 13th show that the fiscal policy in Azerbaijan does not depend on the level of income inequality. For all three aspects of the  $X_2$  variable, fiscal policy in the country does not depend on  $X_2$ . It can be assumed that the main reason for this is that oil revenues are the main source of income in Azerbaijan. The amount of inclusion of these revenues is provided by the Oil Production Sharing Agreement and is not related to fiscal policy.

The regression equation (5) is not enough to assess the interrelation between the formation of fiscal policy and income distribution. Since it is necessary to evaluate the role of industrial production, population size and unemployment in the definition of these relations. Thus, the regression equation involving these variables can be expressed as follows:

$$Y_{2t} = \alpha_0 + \alpha_1 * Z_{1t} + \alpha_2 * X_{2t} + \alpha_3 * Z_{2t} + \alpha_4 * Z_{3t} + \mu_t \quad (6)$$

Where:  $Y_2$  - government spending,  $Z_1$  - industrial production,  $Z_2$  - population,  $Z_3$  - degree of unemployment. As with regression equation (2) in equation (4),  $X_2$  is an indicator of income inequality. Here we will use the Gini coefficient, Theil index and Atkinson index.  $\alpha_2$  shows the effect of income distribution on fiscal

policy. If  $\alpha_2 > 0$ , then this means that greater income inequality requires an increase in government spending to increase GDP. If  $\alpha_2 < 0$ , then this means that when income is distributed, greater inequality requires less government spending to increase GDP.

It should be noted that obtaining the necessary information for both regression equations does not cause serious problems in Azerbaijan, as in any country. Data on all variables in equations (2)

and (4) can be obtained from the database of the State Statistical Committee of Azerbaijan and the World Bank.

**Table. 12.** Dynamics of additional variables for equation (4).

Years	Volume of government spending (million \$)	Gini index	Theil index	Atkinson index	Subindex of state finance	Industrial output (million \$)	Population	Unemployment rate
	Y2	X2=G	X2=T	X2=A	X4	Z1	Z2	
2000	1098.4	-	-	-	0.3362	3999.56	8032.8	6.59
2001	1065.1	0.3645	-	-	0.3253	3967.368	8114.3	6.18
2002	1725.7	0.1736	-	-	0.3704	4101.531	8191.4	6.91
2003	2075.2	0.1881	-	-	0.3746	5032.424	8269.2	7.68
2004	2245.4	0.1623	-	-	0.3613	6083.061	8349.1	7.36
2005	3001.2	0.1664	-	-	0.3454	10118.26	8447.4	8.44
2006	5638.1	-	-	-	0.3664	17866.67	8553.1	8.25
2007	8572.6	-	-	-	0.3407	26780.48	8666.1	7.46
2008	15205.3	0.3179	-	-	0.3601	37216.63	8779.9	6.98
2009	14965.7	0.4654	0.8086	0.3595	0.3734	28204.5	8897.0	7.91
2010	16758.5	0.5587	0.6588	0.5366	0.3629	34972.75	8997.6	8.29
2011	22391.2	0.5119	0.8829	0.4332	0.3743	44337.85	9111.1	7.14
2012	25542.6	0.5692	0.7985	0.5448	0.3833	44314.1	9235.1	7.54
2013	28159.5	0.6401	0.8543	0.6443	0.3898	43458.97	9356.5	8.43
2014	27338.0	0.6475	0.7730	0.6750	0.3807	41166.67	9477.1	8.52
2015	20427.1	0.4522	0.5692	0.3595	0.3917	25113.33	9593.0	8.48
2016	15307.1	-	-	-	0.4012	20838.71	9705.6	-

Note: Compiled on the basis of SSCRA data and authors' calculations.

The mutual multi-correlation interrelation between the indicators that we have taken for the model is practically absent and we retain all these indicators for subsequent calculations.

From table 13, which shows the level of regression connection between these indicators, it is clear that the interrelation between X2 (Gini index), Z1 (industrial production), Z2



(population) and government spending is valid, and hypothesis  $H_0$  is not suitable for these indicators. And for the interrelation of

unemployment and government spending, the  $H_0$  hypothesis is justified

**Table.13.** Dependence of government spending on the Gini index and some macroeconomic indicators.

Dependent Variable:  $\_1\_Y2$   
Method: Least Squares

Sample: 2001 2015  
Included observations: 13

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$\_2\_X2\_G$	13544.01	4713.412	2.873505	0.0239
$\_5\_X4$	73400.01	33062.56	2.222470	0.0617
$\_6\_Z1$	0.253916	0.052768	4.811934	0.0019
$\_7\_Z2$	0.956599	2.419221	2.875554	0.0238
$\_8\_Z3$	-532.1924	750.4751	-0.709141	0.5012
C	-82375.93	13743.42	-5.993846	0.0005

R-squared	0.990958	Mean dependent var	13915.42
Adjusted R-squared	0.984500	S.D. dependent var	10616.66
S.E. of regression	1321.783	Akaike info criterion	17.51539
Sum squared resid	12229773	Schwarz criterion	17.77613
Log likelihood	-107.8500	Hannan-Quinn criter.	17.46179
F-statistic	153.1342	Durbin-Watson stat	1.061529
Prob(F-statistic)	0.000001		

Note: Calculated by the "Eviews" program.

