HOUSEHOLD INCOME AND GINI INDEX IN ECUADOR

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Abstract: *The distribution of income is an aspect that must be addressed by the central and sectional governments of the nations due to its importance in the search for equity in society. Precisely, the Gini method is the main analytical tool that measures the concentration of the income of the inhabitants of a region over a period of time. In this regard, in 2017 Ecuador managed to reduce the Gini index due to a better distribution of wealth, however, from the Covid-19 pandemic the economic and social inequalities of the population are accentuated due to the increase in unemployment and human losses. Therefore, the present study establishes the dynamics of the monthly family income and the Gini index in the period 2000 - 2020. For this purpose, the research is cunatitative, descrptiva, non-experimental and longitudinal and applies the least squares model, the heteroscedasticity test of ARCH and the determination of cointegration. The hypothesis is tested because the Gini index varies inversely to the variation of the monthly family income, demonstrating that they are countercyclical variables to have a negative correlation, while, with the test of Heteroscedasticity of ARCH the hypothesis of Heteroscedasticity is rejected*

Keywords: *Gini index, monthly household income, least squares model, cointegration.*

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1. Introduction

Since the beginning of humanity the study of living conditions has occupied an important place in the debates of all civilizations, currently the well-being of people is related to the economic capacity they have to satisfy their needs, tastes, preferences in the demand for goods and services. In addition to the continuous crises that affect countries in general, there are factors that affect the redistribution of people's income, such as the level of education, gender, age, sector of residence, among others, represent factors that affect the design of the economic and political structure adopted by governments.

In this context, the first objective of the United Nations Development Program aims to eradicate poverty in all its forms, and focuses on the social problem that affects the economy of countries, so it asks the governments of the day to treat this issue with the importance it deserves. Indeed, inequality represents one of the greatest problems of society from the field of ethics, social justice, solidarity and above all it is a measure of state efficiency (UN, 2015) (Cortéz & Rubalcava, 2016).

In addition, since Ecuador is a country affected by the pandemic, political, economic and social crisis due to high external indebtedness, growing levels of poverty and unemployment, corruption and rampant crime, the need arises to develop this work in order to determine the dynamics between family income and the Gini index in Ecuador for the period 2000-2020. Therefore, it proposes as a question What is the influence of the monthly income of families on the Gini index in Ecuador in the period 2000-2020?, then, the hypothesis arises: does the increase in the monthly income of families positively affect the reduction of the Gini index in the short and long term ? The period of analysis 2000 – 2020 is considered, taking into account that, in the year 2000, Ecuador adopts the dollar asor official currency due to the economic instability produced by the bankruptcy of the financial system.

In this context, it is determined whether the variation of the monthly income of families can have a positive effect on the Gini index, the reduction of the indicator can generate positive externalities in the economy and the development of the country. Thus, the article is organized into four parts, the first identifies the theoretical aspects of the relationship between monthly income of families and the Gini index, the second, analyzes the empirical and methodological aspects of this relationship, then, the results are shown and, finally, the conclusions are exposed.

2. Theoretical framework

2.1. Inequality and poverty

Although Smith and David Ricardo are the most representative thinkers of the Classical Economic School, however, they had different realities due to the epochs they lived. Both classical authors defined as fundamental characteristics the individual freedoms and free market of the capitalist economy and came to relate poverty with inequality. Smith believes that poverty has a distinctive class status, since the poor can only sustain themselves by their wage labor. In this way, the difference between poor and rich is the price for their labor, this price is related to the amount of goods that the person can acquire, then, poor people are those who can only cover the needs of subsistence. Thus, inequality becomes one of the main causes of poverty and forces governments to intervene with state policies to reduce the gap. (Smith, 1987)

Ricardo defines poverty as a social problem that affects the working classes and reduces the welfare of society in general and considers work and wages as the fundamental axis of poverty, because the value of a commodity depends on the relative amount of labor necessary to produce it. Therefore, poverty can increase when wages decrease due to the excess supply of labor, so this principle is related to the fundamental theorem. Ricardo is also against taxes for poor people because taxes generate a tendency to reduce purchasing power.(Ricardo, 1986)

In conservative thought there is a positivist separation between the economic and the social, the social part is visualized as a social fact, that is, something natural and ahistorical in this way the economic and political foundations of society are disconnected. In this view, social problems are not part of the structural foundation and their solution does not require the transformation of the system. Lukács (1992) calls ideological decadence of the bourgeoisie the period in which poverty, misery are defined as autonomous phenomena and not as a consequence of an economic process, being responsible the people or groups of people who suffer it. (Netto, 2001)

