

Effects of Income Inequality on Economic Growth: The Case of the Republic of Moldova

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Abstract

As the interdependence between the economic inequality and growth is not straightforward and rather ambiguous, in this article we are testing two hypotheses: the economic growth could be affected by inequality in income distribution and the income inequality is likely to have a negative effect on the economic growth of Moldova. Even though we admit a potential influence of other variables, we conclude that the first hypothesis is true as the econometric measurements have shown a moderate to strong effect of income inequality indicators on the growth variable. At the same time, the analyzed data have shown that with the decrease of inequality, an increasing trend in economic growth is noted. Concurrently, when the inequality expressed by the ratio between the incomes of the population in quintiles I and V increases, we observe a decrease in GDP (PPP) and therefore an economic decline in Moldova, thus proving the second hypothesis.

Key words: economic growth, income inequality, distribution, econometric measurement, income gap

J.E.L. classification: O40, O47, D63, D31, E25

1. Introduction

For decades the overall perception has been that by ensuring growth the general well-being, a higher standard of living and prosperity for all might be achieved. However, this seems to be just partly true as very often those at the lower-income levels are likely to hardly benefit from growth if at all.

Generally speaking, the interdependence between the economic inequality and growth is not straightforward and sometimes rather ambiguous as both phenomena depend on different other factors and circumstances (McKnight, 2019, p.2).

If we were to refer to inequality, the interest in this phenomenon can be traced back to Rousseau (1753) who argued that inequality began with the development of the political and legal authority favored by the revolution that resulted from the invention of metallurgy and agriculture (Peterson, 2017, p.3). At the same time, it is believed that the industrial revolution of the eighteenth and nineteenth centuries led to an increase in income of high-income countries, as well as in low- and middle-income countries, which exceeded the basic subsistence level, in spite of a dramatic increase in population. This has also led to greater economic inequality, as industrialization and, subsequently, income and wealth were concentrated in Western Europe and North America, widening the gap between Western Europe and North America and other countries around the world (Peterson, 2017, p.4). However, according to Stone et al. the problem of income inequality (2020), as it is perceived today, arose in the 1970s. Nevertheless, the income inequality gap has been widening since the 1970s, when economic growth stagnated. Income continued to rise for households at the top of the income scale and slowed down for households at the middle and lower distribution levels (Stone *et al.*, 2015 p. 9).

Nowadays, regardless of the level of economic development, the perception of the population on inequality in advanced, emerging and developing countries is similar, i.e. they all recognize that inequality is a major problem. Even in 2013, a survey by the Pew Research Center found that up to 70% of respondents in developing and emerging countries, as well as 74% of advanced economies, believe that the economic system favors the rich (Kohut, 2013, p. 19-20). In the meantime, mitigating inequality has become a central issue in the policy debate under the 2030 Agenda for Sustainable Development,

which, under Objective 10, aims to reduce inequality within and between countries under the motto of "leaving no one behind" (Sachs *et al.*, 2021, p.45).

In fact, inequalities, although multifaceted, involve two distinct concepts, inequality of outcome, which includes income and wealth, and inequality of opportunity. Income inequality refers to the distribution of income among the population, usually at the household level (SG, V.A., 2017, p. 2). Inequality of wealth is the "value of assets owned minus the debts owed" (Eggleston *et al.*, 2020, p. 1). At the same time, inequality of opportunity refers to the disparity between opportunities at birth, choices made in life and luck (SG, V.A., 2017, p. 2). It may seem that the inequality of opportunity is a rather abstract concept, but when translated into concrete indicators and targeted policy objectives, it can take a measurable shape and ensure the achievability of the equality of opportunities.

