Income inequality and economic growth in Peru

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Abstract

This research measures the impact of economic growth, poverty incidence and high school enrolment in Peru on national income inequality using an annual time series for the period 1985-2022, applying the Kuznets curve theory. A dynamic autoregressive distributed lag (ARDL) model is used. The conclusion is that if economic growth increases by 1%, income inequality decreases by 1.4884%. Meanwhile, education and poverty incidence are directly related to income inequality since a 1% increase in education and poverty incidence increases income inequality by 0.9849 and 0.8933%, respectively.

Keywords: economic growth; income inequality; time series; Kuznets; dynamic autoregressive distributed lag (ARDL) model.

1. INTRODUCTION

In recent years, economic growth and income inequality have become important and recurring topics in research. This is due to their relevance and implications for people's well-being. It is worth mentioning that, over the past decade, Peru's poverty level has decreased; however, the same cannot be said for inequality, which has remained stable or decreased slightly. A publication by Mamani (2023), based on a World Inequality Lab (WIL) study, states that Peru is the fourth most unequal country in the world. Furthermore, the report states that poverty increased from 20% to 30% in 2020. In 2021, it decreased to 26% due to the economic rebound after the Covid-19 pandemic. However, poverty rose again the following year due to low economic growth, intense social conflicts, and high inflation. Thus, since 2019, approximately 2.7 million people have fallen below the poverty line, generating an increase in income inequality.

Authors such as Parodi (2017) argue that Peru faces a major income inequality problem, which generates serious economic stagnation. Inequality and poverty have various adverse effects on access to education and basic services, impacting economic growth and limiting social spending. This research emphasizes economic growth as a means of reducing income inequality.

For the analysis, the supporting research in this paper is based on Ravallion and Chen (1997), Deininger and Squire (1996 and 1998), who demonstrate the existence of an inverse relationship between economic growth and income distribution. For example, Cenas (2019) states that the increase in economic growth (GDP) generates a decrease in income inequality. Other studies, such as those by Lopez (2019) and Martinez (2015), demonstrate the inverse relationship between the two variables. Conversely, Zanzzi *et al.* (2018) analyze the long-run equilibrium relationship between the income inequality variable and the independent variables of education level and poverty.

This research aims to determine the impact of Peruvian economic growth on income inequality, using Kuznets's hypothesis (1955), which states that higher economic growth initially generates an increase in inequality. However, after a certain period of time, growth begins with lower inequality.

This study uses education as an important factor in the distribution of income because an increase in the level of education of people provides them with qualifications, skills and knowledge that will lead to an increase in productivity and, consequently, in income, thus

reducing income inequality and poverty.

The study is organized as follows: The second section describes the literature review related to income inequality, economic growth and the Kuznets's curve theory. The next section presents the main related empirical studies. Then the methods and materials section is presented, followed by the results section. Finally, the last section presents the discussion and conclusions of the study.

2. LITERATURE REVIEW

Income inequality and economic growth

Kuznets's research (1955) was a first attempt to empirically study the relationship between income levels and inequality, using data from Germany, the United States and the United Kingdom. Based on this data, Kuznets showed a decline in income distribution in the early stages of development and a subsequent improvement after the turning point, suggesting that the increase in inequality is an inevitable and natural process, for which he proposed that the concentration of savings and urbanization could explain this pattern.

Since then and over the years, the relationship between economic growth and income inequality has perhaps become one of the most studied topics. Based on these findings, attempts have been made to establish the relationship between the two variables because this is a topic that generates controversies worldwide (Ravallion and Chen, 1997; Deininger and Squire, 1996; Martínez, 2015; Zanzzi *et al.*, 2018).

In the same vein, taking the case of Peru as an example, this country consolidated its position as one of the most dynamic economies in Latin America and the Caribbean. It recorded a 4.5% GDP growth, supported by a favorable international environment, prudent macroeconomic policies and a series of structural reforms in various sectors. National accounts records showed a steady economic expansion throughout the period. However, there was a significant contraction in 1998 as a result of the late effects of an economic recession that began in the second half of 1997. This contraction was influenced by the El Niño phenomenon, which affected Peru from March 1997 to mid-1998, as well as the 1997-1999 global financial crisis that originated in Asia and subsequently spread to other markets. This crisis particularly affected emerging and developing economies (Rozenberg, 2000).

