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# The Determinants of income inequality: Empirical evidence from Latin American countries

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**Abstract:**

Income inequality is considered one of the major concerns to a lot of governments worldwide. The current paper is examining the impact of the foreign direct investment inflows, elderly population, unemployment rate, expenditures on education and trade openness on Income inequality in (11) Latin American economies. The paper used a balanced panel data approach covering the period from 2000 to 2019. The main hypothesis of the paper that trade openness and the unemployment rate have a positive impact on Gini Coefficient; while the foreign direct investment and expenditure on education have a negative effect on Gini Coefficient. The paper found a significant negative impact of expenditure on education and elderly population on Gini coefficient; where a positive significant impact was found between trade openness and unemployment rates on Gini coefficient. The paper also found no significant impact between FDI and Gini Coefficient.

**Keywords:** Foreign Direct Investment; Latin American Countries; Expenditure on Education; GINI coefficient; Elderly population; Unemployment rate; Trade Openness; Panel Data

## 1. Introduction

Income inequality has been one of the major concerns to many economists and policy makers, especially in the developing countries; where there are many factors that lead to higher income inequality between countries in the world.

According to OECD Gini Coefficient is defined as the measure of income inequality on a 0 to 1 scale with 0 representing perfect equality and 1 perfect inequality (OECD, 2015). It is derived from a country's income or expenditures data and serves as an indicator of the distribution of wealth across a population. Thus, the Gini Coefficient is a profound tool for measuring and monitoring inequality within a population.

Although inequality has continued to rise all over the world; historically, Latin America was one of the highest regions where there was a high inequality; however, the performance of most Latin American Countries to reduce income inequality has been notable since the first decade of this century. The issue that caught the attention of researchers and policymakers around the world.

The main objective of this paper is to examine the impact of Foreign Direct Investment (FDI), Elderly population, Unemployment rate, Expenditure on education (Expedu) and trade openness (TO) on GINI coefficient. The paper studies these relations by adopting a balanced panel data approach applied on data covering the period from 2000 to 2019 in (11) Latin American countries. The Research Hypotheses are as follows:

H1: Trade openness has a positive significant impact on Gini Coefficient in the Latin American Countries.

H2: Foreign Direct Investment has a negative significant impact on Gini Coefficient in the Latin American Countries.

H3: Elderly population has negative significant effect on Gini Coefficient in the Latin American Countries.

H4: Expenditure on education has a negative significant impact on Gini Coefficient in the Latin American Countries.

H5: Unemployment rate has a positive significant impact on Gini Coefficient in the Latin American Countries.

Section 2 of the research paper presents the literature review where it is divided into two sections:

Section 2.1 : concerning the general literature review that determine the relations between the variables of the study.

Section 2.2 that talks about the variables of the study specifically for the Latin American countries; whereas Section 3 presents the data; econometric specification, and methodology. Finally, Section 4 is about the empirical results, and the final section presents the conclusion

## 2.Literature Review:

### 2.1 : The Literature review concerning the variables of the study:

First, concerning the impact of education expenditures on GINI coefficient; the findings of different studies were opposing; as some found that education expenditures lead to a reduction in income inequality; while others concluded that public spending on education contributes to an increase in income inequality. Perotti (1993) and Galor and Zeira (1993) confirmed that it is not necessarily that those who are engaged in the public education can benefit from the system, instead, agents must include the opportunity cost of attending school, which decides how much education needs to be obtained. There is a chance that the degree of income inequality will not decrease even in the case of the presence of a public education system.

However, Sylwester (2002) examined the significance impact of education spending on later changes in income inequality in cross-section countries. He found out that the relationship between education spending and declining income inequality

is stronger in the OECD subsample than in the subsample of less-developed countries after separating the sample into two groups.

Heckman (2011) confirmed that for transforming societies, one crucial way of transforming initial socioeconomic inequality is through policies focused on increasing education equity, as the accumulation of human capital is a crucial determinant of one's future social and economic success. Therefore, Heckman confirmed that investments in education that focus on expanding the number of educated people in society will reduce income inequality.