Likewise, poverty is linked to the lack of education in areas such as the natural laws of the market and the behavior that a person must acquire within it, poverty is seen as a planning problem, that is, the inability to manage the family budget and constitutes a moral problem linked to the bad waste of resources, vices, among others. With this vision that developed between the sixteenth and nineteenth centuries, those who tried to face poverty were philanthropic organizations that focused on the lack of personal actions (Netto, 1992). One of the definitions determines that "poverty is the inability to achieve a minimum standard of living measured in terms of basic needs or the income required to meet them" (World Bank, 1990).

After the Second World War under the condition of monopoly capitalism of productive expansion, a hegemonic strategy of capital was developed that incorporates the industrial working class (Montaño, 2005), which was called late capitalism or Fordist accumulation regime. The State has fundamental functions for capitalist accumulation and the inhibition of social conflicts, in this way, social problems are seen as consequences of insufficient social and economic development (Netto, 1992). Thus, the distribution problem focuses on the deficit of effective market demand, the oversupply of labor leaves a portion of the population without selling its labor power and without a source of income to acquire goods and services offered by the market. (Mandel, 1997) (Harvey, 1993)

In the context of the capitalist crisis, the State intervenes in the social area by focusing policies on programs that help mitigate malnutrition and, in general, are programs financed through donations from civil society and contributions from the working classes. In this way, an individual problem continues to be argued, the corporate philanthropy of volunteering is added, replacing the constitutional right of the citizen with local solidarity, poverty is linked to the deficit of goods and services, for which the State stops stimulating consumption and promotes capital for investment with the aim of guaranteeing profit against fluctuations until reaching a crisis. (Montaño, 2005)

Consequently, the neoliberal strategy is different from the classical conception and is oriented in a triple action, on the one hand the participation of the State with social policies aimed at the poorest through actions focused on a kind of clientelism of gifts, on the other hand, the mercantile action elaborated by the capitalist company aimed at the population with purchasing power to transform social services into profitable goods and, Finally, philanthropic action through the intervention of civil society that serves the population that was not considered by the two previous organizations. Therefore, poverty is combated with political actions, philanthropic activities, commercial services even reaching the repression and criminalization of poverty. (Montaño, 2005)

Keynes presented several ideas of the relationship between income distribution and economic growth, such as redistributing part of the income of the rich among the poor, in this way consumption would increase and thus improve production, economic growth (Pérez, 2012). This thinking was totally contrary to that of the classical authors, it was applied in developed countries after the Second World War. Keynes stated that, in the long run, technological advances and capital accumulation would play an important role in economic growth, indicating that the larger the population, the greater the investment and thus, the greater the demand for capital.

Likewise, Keynes argued that in a population without growth prosperity would be related to a more egalitarian distribution of income, this added to a reduction in the interest rate that would favor investment, and by not generating this situation, the chronic underemployment of resources would be seriously affected, therefore, Keynes was in favor of maintaining individual freedoms. In the short term, Keynes affirms that insufficient demand caused the crisis of the 30s, all this triggered the unemployment that was experienced at the time, also, he proposed that the State should intervene in the economic system when circumstances required it. Finally, within the system of individual freedoms and their preservation, this action of the State towards justice and social stability would lead to a complex situation of social acceptance and would have technical and political problems (Pérez, 2012).

2.2. Gini Index

There are measures or indices of concentration that aim to quantify the degree of inequality in the redistribution of an economic magnitude in general as income or benefits among individuals, families, companies, among others. Therefore, the distribution is represented with a statistical variable that can be measured in position, dispersion, asymmetry and pointing, analyzing the greater or lesser equity in the distribution of resources, however, the information is grouped into classes that hinder the accuracy of the measurement.