In 2009, economic growth suffered a second contraction due to the first global financial crisis of the 21st century, which began in 2007 in the United States and several European countries. This crisis primarily resulted from the bursting of a real estate bubble, triggered by a credit boom that had lasted for the previous six years in the United States, as well as in Spain, Ireland and the United Kingdom. The effects of this crisis spread around the world, particularly affecting the developed economies and causing a slowdown in production (Parodi, 2008).

Using the Gini coefficient to examine inequality over time, it is clear that Peru is one of the countries with the highest levels of inequality. Throughout its history, this indicator remained close to 0.55 until the end of the 1990s. During this period, structural reforms were implemented at the beginning of the decade (Mendoza and Leyva, 2011). Since the middle of the last decade, the Gini coefficient has shown a moderate decrease. However, the average for the analyzed period remains high at 0.49 and the downward trend has stopped in recent years.

According to the World Bank (2023), the Gini coefficient determined inequality in income distribution in the last five yearsz noting that the indicator remained at 0.42. However, in 2020, said coefficient indicated a more unequal year, with a value of 0.44. This was the result of the Covid-19 pandemic, which affected Peru's development and caused an increase in poverty. This increase was reflected in the inequality of Peruvian income distribution (Huamán, 2021). In 2021 and 2022, the Gini coefficient decreased to 0.41 due to the adequate recovery of economic activity after the pandemic.

Kuznets curve theory

In 1955, Simon Kuznets published his research known as *Economic Growth and Income Inequality*, in which he studied the existing relationship between economic growth and the level of inequality, which became an important research topic on the subject. It was at

this time that he conducted research for developed countries, which led to what is known as the Kuznets hypothesis. According to this hypopthesis, there is initially a direct relationship between growth and inequality. However, after a certain point, inequality decreases as economic growth increases. Therefore, if Kuznets' hypothesis is confirmed, developing countries will find themselves to the left of the inverted U, This justifies the perceived increase in inequality in developing countries, and it would only be a matter of time before the Spillover Theory comes into play. Likewise, growth will create opportunities to narrow income distribution.

Kuznets (1955) also argued that the empirical data in poorer countries could be better explained by the heavy dependence on agriculture or a traditional countryside characterized by low-productivity economic activity, albeit with minimal inequality. As rural workers migrated to the cities and higher productivity areas, industrial or modern areas, unskilled, low-wage workers began to be accepted. This promoted a high level of inequality in this first stage but significantly increased production in modern areas, creating a positive relationship between also both variables.

Determinants of income distribution

Growing income inequality affects economic, political and social stability, making the study of income distribution determinants a topic of interest. The most studied factors are those related to education and poverty.

This research proposes the study of the role played by poverty throughout the development process. Since this relationship cannot be observed directly, the education variable has been included as a possible transmission mechanism of the positive effects of increases in per capita income. Regarding the poverty variable, Smith (1776) proposes the invisible hand theory, which determines the social patterns of distribution, while Ricardo (1817) views distribution as an effect of conflicts between capitalists, landowners and workers, in which the inverse relationship between wages and profits is the main cause of the distribution problem and a determining force in the accumulation process. Both authors agree that inequality can be maintained or even increased. However, they argue that if society is oriented towards economic growth through capital accumulation, this situation could reduce inequality, since greater wealth generation in the country would improve the conditions of wage earners and increase the access of people with fewer resources to these benefits. Ahluwalia (1976) points out that it is more profitable for low-income families to strengthen their human capital through education than to accumulate physical or financial capital through savings or inheritance.

Some attribute urban-rural income differences to differences in educational opportunities and results. They argue that expanding education would improve human capital and reduce income inequality (Sicular *et al.*, 2007). Additionally, Ahluwalia (1976) also explains the link between human capital, represented by education, and its role in reducing income inequality, in which he states that investing in human capital increases capabilities and improves skills and aptitudes, resulting in increased productivity and personal income and promoting income equity in the long term.

Authors such as De Gregorio and Lee (2002) have found empirical evidence of a negative and statistically significant relationship between income distribution and educational attainment for several countries worldwide. Conversely, Zhang *et al.* (2012) demonstrate that educational expansion is associatedg with worsening inequality. This aspect is generally measured by secondary school enrollment in the existing literature, and this is how it will be assessed in this study. In the short term, however, educational expansion may be associated with greater inequality. For instance, if individuals from high-income families have better educational opportunities, overall inequality could rise in the course of educational expansion (Nielsen, 1994).