Lionel & Laurent (2017) for the data obtained from the US for the years of 1960,1970,1980,1990,2000 and 2010 found that public education spending is typically associated with at least two positive effects: boosting economic growth and decreasing income inequality. However, their findings demonstrated that the effect of public education spending on economic growth depended not only on the level of these expenditures but also on the allocation of human capital.

Seefeldt (2018) studied the impact of tertiary versus primary and secondary education spending on income inequality using the panel data for (50) US states over the period from 1987-2015. The study found that the total and disaggregated education expenditures have a significant inequality- reducing effect on the income distribution.

Second, concerning the impact of FDI on inequality, many researchers paid special emphasis to analyze this debatable relationship, as several perspectives on the relationship between FDI inflows and income inequality have been examined in theoretical and empirical investigations. As some researchers demonstrated that increasing FDI inflows had contributed to greater income inequality; contradictory other researchers asserted that FDI inflows have assisted in reducing income inequality, and some other researchers showed that there is no definite evidence linking FDI inflows to income inequality.

Suanes (2016) examined the relationship between foreign direct investment (FDI) and income inequality in Latin America; the study evaluated the impact of FDI from a sectorial perspective, designating the primary sector, the manufacturing industry, and services as the three basic sectors. The study empirically proved that the positive impact of FDI on income inequality in the service and manufacturing sectors using panel data for (13) economies for the years from 1980 to 2009.

De Mello (1999) empirically tested the relationship between FDI and income inequality for transitional countries in Eastern Europe and Central Asia for the period from 1990 to 2002. The paper found that there is no evidence that FDI affects overall income inequality.

Ravinthirakumaran (2016) discussed the impact of foreign direct investment (FDI) inflows on income inequality in Asia-Pacific Economic Cooperation (APEC) based on annual data for the years from 1990 to 2015, where the GINI coefficient, FDI inflows, per-capita gross domestic product (GDP), trade openness, and human capital are the variables considered. The study employed panel Autoregressive Distributed Lag (ARDL) and panel Heterogeneous Non-Causality Tests. Results indicated that, throughout the 1990–2015, FDI inflows reduced income inequality.

Third for the impact of trade openness on income inequality; Lora and Londono (1998) highlighted the impact of trade liberalization on income distribution and concluded that the foreign trade openness may worsen income inequality by displacing at least temporarily domestic production and employment and by cheapening luxury consumption with mass consumption items, and by making it possible to introduce capital-intensive techniques of production which require more skilled labor, but decrease the demand of unskilled labor.

Elena (2007) analyzed how trade flows affect the distribution of wealth in (70) emerging nations for the years from 1980-1999, and assessed the effect of trade on intra-country income inequality using a dynamic specification, the findings implied that income inequality and total aggregate trade flows have very weak significance,

but by breaking down total trade flows based on where they originate, the findings of the paper stated that trading with high-income nations worsens the income inequality in developing nations (DCs) through both imports and exports.

Ehrhart (2005) and Milanovic (2002) showed that the effects of trade openness on country's income inequality depend on its initial income level as when a country is relatively poor, greater trade openness raises the income share of top deciles, and consequently decreases the income share of the poor groups and of the middle class as well. However, at some medium—level of development, income shares of the poor and the middle class begin to be positively affected by trade openness while the income share of the rich begins to decline

Lim & McNelis (2014) investigated the interconnections between trade openness, aid, and foreign direct investment flows and the Gini coefficient, using panel data for (42) low- to middle-income nations, and found out empirically that initiatives to increase financial and trade openness can reduce inequality, and that trade openness is more effective than foreign direct investment or foreign aid at reducing income inequality; nevertheless, the degree of effectiveness varied depending on the country's level of development.