The topicality of the issue related to reducing inequality, as one of the attributes of ensuring economic growth and especially inclusive growth, has gained ground in the Covid-19 era. According to the World Bank, global inequality has intensified during the pandemic, "partly reversing the decline that was achieved over the previous two decades." Furthermore, inequality between countries is projected to return to the levels observed in 2010 due to the low capacity of emerging markets and developing economies (EMDEs) to address the challenges posed by Covid-19. At the same time, inequality within countries remains high, especially in the EMDE, amid extreme poverty (W.B., 2022, p. 157). And according to the 2022 Global Inequality Report, the calculated averages of how much the population earns or owns hide, in fact, a large inequality gap between and within countries. In concrete terms, with reference to global income, the top 10% of the global population has 52% of the income, while the poorest 50% of the population has only 8.5% of the global income. Meanwhile, the situation with inequalities in the wealth held is even worse: the poorest 50% of the world's population own only 2% of all global wealth, while 76% of total wealth belongs to the top richest 10% of the global population (Chancel *et al.*, 2022, p. 10). At the same time, it is worth noting that Europe has the lowest levels of inequality on a global scale, but despite this, the concentration of wealth is still very high, as the poorest 50% hold 4% of the total wealth, while the richest 10% own 58% of the global wealth (Chancel *et al.*, 2022, p. 11).

As for the impact of economic inequality on growth, it should be mentioned that researchers come up with different and sometimes contradictory results. For example, according to Gulaliyev *et al.* (2020) no trend could be possibly assigned to every country. And, therefore, the so-called *cross-sectional analysis* proposed by Dabla-Norris *et al.* (2015) and *panel analysis* performed by Bouincha *et al.* (2018) provide different results. Cross-sectional analysis shows a negative relationship between income distribution and economic growth according to Dabla-Norris *et al.*, (2015), while the panel analysis indicates that this relationship is negative in some countries and positive in others in line with Bouincha *et al.* (2018). The relationship between inequality and growth varies depending on the level of development, even within the same country according to Barro (2000) and in temporal terms, there is a negative relationship on long term, but a positive in the medium and short term between inequality and growth according to Forbes (2000) (Gulaliyev *et al.* 2020, p. 44). Therefore, the effect of inequality on economic growth is equivocal and depends on a multitude of other associated factors.

2. Literature review

As a multidimensional issue, the economic inequality has been analyzed in terms of its various facets and in correlation with other economic and social concepts.

Some researchers have extended the study of the inequality-growth relationship, focusing on inclusive economic growth, which would contribute to a wider segment of the population benefiting from economic growth. For example, some authors studied inclusive growth in the light of strategies to address poverty and inequality. They argue that corporations should change their perspective on regional ecosystems and seek "systemic, multisector opportunities; mobilize complementary partners; and obtain seed and scale-up financing from organizations with a mission to alleviate poverty" and reduce inequality (Kaplan *et.al*, 2018, p.1). Governance has a major role to play in combating inequality to ensure inclusive growth. Thus certain authors analyzed corruption and lack of institutional and human capacity as two main sources of poor governance. They provide an overview of the negative impact of corruption and a lack of capacity of governance, with subsequent repercussions on inclusive growth, poverty and inequality. Some of the policies listed by experts that could improve the state of affairs are

those that focus on structural reform, automation, human resources policies, capacity building, effective anti-corruption systems, transparency, accountability, and inclusive institutions, to support and monitor the policy making process (Ivanyna *et al.*, 2021, p. 4). The trade-offs between boosting growth and reducing inequality and poverty have also been analyzed by certain authors. Researchers conclude that growth can reduce poverty, but the impact of economic growth on inequality depends on the sources of growth. On the other hand, the impact of poverty and inequality on growth is not unique. However, it is clear that poverty and inequality reduce growth in the long run, so the role of policies is to ensure a balance and improve equal opportunities, to increase inclusion and growth (Cerra *et al.*, 2021, p. 31).