This study begins with the application of a multiple regression model between income inequality (Gini index), economic growth (GDP per capita), education (school enrollment, gross secondary level %) and poverty rate (poverty incidence rate % of the population). Based on the econometric model proposed by Gujarati and Porter (2010):

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + u_i \qquad (1)$$

Where:

Y_i = Income inequality (Gini) in country *i*

X_{1i} = Gross domestic product per capita in country *i*

X_{2i} = Incidence rate of poverty in country *i*

X_{3i} = Secondary school enrollment in country *i*

u_i = Error term

Zanzzi *et al.* (2018) studied the link between income inequality, economic growth, education, and poverty based on the research conducted by Cheng and Wu (2016).

$$INE = f(GDP_t, GDP_t^2, POV_t, EDU_t) \quad (2)$$

Where:

INE: Income inequality, measured by the Gini index.
GDP: GDP per capita (constant 2010 dollars)
GDP^2: GDP per capita squared
POV: Poverty incidence rate based on the poverty line (percentage of the population)
EDU: Tertiary level gross enrollment ratio

The researchers found that GDP growth rates and education growth rates are directly proportional to income inequality. Meanwhile, the poverty growth rate is inversely related to income inequality. This proves that there is a Kuznets-type relationship between income inequality and GDP per capita.

Then, to select the theoretical model, they used a mixture of previously developed theories and research based on what has been studied. Therefore, the long-term relationship between inequality, GDP per capita, education, and poverty will be evaluated. As discussed below:

$$GINI_t = \beta_0 + \beta_1 PBIpc_t + \beta_2 POV_t + \beta_3 EDUC_t + e_t \quad (3)$$

Where:

$GINI_t$: Income inequality as measured by the Gini index.

$PBIpc_t$: GDP per capita (in constant 2010 dollars)

POV_t: Poverty incidence rate based on the poverty line (as a percentage of the population)

$EDUC_t$: Enrolment in secondary education

3. EMPIRICAL STUDIES

Currently, a wide variety of research is aimed at evaluating the relationship between income inequality and economic growth. These studies include several variables, such as economic growth, school enrollment, and poverty incidence, which reflect a relationship with income inequality. Ramos *et al*. (2018) analyzed income inequality patterns and their determinants in Latin American countries. They found that when GDP per capita and the poverty rate increase by 1%, income inequality increases by 0.0226% and 0.0057%, respectively. Conversely, when years of study increase by 1%, income inequality decreases by 0.0546%. These results suggest that GDP per capita, the poverty rate, and years of study significantly impact income inequality. In the same year, Zanzzi *et al*. analyzed the relationship between income inequality, income per capita, poverty, and education in Chile. They found that when GDP and education growth rates increase by 1%, income inequality increases by 3.087% and 0.012%, respectively. However, when the poverty growth rate increases by 1%, income inequality decreases by 0.0453%. This proves the existence of a Kuznets-type relationship between income inequality and GDP per capita. In another study, Brevis (2020) evaluated the determinants of Chilean income inequality and found that an increase in GDP per capita of 1% leads to a decrease in income inequality of 0.368%. This indicates a negative effect of income inequality and suggests that higher GDP per capita leads to lower inequality. Regarding the contribution of the secondary sector, Brevis shows that when it increases by 1%, inequality increases by 0.001%. This shows that the traditional inverted U-shape proposed by Kuznets does not apply to Gini and GDP per capita.

In Peru, researchers such as López (2019) aimed to measure the impact of economic growth (measured by GDP per capita) and education on income distribution. They found that an increase in the economic growth rate by 1% leads to a 0.011% decrease in income inequality, while an increase in average years of study by 1% leads to a 11.923% decrease in income inequality. These results suggest that economic growth significantly impacts income distribution and reduces income inequality.

Conversely, Varona-Castillo and Gonzales-Castillo (2021) analyzed the determinants of the causal relationship between GDP per capita and income distribution in Peru. They found a direct causal relationship that is statistically significant at 1%. They also found a statistically significant HUK. However, the finding of a W-shaped causal relationship rather than a Kuznets inverted U reflects a Peruvian economy with slow, unsustainable growth; low levels of human capital; and a weak institutional framework, which causes income distribution to be unequal in a cyclical manner.

4. METHODS AND MATERIALS

Materials

This research used time series and quantitative data, applying an annual frequency. All data was collected from the secondary source of the World Bank and the Central Reserve Bank of Peru. The study sample consisted of 38 observations during the annual periods from 1985 to 2022, due to the availability of data during this period. These observations indicate the values of each of the research variables. The four variables used were the following: income inequality (GINI) expressed as a percentage, poverty incidence rate (POV) expressed as a percentage of the population, secondary school enrollment (EDU) expressed as a gross percentage, and GDP per capita (GDPCP) expressed in constant 2007 prices. All tests and analyses were conducted using Eviews software, version 12.