## 2.2 The Literature review connecting the variables of the study to the Latin American Countries

(UNDP, 2021) analyzed trends and changes in economic inequality in Latin America in the period from 1992 to 2018, based on harmonized micro data from over 350 national household surveys across all of the countries in the region. After a decade of some success, there are signs of slowing down in the path to reducing income inequalities and other variables. Throughout Latin America, inequality is still a significant social problem.

(Carvajal et al., 2019) examined developments in income inequality and its causes in Latin American nations in the period from 2004 to 2013. A panel regression model was applied to determine the factors that contribute to inequality. Results found that factors such as per capita GDP, per capita health spending, tax burden, poverty rate, literacy rate, and years of schooling can statistically explain inequality.

(Amarante et al, 2016) aimed to determine if changes that happened to some Latin American countries over the past decade, have improved or worsened the income inequality between individuals. The paper found that the measures of global inequality in the region dramatically decreased between 2003 and 2012, where data examined from household surveys in the Latin American nations.

(Lopez & Perry, 2008) examined recent changes in inequality in the Latin American region as well as how inequality may affect growth and production volatility. The study recommended a two-pronged approach that combines steps to increase the state's capacity to redistribute income through taxes and transfers with measures aimed at enhancing the allocation of assets mainly in education.

(De Ferranti, 2004) examined the reasons behind the region's inequality, and described how it hinders development, the paper proposed recommendations, to achieve fairness in the distribution of resources, earnings, and opportunities. In the study, data from household's surveys of 3.6 million people in 20 countries were used in this study. According to this study; inequality in Latin America and the Caribbean recognized four main pillars that governments and civil society organizations must consider to change 1) Increase the transparency of political and social institutions, and 2) Ensure that policies and institutions in the economy priorities equity as increasing the expenditure on education is one of the important policies to ensure equity. 3) Improve the poor's access to high-quality public services, particularly in the areas of

education, health, water, and electricity; 4) Restructure income transfer programs to ensure that the poorest households are reached.

Regarding the impact of Foreign Direct Investment on inequality in Latin American countries, (Te Velde, 2003) concluded that if FDI may have facilitated development, however with different benefits and drawbacks for various countries upon their varying economic and political systems. The main finding of the study is that, while foreign direct investment (FDI) may have benefited Latin America's development, more may be done to improve its impact on income distribution and inequality.

## 2. Data and Methodology:

Annual data from (١1) Latin countries covering the period from 2000 to 2019 are gathered from World Development Indicators Database (WDI) (2022). Variables used in this study represent macroeconomic variables, namely GINI index, FDI, Elderly population, Unemployment rate, EXPedu and TO.

The study starts with explanatory analysis by presenting the main descriptive statistics for each variable. Also, a correlation matrix is considered to explore the relationship between the Gini index and other independent variables in the study.

The study uses panel data , E-views Statistics Software will be used to run three models with GINI index as the dependent variable “Y” and FDI, Elderly population, Unemployment rate, EXPedu and TO
as the independent variables “X”. These three models are: random, fixed and pooled effects models. After running the models, Hausman test will be conducted to choose the best model (Sheytanova, 2015).All the variables are transformed into the log form. Table 1 summarizes the information on the variables used in this study.

Table 1: Variable definition and description

| Variable | Description | Definition |
|---|---|---|
| (GINI) | Dependent variable | Gini index measures the extent to which the distribution of income (or, in some cases, consumption expenditure) among individuals or households within an economy deviates from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual or household. The Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus, a Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality. |
| Foreign Direct Investment (FDI) | Independent variable | Foreign direct investment refers to direct investment equity flows in the reporting economy. Data are in current U.S. dollars. |
| Trade openness (TO) | Independent variable | Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product. |
| Expenditure on Education (EXPedu) | Independent variable | General government expenditure on education (current, capital, and transfers) is expressed as a percentage of GDP. It includes expenditure funded by transfers from international sources to government. General government usually refers to local, regional and central governments. |
| Elderly population | Independent variable | Population ages 65 and above as a percentage of the total population. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. |
| Unemployment rate | Independent variable | Unemployment refers to the share of the labor force that is without work but available for and seeking employment. |