Regarding the issue of inequality in the socio-economic context of the Republic of Moldova, this phenomenon was researched inter alia in the light of the degree of economic inequality in the well-being of the population of the Republic of Moldova by conducting a comparative analysis with other countries. The results of the referred to research indicate a decrease in the degree of inequality in the well-being of the population of the Republic of Moldova, which was confirmed by the decreasing trend of the Gini coefficient (Ivanov, 2017, p.133). Furthermore, other researchers addressed inequality from the perspective of human development, which encompasses all basic economic and social aspects. The main indicators of inequality and their impact on human development in the Republic of Moldova were analyzed in that study and the results made it possible to assess the losses in human development of the country, caused by the level of inequality in the main components of the human development index, namely in the field of health, education and income (Rojco *et al.*, 2019, p. 255). Furthermore, the inequality was analyzed in other works in terms of factors and trends in income and expenditure of the population of the Republic of Moldova (Colesnicova *et al.*, 2018, p. 76). Other researchers addressed the efforts of the social protection sector in combating poverty and reducing inequality, mainly through "targeted" payments (Sandu *et al.*, 2017, p.5). In a research carried out in the same year, the economic inequality and its link to economic growth were analyzed. The approach used by the researcher in studying this nexus is by distinguishing between normal and excessive inequality. The conclusion of the research was the confirmation of the fact that inequality at a normal level generates economic growth while excessive inequality hinders growth, a fact demonstrated in the case of the Republic of Moldova for 2007, 2008, 2009, 2011 and 2013. While in 2010 and 2014 the GDP growth was accompanied by a decrease in both normal and excessive inequality (Rojco, 2017, p. 42).

Thus, the purpose of this research is to test two hypotheses:

- economic growth could be affected by inequality in income distribution;
- income inequality is likely to have a negative effect on the economic growth of the Republic of Moldova.

3. Research methodology

In order to test the aforementioned assumptions, the GINI coefficient as well as the ratio between the incomes of the population in quintiles I and V were selected as indicators of income inequality, whereas for economic growth, GDP adjusted to purchasing power parity (PPP) was selected as an indicator, considered by the author as the most relevant indicator in the context of the inequality - economic growth nexus.

The information base of the research consists of statistical data retrieved from the database of the National Bureau of Statistics (NBS) of the Republic of Moldova and from the IMF database. The methodology used resides in the construction of a simple linear regression and the Pearson correlation for the above-mentioned indicators by processing the data in the JASP 0.16 application. At the same time, the information obtained from data processed in JASP 0.16 is used to analyze how strongly the selected indicators are correlated. Finally, we observe the graph of the variation of GDP (PPP) and GINI and GDP (PPP) and the ratio between the incomes of the population in quintiles I and V for the Republic of Moldova during the years 2014-2020.

The expected result is to prove the existence of a correlation between income inequality and economic growth; to confirm a non-negligible degree of inequality influence on economic growth; and to suggest that income inequality has adverse effects on economic growth in the Republic of Moldova.

4. Findings

In order to observe the relationship between the selected variables and to analyze the effects of income inequality on GDP adjusted to purchasing power parity, we constructed a simple linear regression between gross domestic product (GDP) and GINI and then between GDP (PPP) and the ratio between the incomes of the population in quintiles I and V (Q I-V). By simple linear regression we established the rate of change in the dependent variable explained by the independent variable, as well as quantified the extent to which the independent variable explains the dependent variable.

Table 1. below showing the Model Summary, provides the information needed to determine how well the model fits the collected data.

Table 1. Model Summary (Simple Linear Regression) - Gross Domestic Product Adjusted to Purchasing Power Parity (GDP (PPP)) vs. GINI, and GDP (PPP) vs. the ratio between the incomes of the population in quintiles I and V (Republic of Moldova, 2014-2020)

Model	R	R ²	Adjusted R ²	RMSE	Durbin-Watson		
					Autocorrelation	Statistic	p
GINI	0.606	0.367	0.241	1.604	0.284	0.885	0.044
QI-V	0.803	0.645	0.573	1.203	-0.030	1.739	0.485