Empirical analysis

This research is based on a multiple linear regression model showing the relationship between exogenous and endogenous variables. We carried out an analysis of dispersion, as well as an analysis of descriptive statistics of central tendencies for each series individually. Then, we proceeded with the assumptions related to the optimal model and its fulfillment. If the variables were seasonal, we proceeded with deseasonalization since the data are time series. Additionally, we applied tests and corrections for violations of the assumptions. Next, we performed a stationarity analysis using Enders' notation. For this analysis, we applied the Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979) and the Phillips-Perron test (Phillips & Perron, 1988) to observe the unit root according to the proposed model and Granger causality (Granger, 1969). We considered a 5% significance level for these tests.

Next, we estimated the model proposed by Pesaran and Shin (1997) and Pesaran *et al*. (2001). Using this time series method, we determined the elasticity or variation of all the variables in the short or long term. Additionally, this model allowed us to treat the independent regressor variables, whether they were integrated of order zero (I(0)), one (I(1)), or mutually integrated.

This model, the ARDL, is defined as follows:

$$Y_t = \alpha_0 + \sum_{j=1}^{p} \lambda_j Y_{t-j} + \sum_{j=0}^{q} \beta_i X_{t-i} + \varepsilon_t \qquad (4)$$

The research was based on the following model, which shows a relationship between the independent variables and the dependent variable.

Thus, based on the research of Cheng and Wu (2016), Zanzzi *et al*. (2018) examined the relationship between income inequality, economic growth, education, and poverty in Chile.

To select the theoretical model, a mix of theories and research developed in the theoretical framework of this study was used, based on the study of Zanzzi *et al*. (2018) and all other studies. Thus, the long-term relationship between inequality, GDP per capita,

education, and poverty will be evaluated to verify:

$$GINI_t = \beta_0 + \beta_1 PBIpc_t + \beta_2 POV_t + \beta_3 EDUC_t + \varepsilon_t \quad (5)$$

The estimated model must satisfy the assumptions of the multiple linear regression model (Larios-Meñoño *et al*., 2016). The Glejser and Breusch-Pagan-Godfrey heteroscedasticity test was applied to determine whether the errors are heteroscedastic or homoscedastic. The Arch test was used to determine whether the series has conditional volatility or autoregressive conditional heteroskedasticity. The Breusch-Godfrey test was used to check for autocorrelation. The Jarque-Bera normality test was used to check whether the random variables (errors) follow a normal distribution. The Reset-Ramsey test was used to check the linearity of the parameters.e. Whether the errors are autocorrelated and whether the model is correctly specified. Finally, Cusum and Cusum-Q tests were used to check for stability of the parameters, i.e., to detect structural changes at a given point during the analysis period.

5. RESULTS

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Unit root test

This test confirms whether the series have a unit root. In the case of the DFA test, it was found that the study variables (LGINI, LPBI_PC, LEDUC, and LPOV) did not present stationarity since their p-value was greater than the significance level of 0.05 in the tests with intercept, trend, and without either (see Table 1). Therefore, we proceeded to work with the first differences to look for stationarity in each series. Thus, we determined that the p-value was lower than the 0.05 significance level, enabling us to reject the null hypothesis of a unit root and infer stationarity in the first difference. This yielded the following variables: DLGINI, DLPBI_PC, DLEDUC, and DLPOVV for both the Dickey-Fuller and Phillips-Perron tests.

Table 1. Unit root tests, Augmented Dickey-Fuller and Phillips-Perron test

Variable	*Test: unit root*	*Augmented Dickey-Fuller*			*Phillips-Perron*		
		Intercept	*Trend and intercept*	*None*	*Intercept*	*Trend and intercept*	*None*
LGINI	Level	0.2333	0.0625	0.5917	0.1725	0.0625	0.5917
	1st Dif.	0.0000	0.0026	0.0000	0.0000	0.0026	0.0000
LPBI_PC	Level	0.9692	0.5236	0.9861	0.9479	0.5236	0.9711
	1st Dif.	0.0017	0.0055	0.0211	0.0016	0.0055	0.0001
LEDUC	Level	0.7042	0.8519	0.9974	0.7042	0.8226	0.9981
	1st Dif.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LPOV	Level	0.8528	0.1316	0.3680	0.7737	0.5314	0.4211
	1st Dif.	0.0001	0.0005	0.0000	0.0000	0.0003	0.0000

Source: prepared by the authors, using E-Views 12.