Source: World Development Indicators Database (WDI)

## 3. Explanatory Analysis

In this section, the descriptive statistics and the correlation matrix for the variables under study are summarized in table 2 and table 3 respectively. Firstly, the descriptive statistics for the variables GINI, FDI, TO, Elderly population, Unemployment rate and EXPedu are presented in Table 2. The mean of GINI coefficient is 3.8 which represents the value at the center of the data where the majority of developing countries are around this value. Therefore, one can see the average values of the rest of the variables considered in the study—21.5 for FDI; 4.12 for TO; 1.92 for Elderly population; 1.78 for Unemployment rate; and 1.31 for EXPedu. It was observed that the median values were close to the mean values of the variables included in our analyses. The value of the median indicates that 50% of the data took values below the median and 50% took values above the median.

The value of the standard deviation suggests a more accurate and detailed estimate of the dispersion. Moreover, standard deviations indicate the fluctuation of the time-series. In this sense, the value of standard deviation of Gini index is equal to 0.099, which represents the average distance between the mean (3.88) and the values that are around. On the other side, FDI reflects the largest value of dispersion among all variables.

GINI and EXPedu showed a negative skewness. Whereas, GINI, TO and EXPedu were skewed to the left. On the opposite side, GCF and FDI were skewed to the right. The kurtosis value is greater than three for EXPedu, which indicates that it has leptokurtic distributions. Since the kurtosis of the GINI, TO, Unemployment rate and elderly population variables were below three, it meant that its distribution was platykurtic. The high significant values of the Jarque-Bera test indicates that our variables of interest were non-normally distributed at the 1% level.

**Table 2: Descriptive statistics**

| Indicator | GINI | FDI | EXPedu | TO | Elderly population | Unemployment rate |
|---|---|---|---|---|---|---|
| **Mean** | 3.881687 | 21.55410 | 1.306575 | 4.128175 | 1.920137 | 1.780335 |
| **Median** | 3.891818 | 21.43835 | 1.336927 | 4.126479 | 1.861830 | 1.765583 |
| **Maximum** | 4.085976 | 23.54023 | 1.958702 | 5.116185 | 2.704125 | 3.021400 |
| **Minimum** | 3.637586 | 19.81318 | 0.140570 | 3.084304 | 1.302888 | 0.826366 |
| **Std. Dev.** | 0.099011 | 0.909194 | 0.314021 | 0.433883 | 0.337736 | 0.444451 |
| **Skewness** | -0.341092 | 0.441078 | -0.208191 | 0.113233 | 0.581744 | 0.426388 |
| **Kurtosis** | 2.416479 | 2.279647 | 3.078253 | 2.549137 | 2.869797 | 2.675509 |
| **Jarque-Bera** | 7.387156 | 11.83610 | 1.645395 | 2.333503 | 12.56434 | 7.631432 |
| **Probability** | 0.024883 | 0.002690 | 0.439245 | 0.311377 | 0.001869 | 0.022022 |
| **Sum** | 853.9712 | 4720.347 | 287.4465 | 908.1984 | 422.4301 | 391.6738 |
| **Sum Sq. Dev.** | 2.146898 | 180.2063 | 21.59543 | 41.22766 | 24.98040 | 43.26046 |
| **Observations** | 220 | 219 | 220 | 220 | 220 | 220 |

Secondly, the correlation matrix among the variables under study are shown in Table 3. The study uses correlation analysis to measure the direction and the strength of the relationship between two variables. The result ranges from -1 to +1; where -1 means a perfectly negative correlation, +1 means a perfectly positive correlation and 0 means no correlation (Rencher and Schaalje, 2010). The outcomes indicate that there a negative correlation of FDI elderly population, unemployment rate and EXPedu with GINI index. On the other hand, there is a positive moderate relationship between TO and GINI index