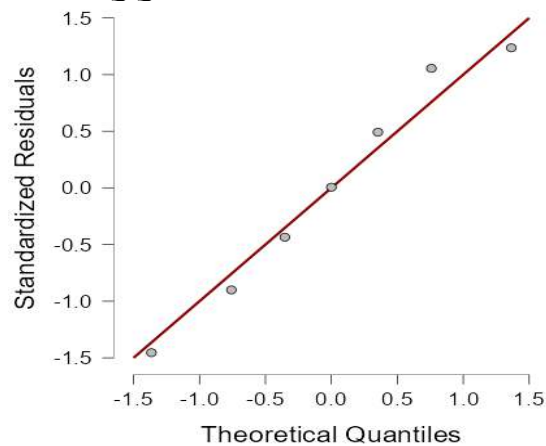
Source: Data retrieved from the NBS of Moldova and IMF database, processed by the author in JASP 0.16

R of the model shows us the absolute value of the correlation between the dependent and the independent variable and indicates how close the association between the variables is. In the case of GDP (PPP) vs. GINI, $R = 0.606$, which indicates a correlation of medium intensity and in the case of GDP (PPP) vs. Q I-V this is $R = 0.803$ which demonstrates a correlation of a strong intensity. At the same time, the Durbin-Watson statistics for the entered data are 0.885 for GDP (PPP) vs. GINI and 1.739 for GDP (PPP) vs. Q I-V. It should be noted that the Durbin-Watson statistics verifies the correlation between residues, which could invalidate the test. For validation we should have values greater than 1 and less than 3, but ideally around 2. We note that in the case of GDP (PPP) vs. GINI, the value is less than 1 which shows the existence of a correlation between the residues, which leads to the invalidation of the Durbin-Watson test, while in the case of GDP (PPP) / Q I-V the value is close to 2 which demonstrates the lack of correlation between residues (error independence) and validates the test for simple linear regression GDP (PPP) vs. Q I-V.

Of greater interest are the values of R² which show the proportion of variation in the dependent variable which can be explained by the independent variables. Therefore, $R^2 = 0.367$ (GDP (PPP) vs. GINI), which assumes that the independent variable (GINI) explains 36.7% of the variation of the dependent variable (GDP (PPP)). At the same time, $R^2 = 0.645$ (GDP (PPP) vs. Q I-V), which assumes that the independent variable (Q I-V) explains 64.5% of the variability of the dependent variable (GDP (PPP)). However, for an easier correction of the data, an adjusted R² value is also provided, which indicates that GINI explains 24.1% and Q I-V at 57.3% the variation of the dependent variable (GDP (PPP)), which according to Cohen's classification 1988, demonstrates a moderate effect in the case of GINI and a strong effect in the ratio of the income of the population in quintiles I and V (Q I-V).

To confirm the normal distribution of the indicators GDP (PPP) vs. Q I-V, we follow the graph QQ Plot produced (Figure 1).

Figure 1. Normal distribution of indicators (GDP (PPP) vs. $Q\ I-V$). Republic of Moldova (2014-2020)
Q-Q Plot Standardized Residuals



Source: Data retrieved from the NBS Moldova and IMF database processed by the author in JASP 0.16

We observe a normal distribution of residues given that the points are aligned along the diagonal line. Even if the points are not perfectly aligned along the diagonal line, they are still sufficiently aligned to indicate the normal distribution of the residue. Given that the linear regression analysis is robust enough, we accept this result which assumes that there is no need to make transformations (i.e. no data normalization is required) and the condition of normality of the residue distribution was not violated.

Next, we follow the data presented in ANOVA on regression and residues (Table 2.).

Table 2. ANOVA. Simple linear regression for indicators (GDP (PPP) vs. $Q\ IV$). Republic of Moldova (2014-2020)

		Sum	df	Mean Square	F	p
Model		of Squares				
H ₁ (QI-V)	Regression	13.111	1	13.111	9.066	0.030
	Residual	7.230	5	1.446		
	Total	20.341	6			

Note. The intercept model is omitted, as no meaningful information can be shown.