Granger causality test

Next, we performed a Granger causality test, analyzing up to lag number ten. In this test, DLGINIt causes DLEDUCt in Granger's sense at lag number ten because the p-value at this lag is 0.0082, which is less than the significance level of 0.05. Therefore, we reject the null hypothesis, indicating that there is no causality (see Table 2). The p-values in the other relationships up to lag ten are greater than the significance level of 0.05; therefore, the null hypothesis of no Granger causality is not rejected.

Table 2. Granger Causality Test

Causality	*Criteria*	*Lag*	*F-statistical*	*P-value*
ΔDLPBI_PC → ΔDLGINI	AIC	10	1.93292	0.2169
ΔDLGINI → ΔDLPBI_PC	AIC	4	1.36579	0.2752
ΔDLEDUC → ΔDLGINI	AIC	10	2.33290	0.1560
ΔDLGINI → ΔDEDUC	AIC	10	8.51781	0.0082
ΔDLPOV → ΔDLGINI	AIC	10	1.01342	0.5176
ΔDLGINI → ΔDLPOV	HIC	10	2.15716	0.1796

Source: prepared by the authors, using E-Views 12.

ARDL dynamic model estimation

After analyzing the study variables, we proceeded to estimate the ARDL distributed lag model (see Table 3).

Table 3. ARDL dynamic model

Dependent variable: DLGINI		
Variable	*Coefficient*	*Prob.**
DLGINI(-1)	-0.471528	0.0247
DLGINI(-2)	-0.564290	0.0073
DLGINI(-3)	-0.490488	0.0212
DLGINI(-4)	-0.744586	0.0035
DLPBI_PC	-1.488452	0.0449
DLPBI_PC(-1)	0.002477	0.9959
DLPBI_PC(-2)	1.387193	0.0096
DLPBI_PC(-3)	1.246848	0.0055
DLEDUC	0.984953	0.0749
DLEDUC(-1)	0.953305	0.0737
DLEDUC(-2)	0.271628	0.6029
DLEDUC(-3)	1.480838	0.0091
DLPOV	-0.068768	0.8053
DLPOV(-1)	0.426070	0.0751
DLPOV(-2)	0.893304	0.0034
C	-0.071175	0.0113
Adjusted R-squared	0.698690	
Prob(F-statistic)	0.029197	

Source: prepared by the authors, using E-Views 12.

An increase in family economic income due to better labor force development and performance will tend to decrease income inequality. For example, if GDP per capita increases by 1%, income inequality, as measured by the Gini index, decreases by 1.4884%. However, the result changes in the lags of the same variable, as income inequality increases. Regarding the growth rate of secondary school enrollment, we found that an increase of 1% leads to an increase of 0.984% in the growth rate of income inequality. Finally, a 1% increase in the poverty incidence rate results in a 0.893304% increase in the growth rate of income inequality.

Final tests to compare the assumptions of the ARDL model

Table 4 shows the results of the tests used to verify the model assumptions. The Breusch-Godfrey autocorrelation test showed that there is no serial correlation problem in the model for the first and second lags since the p-value was 0.9852 and 0.5610, respectively, both of which are greater than the 5% significance level. Likewise, we confirmed that homoscedasticity of the residuals is guaranteed since the p-values of the first- and second-lag ARCH tests (Breusch-Pagan-Godfrey and Glejser) are greater than the 5% significance level. Furthermore, the residuals follow a normal distribution at the 5% level, as determined by the Jarque-Bera normality test. Finally, we verified that the model is linear, proving that it is correctly specified, since the p-value is 0.1776, greater than the 5% significance level.

Table 4. Tests to compare assumptions

Tests	*Statistical*	*P_value*
Heteroscedasticity ARCH 1	Chi-Square	0.1274
Heteroscedasticity ARCH 2	Chi-Square	0.3129
Heteroscedasticity (Breusch Pagan Godfrey)	Chi-Square	0.6151
Heteroscedasticity (Glejser)	Chi-Square	0.5484
Breusch-Godfrey Serial Correlation LM (1)	Chi-Square	0.9852
Breusch-Godfrey Serial Correlation LM (2)	Chi-Square	0.5610
Normality	Jarque-Bera	0.4491
Linearity (Ramsey)	T-statistic	0.1776

Source: prepared by the authors, using E-Views 12.