**Table 3: Correlation matrix**

| | | GINI | FDI | Trade | Expedu | Elderly | Unemployment Rate |
|---|---|---|---|---|---|---|---|
| GINI | Pearson Correlation | 1 | | | | | |
| | Sig. (2-tailed) | | | | | | |
| | N | | | | | | |
| FDI | Pearson Correlation | -.178** | 1 | | | | |
| | Sig. (2-tailed) | .008 | | | | | |
| | N | 219 | | | | | |
| Trade | Pearson Correlation | .341** | -.485** | 1 | | | |
| | Sig. (2-tailed) | .000 | .000 | | | | |
| | N | 220 | 219 | | | | |
| Expedu | Pearson Correlation | -.233** | .304** | -.168* | 1 | | |
| | Sig. (2-tailed) | .000 | .000 | .013 | | | |
| | N | 220 | 219 | 220 | | | |
| Elderly | Pearson Correlation | -.684** | .390** | -.486** | .257** | 1 | |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | | |
| | N | 220 | 219 | 220 | 220 | | |
| Unemployment rate | Pearson Correlation | -.004 | .217** | -.565** | .222** | .422** | 1 |
| | Sig. (2-tailed) | .949 | .001 | .000 | .001 | .000 | |
| | N | 220 | 219 | 220 | 220 | 220 | |

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

## 4. Empirical Results and Discussion

### a. Model Results

To estimate the model, the study uses panel data analysis. Accordingly, the three models, fixed effect model, random effect model and pooled regression model. Panel data model approach is used because it combines time series and cross section data. Table 4 shows estimates of the pooled regression, fixed effect model, and random effect model. The model in general takes the form;

$$GINI_{it} = \beta_0 + \beta_1 FDI + \beta_2 EXPedu + \beta_3 TO + \beta_4 ElderlyPopulation + \beta_5 Unemployment\ Rate + \varepsilon_{it}$$

Table 4: Pooled regression model, fixed effect model, and random effect model

| **Pooled Regression Model** | | | | | |
|---|---|---|---|---|---|
| **Variable** | Variable Coefficient | Std. Error | t-Statistic | Prob. | Obs. |
| **C** | 3.367823*** | 0.151106 | 22.28778 | 0.0000 | 220 |
| **FDI** | 0.023951*** | 0.005449 | 4.395336 | 0.0000 | 220 |
| **EXPedu** | -0.048878*** | 0.013956 | -3.502397 | 0.0006 | 220 |
| **TO** | 0.073508*** | 0.013115 | 5.604720 | 0.0000 | 220 |
| **Elderly population** | -0.227901*** | 0.014733 | -15.46870 | 0.0000 | 220 |
| **Unemployment Rate** | 0.109963*** | 0.011571 | 9.503332 | 0.0000 | 220 |
| **Fixed Effect Model** | | | | | |
| **Variable** | Variable Coefficient | Std. Error | t-Statistic | Prob. | Obs. |
| **C** | 4.091902*** | 0.164495 | 24.87547 | 0.0000 | 220 |
| **FDI** | 0.006978 | 0.006897 | 1.011779 | 0.3128 | 220 |
| **EXPedu** | -0.079540*** | 0.011983 | -6.637645 | 0.0000 | 220 |
| **TO** | 0.033145* | 0.018828 | 1.760393 | 0.0798 | 220 |
| **Elderly population** | -0.306465*** | 0.027986 | -10.95082 | 0.0000 | 220 |
| **Unemployment Rate** | 0.109426*** | 0.012223 | 8.952266 | 0.0000 | 220 |
| **Random Effect Model** | | | | | |
| **Variable** | Variable Coefficient | Std. Error | t-Statistic | Prob. | Obs. |
| **C** | | 0.160643 | 25.19850 | 0.0000 | 220 |

| | | | | | |
|---|---|---|---|---|---|
| | 4.047972*** | | | | |
| **FDI** | 0.007140 | 0.006497 | 1.098999 | 0.2730 | 220 |
| **EXPedu** | -0.080046*** | 0.011672 | -6.857831 | 0.0000 | 220 |
| **TO** | 0.035882** | 0.017618 | 2.036682 | 0.0429 | 220 |
| **Elderly population** | -0.293570*** | 0.025209 | -11.64552 | 0.0000 | 220 |
| **Unemployment Rate** | 0.112382*** | 0.011815 | 9.511939 | 0.0000 | 220 |