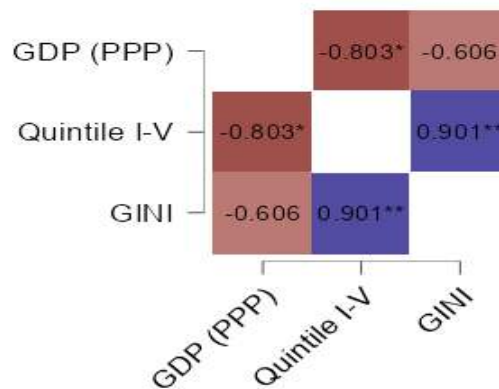
Source: Data taken from the NBS Moldova and IMF database processed by the author in JASP 0.16

The ANOVA table (Table 2.) shows the regression, which represents the model itself, and the residue, which represents the error. F is statistically significant because $p = 0.03$. At the same time, it should be noted that the linear relationship hypothesis is correct if the value of the factor "p" is less than 0.05. In this case, where $p = 0.03$ we can state with a probability of 97% that there are links between the selected variables.

We conclude that the regression model is relevant and statistically significant, where $F(1, 5) = 9.066$, $p < 0.03$ and $R^2 = 0.645$.

Next we aim to observe the degree of interdependence between variables. Thus, for the correlation between GDP (PPP), the GINI coefficient and the ratio between the incomes of the population in quintiles I and V. After processing the data in JASP 0.16 according to the Pearson correlation (Pearson's heatmap, Figure 2.) we obtained the following data on the correlation between the variables.

Figure 2. Pearson correlation between Gross Domestic Product adjusted for purchasing power parity (GDP (GDP)), GINI and the ratio of incomes of the population in quintiles I and V (Republic of Moldova, 2014-2020)



Source: Data retrieved from the NBS Moldova and IMF database processed by the author in JASP 0.16

As can be seen from Figure 2., the strongest link is between the GINI variables and the ratio between the incomes of the population in quintiles I and V (Q I-V), and between GDP (PPP) and Quintile I-V. And the link between GDP (PPP) and GINI is of medium intensity. It should be noted that the correlation coefficient is between 0 and 1 and the closer it is to 1, the stronger the correlation is.

At the same time, the Shapiro-Wilk test (Table 3.) designed to highlight deviations from normality shows that the data have a normal distribution $p = 0.071$. An abnormal distribution is when the p-value is less than or equal to 0.05 (Variation. Distribution Analyzer, 2022).

Table 3. Shapiro-Wilk test for deviations from normal for Gross Domestic Product adjusted to purchasing power parity (GDP (PPP)), GINI coefficient and the ratio between the incomes of the population in quintiles I and V (Republic of Moldova, 2014-2020). Assumption checks.

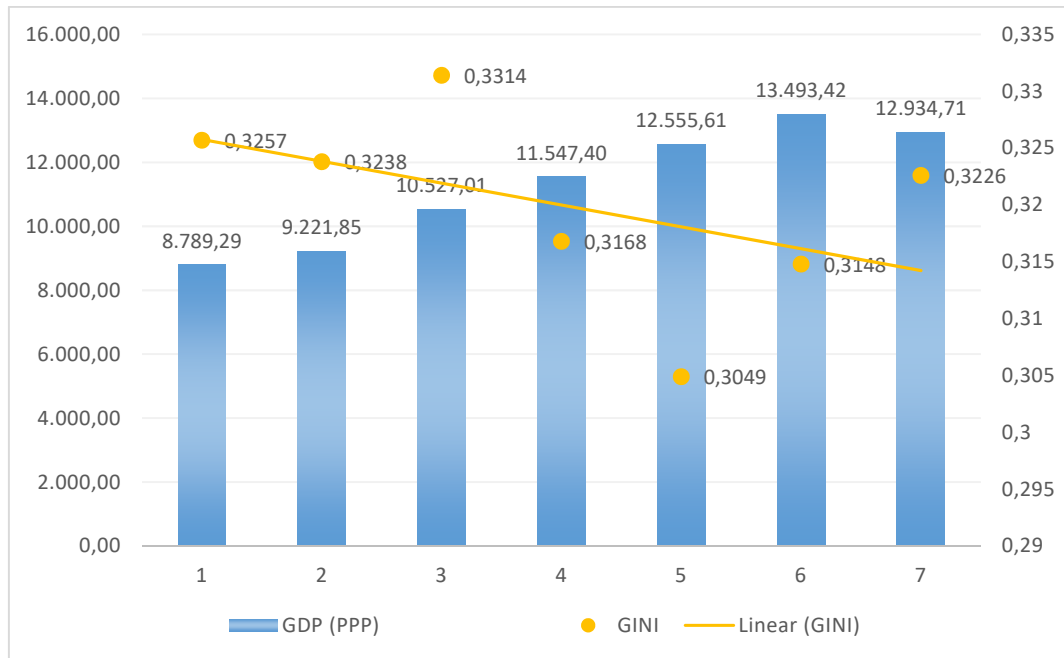
Shapiro-Wilk Test for Multivariate Normality	
Shapiro-Wilk	p
0.824	0.071