There are extreme days in this type of measurements, the first that refers to the minimum concentration or maximum equality that occurs when the same amount isassigned in the distribution of the total amount and, the second, is the maximum concentration or minimum equality, which arises when only one person receives the totality of the resource. These two extremes must be identified by concentration measures by calculating the average situation. Hence, Gini's proposal is to organize the data from lowest to highest, then the accumulated amounts and the amount of resources that each person receives are ordered, with these values the accumulated proportions of the resource are obtained (Gujarati, n.d.). (Novales, 2000)

Precisely, the Gini coefficient summarizes the way income is distributed among the inhabitants of a population, where the value zero indicates perfect equality and the value 1 indicates the absence of equality (INEC, 2017). From the positive point of view, studies are established on the measurement of living standards financed by multilateral organizations such as the Inter-American Development Bank, the World Bank and the statistical institutes of each country. InEcuador, INEC applies the survey of living conditions, even with these tools the objective measurement is not easy. In this field, Carrillo et al. 201 6 and 2018 mention that it is important to continuously analyze the relationships between poverty, income and Gross Domestic Product because these results contribute to the design of social strategies that are oriented to the happiness and well-being of people.

3. Methodology

The study has a quantitative, documentary and transversal research. The numerical data for the years 2000 to 2020 are obtained from the bulletins of the Central Bank of Ecuador. Se appliesl to least squares regression through the EVIEWS program in order to identify the relationship between the dependent and independent variableand and, check the best estimation of factors in the verification of countercyclical s variables (Gujarati & Poter, 2013). Table 1 describes the Gini index that corresponds to the data published by the Central Age of Ecuador for the years 2000 – 2020 and, Table 2, presents the values of the monthly income of families in the same period of time.

Table 1
Gini Index

Year	Poverty %	Year	Poverty %
2000	56,4	2011	45,9
2001	55,3	2012	46,1
2002	54,5	2013	46,0
2003	53,5	2014	45,0
2004	53,9	2015	46,0
2005	53,1	2016	45,0
2006	52,3	2017	44,7
2007	53,4	2018	45,4
2008	49,8	2019	45,7
2009	48,5	2020	47,3
2010	48,8		

Note: Bulletin of the report on poverty, income and inequality (ECB, 2022)

Table 2
Monthly income of families

Year	Monthly income of families (USD)	Year	Monthly income of families (USD)
2000	163,57	2011	492,80
2001	200,63	2012	545,07
2002	221,26	2013	593,60
2003	253,17	2014	634,67
2004	265,95	2015	660,80
2005	280,00	2016	683,20
2006	298,67	2017	700,00
2007	317,34	2018	720,53
2008	373,34	2019	735,47
2009	406,93	2020	746,67
2010	448,00		

Note: Bulletin of the report on poverty, income and inequality (ECB, 2022)

4. Results

In the 50s Ecuador had an economic change due to the production and export of bananas, in 1972 began with the exploitation and export of oil deposits both on the coast and eastern Ecuador, the first oil discoveries occurred in the province of Santa Elena, these activities highlighted the Ecuadorian economy, The governments of the day did not invest adequately to improve the quality of life of Ecuadorians, leaving a negative social result. The dependence on oil production and economic mismanagement generated at the end of the 90s imbalance and collapse of the financial system which caused the exchange of currency adopting the dollar as the official currency that avoids the country falling into more disastrous economic and social situations as was the Argentine case with the so-called corralito (Naranjo, 1995).

Since 2000 in Ecuador, the increase inschooling has led to an increase in the level of household consumption, which contributed to the reductionof poverty, as did other factors such as connectivity and increased basic services, access to financial services, receipt of remittances from households, and a better working condition of the head of household. In 2006, the Human Development Bond reached a value of USD 15 with a number of beneficiaries of 1,003,648, of which 80% were mothers. At present the amount has increased to USD 30 together with the co-responsibility that they must comply with school attendance and medical check-ups of children at home.

The reduction of poverty from 32.8% in 2010 to 21.5% in 2017 was caused by a growth effect and a redistribution effect. The 11.3 percentage points in poverty reduction is explained by the two aforementioned effects, real consumption growth caused poverty to be reduced by 4.4% and the redistribution effect caused a decrease of 6.9%. In this period, a model of social justice was strengthened, where the consumption of households with lower incomes grew at a faster rate than households with higher incomes.

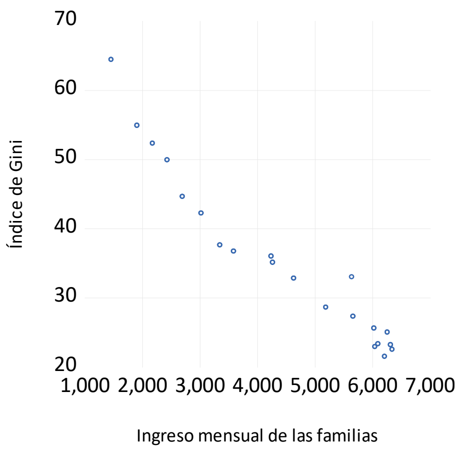
With this background, the Pearson correlation between both variables, the monthly income of families and the Gini index is developed, so Table 3 deduces that there is a strong negative relationship between both variables, that is, a fall in monthly family income generates an increase in the Gini index and, an increase in monthly household income causes a decrease in the Gini index.