Notes: ***, ** and * denote significance at 1%, 5% and 10% levels, respectively. Model 1 is a within-group fixed effect estimator (FE), Model 2 is feasible generalized least square estimator (RE) and Model 3 is ordinary least square pooled regression.

According to Table 4, the factor of elderly population has the largest impact on GINI index among other factors in the fixed and random models. In fixed and random models, it negatively influenced the dependent variable of GINI index by around 30%, while it has a negative significant impact of GINI index in the pooled regression model by around 23%.

On the other hand, FDI has no significant impact of GINI index in the fixed and random models, whereas it significantly affect on GINI index by 2.3% in the pooled regression model.

All the three models, pooled, fixed and random, indicated that there is a negative effect of Expenditure on Education (EXPedu) on GINI index. These results matches with the economic view, which is expenditure on education has negative effect on GINI index. As expenditure on education increases, the GINI index decreases, which implies that income equality increases.

On the same manner, the three models for Trade Openness (TO), it positively influenced the dependent variable of GINI index. This indicates that TO leads to increase the GINI index and hence decrease income equality. Also, Unemployment rate positively influenced the dependent variable of GINI index in the three models by around 11%.

The next step is to choose between the fixed effect model and the pooled regression model consisted of running the Redundant Fixed Effects Tests as shown in table 5. As the null hypothesis was rejected, It had been concluded that the fixed effect model was adequate in our case (Bell & Jones, 2015).

Table 5: Redundant Fixed Effects Tests

| Effects Test | Statistic | d.f. | Prob. |
|---|---|---|---|
| Cross-section F | 39.948240 | (10,203) | 0.0000 |
| Cross-section Chi-square | 238.239693 | 10 | 0.0000 |

Now, we need to choose between the fixed effect model and the random effect model by conducting the Hausman test (Sheytanova, 2015). In this case, the null hypothesis would imply that there were no significant differences between the estimates of the fixed effect model and the random effect model. If the null hypothesis was rejected, the fixed effect model should be chosen. Otherwise, the random effect model would be considered to be more adequate. Table 6 shows the output of this test.

Table 6: The Hausman test.

| Test Summary | Chi-Sq. Statistic | Chi-Sq. d.f. | | Prob. | |
|---|---|---|---|---|---|
| Cross Section Random | 7.407561 | 5 | | 0.1921 | |
| | Fixed Effect | Random Effect | Var. (Diff.) | Prob. | Obs. |
| FDI | 0.006978 | 0.007140 | 0.000005 | 0.9444 | 220 |
| EXPedu | -0.079540 | -0.080046 | 0.000007 | 0.8519 | 220 |
| TO | 0.033145 | 0.035882 | 0.000044 | 0.6804 | 220 |
| Elderly population | -0.306465 | -0.293570 | 0.000148 | 0.2887 | 220 |
| Unemployment Rate | 0.109426 | 0.112382 | 0.000010 | 0.3454 | 220 |

As one can see from Table 6, the p-value was above 0.05; Therefore, the null hypothesis was not rejected and it is concluded that the random effect model was more suitable for our study.

Accordingly, the random effect model is generally written as:

$$Y_{it} = \mu + \beta' X_{it} + \alpha_i + \varepsilon_{it}$$

Where:

$Y_{ij}$ is the dependent variable; where i is the entity and t is the time.

$\mu$ is the individual effect of the $i^{th}$ individual-specific variables that are constant over time.