Thus, based on equation (6), the model of the interrelation between fiscal policy, the Gini

index, industrial output and population size can be formulated as follows:

$$Y2 = 82375.93 + 0.2539 * Z1 + 13544.01 * X2 + 0.9566 * Z2 \quad (6)$$

## Conclusion

Despite the fact that in recent years, all these three indices, showing the level of income inequality in Azerbaijan, have slightly decreased, but the existing level of inequality is very high. There is an assumption that such high level of income inequality is associated primarily with high levels of wage inequality in various spheres of economic activity and the liberality of fiscal policy. Since the proportion of workers in Azerbaijan who receive salaries is one of the lowest in the world. The analysis shows that the level of economic development of Azerbaijan and country's revenues from the oil sector, along with an increase in the average income among the population, have significantly increased inequality. Analysis of the inequality of household incomes in Azerbaijan according to various methods showed that the level of inequality is very high and the role of fiscal policy for the redistribution of income is not high.

## References

- Aghion, P., Bolton, P. (1997). A theory of trickle-down growth and development. *The Review of Economic Studies*, 64(2), 151-172.
- Alesina, A, Rodrik, D. (1994c). Distributive Politics and Economic Growth. *Quarterly Journal of Economics*, no 109, 465-490.
- Alesina, A., Perotti, R. (1996). Income distribution, political instability, and investment. *European economic review*, 40(6), 1203-1228.
- Alesina, A., Rodrik, D. (1994). Distributive politics and economic growth. *The quarterly journal of economics*, 109(2), 465-490.
- Atkinson, A. B., Bourguignon, F. (2000). Introduction: Income distribution and economics. *Handbook of income distribution*, 1, 1-58.
- Atkinson, A. B., Micklewright, J. (1992). *Economic transformation in Eastern Europe and the distribution of income*. Cambridge University Press.
- Barro, R. J. (2000). Inequality and Growth in a Panel of Countries. *Journal of economic growth*, 5(1), 5-32.

- Caballero, R. J., Krishnamurthy, A. (2004). Fiscal policy and financial depth (No. w10532). National Bureau of Economic Research.
- Cecilia, G.P, Turnovsky, S.J. (2006). Growth and Income Inequality: A Canonical Model. Retrieved from <http://www.vcharite.univ-mrs.fr,PP,penalosa,workingpapers>.
- Cowell, F. (1995). Measuring inequality, LSE handbooks in economics series. Harvester: Prentice Hall.
- Das, S. P., Das, M., & Fomby, T. B. (2004). Decreasing marginal impatience, income distribution and demand for money: Theory and evidence. Indian Statistical Institute, Planning Unit, New Delhi Discussion Papers, 4.
- Ellison, G. T. (2002). Letting the Gini out of the bottle? Challenges facing the relative income hypothesis. *Social Science & Medicine*, 54(4), 561-576.
- Feenstra, R, Hanson, G. (1996). Foreign Investment, Outsourcing and Relative Wages. NBER Working Paper, no 5121. Massachusetts: National Bureau of Economic Research.
- Forbes, K. J. (2000). A reassessment of the relationship between inequality and growth. *American economic review*, 90(4), 869-887.
- Galor, O., Zeira, J. (1993). Income distribution and macroeconomics. *The review of economic studies*, 60(1), 35-52.
- Gavin, M., Perotti, R. (1997). Fiscal policy in latin america. NBER macroeconomics annual, 12, 11-61.
- Guerson, A. (2003). On the optimality of procyclical fiscal policy when governments are not credible. Washington, DC, United States: George Washington University. Doctoral dissertation.
- Gulaliyev, M.G, (2017). Assessment of the dependence of economic growth on government finances (a comparative analysis of Azerbaijan and Georgia). *Innovatsina economica*, 1(2). Ukraine.
- Gylfason, T., Zoega, G. (2003). Inequality and economic growth: Do natural resources matter?. *Inequality and Growth: Theory and Policy Implications*, 1, 255.
- Helpman, E., Itskhoki, O., Redding, S. (2010). Inequality and unemployment in a global economy. *Econometrica*, 78(4), 1239-1283.
- Hey, J. D., Lambert, P. J. (1980). Relative deprivation and the Gini coefficient: comment. *The Quarterly Journal of Economics*, 95(3), 567-573.
- Kuznets, S. (1955). Economic Growth and Income Inequality. *American Economic Review*, no 45, 1-28.
- Kuznets, S. (1955). Economic growth and income inequality. *The American economic review*, 45(1), 1-28.
- Lambert, P.J. Pfähler, W. (1997). Market Demand and Income Distribution: A Theoretical Exploration. *Bulletin of Economic Research*, 49(2), 137-151.
- Li, H., Zou, H. F. (1998). Income inequality is not harmful for growth: theory and evidence. *Review of development economics*, 2(3), 318-334.
- Lundberg, M. Squire, L. (2003). The Simultaneous Evolution of Growth and Inequality. *Economic Journal*, no 113. 326-344.
- Mendoza, E. G. (1995). The terms of trade, the real exchange rate, and economic fluctuations. *International Economic Review*, 101-137.
- Official site of the State Statistic Committee of Azerbaijan Republic. Retrieved from [http://www.stat.gov.az/source/budget\\_households](http://www.stat.gov.az/source/budget_households)
- Official site of World Bank. Retrieved from <http://data.worldbank.org/indicator/SI.POV.GINI>
- Perotti, R. (1996). Growth, income distribution, and democracy: What the data say. *Journal of Economic growth*, 1(2), 149-187.
- Persson, T., & Tabellini, G. (1994). Is inequality harmful for growth?. *The American economic review*, 600-621.
- Pfähler, W., Wiese, H. (1990). Transactions demand for cash and income distribution: a note on aggregation. *Bulletin of Economic Research*, 42(1), 73-77.
- Saint-Paul, G., Verdier, T. (1993). Education, democracy and growth. *Journal of development Economics*, 42(2), 399-407.
- Talvi, E., & Vegh, C. A. (2005). Tax base variability and procyclical fiscal policy in developing countries. *Journal of Development economics*, 78(1), 156-190.