Table 3
Correlation

	Monthly Income of Families	Gini_ Index
Monthly Income of Families	1.000000	**-0.966705**
Gini index	**-0.966705**	1.000000

Note: Elaboration of the authors

Figure 1
Scatter plot



Note: Elaboration of the authors

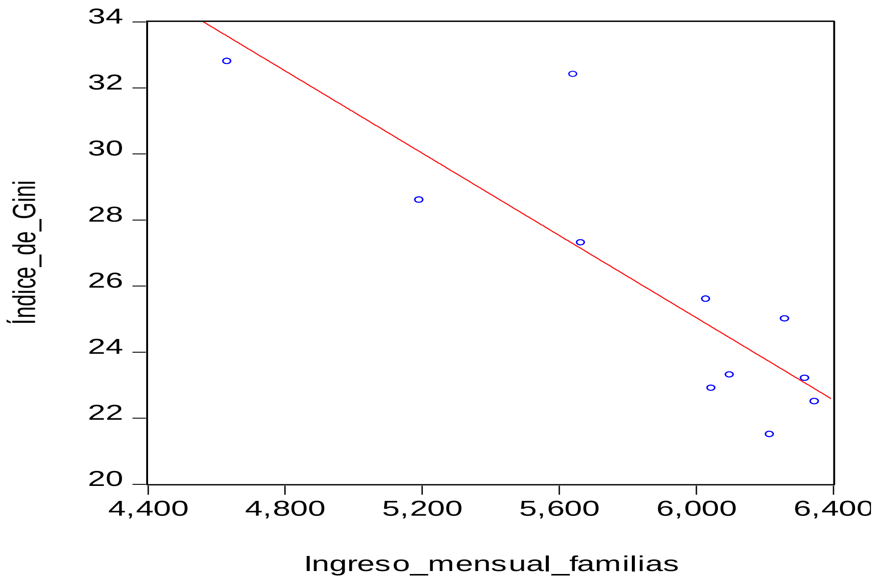
In the figures there are cyclic oscillations that make it difficult to obtain a trend in time, therefore, to achieve a constant dispersion and achieve a distribution that does not vary over time, the time series are modified to logarithm, in this way the equation that represents the model is expressed in Table 4, where C (1) is the intercept that is equal to 9.3934, C(2) which is equal to -0.7077 is the coefficient that multiplies the variable monthly income of families. Likewise, in F igura 2 it is observed that the slope of the independent variable is negative, it is verified that the variables analyzed are countercyclical, in this way the inverse relationship between variables is demonstrated, that is, if the monthly income of families increases, the Gini Index decreases.

Table 4
Model calculation

Estimation Command:
LS LOG(Índice_de_Gini__) C LOG(Ingreso_mensual_familias)
Estimation Equation:
LOG(Índice_de_Gini) = C(1) + C(2)*LOG(Ingreso_mensual_familias)
Substituted Coefficients:
LOG(Índice_de_Gini) = 9.39342486455 - 0.707714134224*LOG(Ingreso_mensual_familias)

Note: Elaboration of the authors

Figure 2
Normal probability



Note: The Gini Index is displayed based on the monthly income of families

When analyzing the results it is verified that the independent variable Monthly income of families has a good adjustment of explanation with respect to the Gini Index which is the dependent variable, the coefficient of determination R^2 adjusted is 0.93 indicating that when varying in one unit the monthly income of the families varies 0.93 the Gini Index, The Durbin-Watson test gives us a value of 0.6765 comparing with the tables for two variables and with 20 samples it is between 0.86 and 1.27 therefore we conclude that the variables have positive autocorrelation. Figure 3 indicates how the value calculated by the model resembles the reality of the Gini index and it can be seen that between the hypothesis and the current situation there is no gradual difference.