$\beta$ is the vector coefficient

$X_{it}$ is the vector of independent variables.

$\alpha_i$ (i=1….n) is the unknown intercept for each entity ( n entity-specific intercepts).

$\varepsilon_i$ is the error term

i.e. the model is:

$$GINI_{ij} = \mu + \beta_1 FDI + \beta_2 EXPedu + \beta_3 TO + \beta_4 ElderlyPopulation + \beta_5 Unemployment\ Rate + \alpha_i + \varepsilon_i$$

According to the random effect model, for instance, the variable elderly population contributed annually to the decrease in the GINI index by 29.43%. In the same manner, expenditure on education contributed annually to the decrease in the GINI index by around 8%. On the opposite side, TO contributes to increase the GINI index annually by 3.5%. Moreover, unemployment rate contribute to increase GINI index by 11.2%.

### 4.2 Model Diagnostics:

To ensure that our results are reliable, it is important to check some assumptions. For instance, homoscedasticity assumption must be fulfilled, and multicollinearity and autocorrelation must be avoided (Lobaskova, 2018). Homoscedasticity describes a situation in which the error term (that is, the "noise" or random disturbance in the relationship between the independent variables and the dependent variable) (Lobaskova, 2018). Moreover, Multicollinearity is the occurrence of high correlations among two or more independent variables in the model. Multicollinearity can lead to skewed or misleading results when a researcher or an analyst attempts to determine how each independent variable can be used most effectively to predict or understand the dependent variable in a statistical model (Ragsdale, 2018). In this research, all assumptions are verified for the model.

Homoscedasticity (i.e, Constant Variance) describes a situation in which the error term is the same across all values of the independent variables. Then, the Breusch-Pagan test used to examine the heteroscedasticity, which is the violation of homoscedasticity (Breusch & Pagan, 1979). It is noted that P-value = 0.31 >0.05. Therefore, we do not reject H0 and hence The test concluded that there is constant variance in the models, confirming that Homoscedasticity is achieved (Croux, Dhaene, & Hoorelbeke, 2003).

Autocorrelation occurs when the residual errors are dependent on each other. The presence of correlation in error terms drastically reduces model's accuracy. Autocorrelation can be tested using the Breusch–Godfrey test. The Breusch–Godfrey test is a test for autocorrelation in the errors. The null hypothesis is that there is no serial correlation of any order up to p. Because the test is based on the idea of Lagrange multiplier testing, it is sometimes referred to as an LM test for serial correlation. Since P-value = 0.172 > 0.05, there is no serial correlation.

**Table 7: Homoscedasticity and autocorrelation check**

| **Homoscedasticity** | |
|---|---|
| **chi2(1)** | 0.48 |
| **Prob > chi2** | 0.29 |
| **Autocorrelation** | |
| **Breusch–Godfrey test** | 0.172 |

Furthermore, a multicollinearity test was used to inspect if there is a correlation among the independent variables to decrease the errors in the model. Based on the variance inflation factor test (VIF) results, a value lower than 5 indicates no multicollinearity. Moreover, a value more than 5 indicates there is multicollinearity between independent variables (Daoud, 2017). According to the results which are shown in Table 8; there is no multicollinearity. Thus, multicollinearity is avoided.

Table 8: Multicollinearity check

| Independent Variables | VIF |
|---|---|
| FDI | 1.474 |
| TO | 1.951 |
| Elderly Population | 1.459 |
| EXPedu | 1.157 |
| Unemployment rate | 1.593 |

## 5. Conclusion

This research was conducted with the purpose of investigating the variables impacting on GINI index, with a special focus on developing countries. The study included (11) Latin countries, with a time frame from 2000 to 2019. The paper found a significant negative impact of expenditures on education on Gini coefficient, where a positive significant impact was found between trade openness and unemployment rates on Gini coefficient, the study also found that there is no significant impact between FDI and Gini Coefficient.

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