5. DISCUSSION

This study analyzed the relationship between income inequality and economic growth in Peru from 1985 to 2022 due to its relevance and implications for people's well-being. Developed countries tend to have a more equal distribution of income and wealth than developing countries. The analysis revealed that the GDP per capita variable did not directly correlate with Peruvian income inequality. Additionally, the incidence rate of poverty was inversely related to income inequality, and secondary school enrollment did not negatively impact income inequality.

According to Kuznets's economic theory (1955), there is initially a direct relationship between growth and inequality; however, after a certain point, inequality decreases as economic growth increases. In other words, nations with significant growth generate a better income distribution. The results support this theory because it was possible to show that a 1% increase in GDP per capita had a negative impact of 1.488% on income inequality during the studied period. This demonstrates an inverse relationship between economic growth (GDP per capita) and income inequality. Additionally, Barro (1999) argues that economic growth causes people to migrate from agriculture to industry, increasing their per capita income. However, this migration increases economic inequality. This is consistent with the results of this study, as growth in per capita income decreases income inequality.

Becker (1964) argued that human capital is the set of useful skills an individual acquires through knowledge acquisition, which can be general or specific. Becker also argued that investing more in education increases per capita income because there is a positive relationship between human capital and economic growth. This leads to reduced poverty and decreased income inequality, which is consistent with the results obtained in this study.

Similarly, authors such as Zhang *et al*. (2012) point out that expanding education is correlated with worsening inequality. Nielsen (1994), in turn, points out that educational expansion may be associated with greater inequality. For example, if people from high-income families have better educational opportunities, overall inequality may increase during educational expansion. Similarly, based on Kuznets' U-inverse hypothesis, Cheng and Wu (2016) found that a 1 percent increase in higher education enrollment increases income inequality by 1.1676 percent. These results align with those obtained in this study. If the enrollment growth rate in secondary education increases by 1%, the income inequality growth rate increases by 0.984%. This is likely because people from high-income families have better educational opportunities.

Cenas (2019) concluded that income inequality decreases by 0.000009% for a 1% increase in economic growth, which aligns with this study's findings. For a 1% increase in GDP per capita growth, the growth rate of income inequality decreases by 1.4884%. Furthermore, López (2019) shows that for every additional unit of GDP growth, inequality decreases by 0.12%. Martinez (2015) found that a 1% increase in GDP per capita reduces income inequality by 0.189%. However, discrepancies were recorded in the

Zanzzi *et al*. (2018) study. They found that if GDP and education growth rates increase by 1%, income inequality will also increase by 3.087% and 0.012%, respectively. Conversely, if the poverty growth rate increases by 1%, income inequality decreases by -0.0453%. These results led to the implementation of educational reforms that benefit students from vulnerable households by providing them with the necessary tools for learning.

6. CONCLUSIONS

This study analyzed the impact of economic growth in Peru on income inequality from 1985 to 2022. Inequality threatens long-term economic and social development by slowing the reduction of poverty and increasing concern for economic well-being at the national level, so this issue cannot be ignored.

According to the results, economic growth, as measured by GDP per capita, the school enrollment rate, and the poverty incidence rate, has an opposite effect on income inequality during the period from 1985 to 2022. Similarly, there is no direct relationship between economic growth and income inequality. Regarding education, it has been shown to negatively impact Peruvian income inequality. Therefore, the model suggests that, despite progress in access to education in recent decades, education does not play a significant role in counteracting the positive effects of a more skilled labor force.

Regarding the incidence of poverty, it was found to negatively affect Peruvian income inequality since higher poverty limits the ability of part of the population to study and continue their education. This means they will not be able to access higher salaries, causing inequality to increase.

The model shows a good fit, as evidenced by a goodness-of-fit coefficient of 0.698690. This indicates that GDP per capita, human capital as measured by the school enrollment rate, and the poverty incidence rate are significantly related to income inequality. Based on these results and the justification of this research, it is recommended that economic growth be stimulated through greater private investment. This will create new businesses and companies, generating jobs and stimulating the country's integral development. This will promote equal opportunities and advance and improve the quality of life of Peruvians, increasing their purchasing power and eradicating poverty.

To identify and define policies focused on reducing income inequality, it is advisable to compare Peru with other Latin American countries and consider spatial analysis, as inequality is evident at the provincial, regional, and local levels.

Finally, the government should prioritize public policies that strengthen the education sector's role in reducing regional disparities by improving infrastructure, training qualified teachers, providing educational materials, and offering basic services such as water, electricity, sanitation, and technology. Additionally, economic policies should be implemented to strengthen economic growth, improve education levels, increase salaries, and eradicate poverty to achieve a better salary distribution.

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