Table 5

General Matrix of the Simple Regression Model

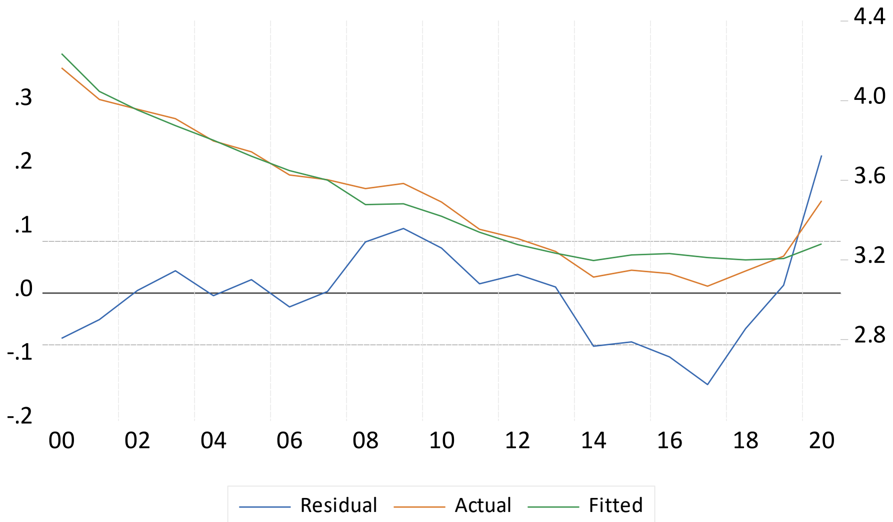
Dependent Variable: LOG(Gini Index)
Method: Least Squares
Date: 12/16/22 Time: 18:18
Sample: 2000 2020
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.393425	0.333710	28.14851	0.0000
LOG(Ingreso_mensual_familias)	-0.707714	0.040070	-17.66198	0.0000
R-squared	0.942589	Mean dependent var		3.507777
Adjusted R-squared	0.939567	S.D. dependent var		0.330490
S.E. of regression	0.081245	Akaike info criterion		-2.092307
Sum squared resid	0.125414	Schwarz criterion		-1.992829
Log likelihood	23.96922	Hannan-Quinn criter.		-2.070718
F-statistic	311.9456	Durbin-Watson stat		0.676559
Prob(F-statistic)	0.000000			

Note: EVIEWS Program Data

Figure 3

Residual



Note: Elaboration of the authors

Finally, in Tabla 6 it is observed that the probability has a value greater than 0.05, consequently, it is concluded that there is no principle of Heteroscedasticity.

Table 6

Heterocedasticidad: test ARCH

F-statistic	0.017697	Prob. F(1,18)	0.8956
Obs*R-squared	0.019645	Prob. Chi-Square(1)	0.8885

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 12/16/22 Time: 19:22
Sample (adjusted): 2001 2020
Included observations: 20 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.005761	0.003174	1.815163	0.0862
RESID^2(-1)	0.065904	0.495399	0.133032	0.8956

R-squared	0.000982	Mean dependent var	0.006019
Adjusted R-squared	-0.054519	S.D. dependent var	0.010916
S.E. of regression	0.011210	Akaike info criterion	-6.049449
Sum squared resid	0.002262	Schwarz criterion	-5.949876
Log likelihood	62.49449	Hannan-Quinn criter.	-6.030011
F-statistic	0.017697	Durbin-Watson stat	1.245345
Prob(F-statistic)	0.895644		

Note: Elaboration of the authors

5. CONCLUSIONS

The income received by families in any society has a direct impact on the balance of levels of inequality and poverty, or failing that, contributes to the achievement of social and economic equity among all members of these. Therefore, developing studies that quantitatively determine the relationships between social and economic variables contribute to academia and to the agencies responsible for establishing state policies to seek the improvement of social conditions and well-being.

The hypothesis is tested because the Gini index varies inversely to the variation of the monthly family income, demonstrating that they are countercyclical variables to have a negative correlation, while, with the test of Heteroscedasticity of ARCH the hypothesis of Heteroscedasticity is rejected.

The adjusted R^2 value shows that by increasing the production of goods and services in the country it guarantees the reduction of poverty, being verified in the Gini index in June 2020 it had a value of 0.50, therefore, together with economic growth, equity policies should be applied in the redistribution of wealth. The State should seek a public policy instrument aimed at investing in education, especially in the first years of schooling; improve the health service. In this way provide equal opportunities to the entire population.

It is proposed to develop studies that include a segregation of time in periods of pre-pandemic (before 2020), pandemic (2020) and post-pandemic (since 2021) and includeother variables such as Gross Domestic Product and Poverty, among others.

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