Source: Data retrieved from the NBS Moldova and IMF database processed by the author in JASP 0.16

We conclude that the assumption that economic growth is affected by inequality in income distribution proved to be true. The change in economic growth expressed in the present analysis by GDP adjusted to purchasing power parity as a dependent variable is explained (according to adjusted R²) at 24.1% by the GINI indicator and at 57.3% by the ratio between the incomes of the population in quintiles I and V (Q I-V) which represent indicators for measuring inequality. Therefore, the influence of income inequality indicators demonstrates a moderate to strong effect on the growth indicator.

Once the assumption that economic growth is affected by income inequality has been confirmed, we analyze the graph of the change in gross domestic product adjusted to purchasing power parity and the GINI coefficient (Figure 3) and then the graph of gross domestic product adjusted to purchasing power parity and the indicator represented by the ratio between the incomes of the population in quintiles I and V (Figure 4).

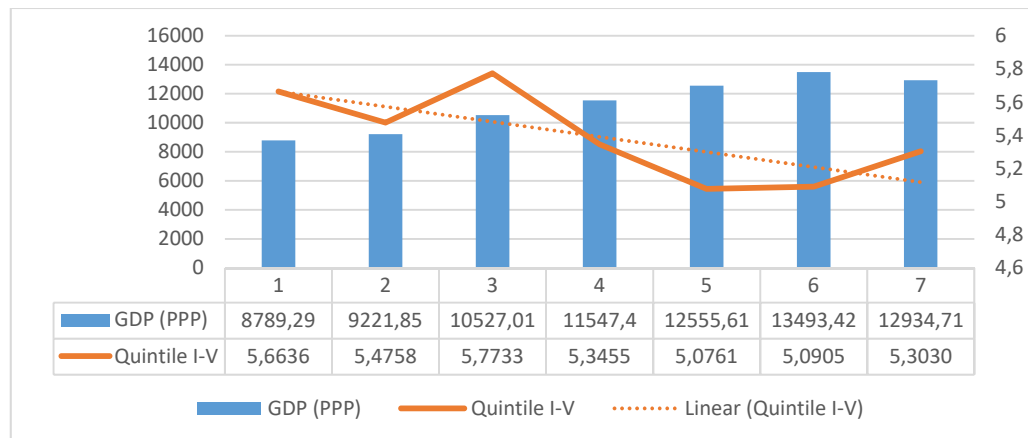
Figure 3. Graph of variation of gross domestic product adjusted to purchasing power parity (thousands, USD) and GINI coefficient, (Republic of Moldova, 2014-2020)



Source: Developed by the author based on data retrieved from the database of NBS Moldova and the IMF.

As can be seen in the graph above, although a certain correlation has been established between these two variables, it seems that not in all the cases the increase in the GINI coefficient results in a decrease in gross domestic product adjusted to purchasing power parity, although in most cases this statement has been confirmed. However, the variation in economic growth expressed in this analysis by GDP adjusted to purchasing power parity as a dependent variable is explained as seen above only at 24.1% by the GINI indicator, thus deviations or lack of proportional variation can be explained by the fact that there are other variables that produce their effect on growth.

Figure 4. Graph of the variation of the gross domestic product adjusted to the purchasing power parity (thousand, USD) and of the indicator represented by the ratio between the incomes of the population from quintiles I and V, (Republic of Moldova, period 2014-2020)



Source: Developed by the author based on data retrieved from the database of NBS Moldova and the IMF

Analyzing the graph above we notice a clearer correlation between the variables, except for one "outlier" (3) which could be explained also by the impact of the banking crisis of 2016 which caused an increase in the income gap. The year 2016 was marked by declining revenues and funding constraints. The budget deficit for 2016 has increased to encourage economic recovery. According to the recommendations of the International Monetary Fund (IMF), fiscal policy has been anchored in a robust medium-term framework and measures have been taken to strengthen the revenue base and to prioritize social and infrastructure spending (IMF, 2016). We could consider that the above could explain the increase in inequality which, yet, did not have an immediate impact on GDP (PPP). At the same time, in the other cases analyzed in the period of 2014-2020, we find that with the decrease of inequality there is an economic growth and when the inequality expressed by the ratio between the incomes of the population in quintiles I and V increases, we are witnessing a decline in GDP adjusted to purchasing power parity and therefore an economic decline. However, we must take into account the fact that up to a certain level inequality has a positive, stimulating effect and that leads to economic growth, and when inequality is in excess it produces adverse effects (Rojco, 2017, p. 42). Although in this research we have not analyzed normal versus excessive inequality, based on other researches, we can assume that another reason why there are inconsistencies in the relationship between growth and inequality is the variation of inequality between norm and excess. Thus when the economic inequality is normal, it leads to economic growth, and when inequality is in excess it has adverse effects (Rojco, 2017, p. 42).

5. Conclusions

Admitting that there might be a potential interference with other variables, we conclude that the first hypothesis that economic growth is affected by inequality in income distribution has proved to be true. The variation of economic growth expressed in this analysis by GDP adjusted to purchasing power parity as a dependent variable is explained at 24.1% by the GINI indicator and at 57.3% by the ratio between the incomes of the population in quintiles I and V (Q I-V) which are indicators for measuring income inequality. Therefore, the influence of income inequality indicators demonstrates a moderate to strong effect on the growth indicator.

At the same time, although a certain correlation has been established between the variables, it seems that not in all the situations (year 2016) the increase in inequality leads directly to the decrease in economic growth, even if in the most cases that have been analyzed (for the years 2014, 2015, 2017, 2018, 2019, 2020) an upward trend of GDP (PPP) has been observed once the indicators selected for measuring income inequality decreased, and vice versa. In addition, we conclude that since GDP adjusted to purchasing power parity as a dependent variable is explained only at 24.1% by the GINI indicator, the deviations or lack of proportional variation can be explained by the fact that there are other variables that interfere with this relationship.

At the same time, we observed a clearer correlation between the variables GDP (PPP) and the ratio between the incomes of the population in quintiles I and V, except for one outlier (2016) as in the case of the correlation GDP (PPP) vs. GINI. However, this increase in inequality does not seem to have had an immediate impact on GDP (PPP). At the same time, in the other cases analyzed in the period between 2014-2020, except for 2016, we find that with the decrease of inequality there is an economic growth and when the inequality expressed by the ratio between the incomes of the population in quintiles I and V increases, we are witnessing a decrease in GDP adjusted to purchasing power parity and therefore an economic decline in the Republic of Moldova. Therefore, we can say that the second hypothesis that income inequality has a negative effect on economic growth in the Republic of Moldova has been confirmed, although this correlation remains equivocal and it would be appropriate to analyze the results also obtained by dividing inequality into the normal and the excessive one.

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