T. R.
VAN YUZUNCU YIL UNIVERSITY
INSTITUTE OF NATURAL AND APPLIED SCIENCES
DEPARTMENT OF STATISTICS

**THE RELATIONSHIP BETWEEN ECONOMIC DEVELOPMENT AND INCOME
INEQUALITY: PANEL DATA ANALYSIS**

M.Sc. THESIS

PREPARED BY: Rebaz Abbas SULAIMAN
SUPERVISOR: Asst. Prof. Dr. Muhammed Hanifi VAN

VAN-2022

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ACCEPTANCE and APPROVAL PAGE

This thesis entitled "The Relationship Between Economic Development And Income Inequality: Panel Data Analysis" presented by Rebaz Abbas Sulaiman under the supervision of Asst. Prof. Dr. Muhammed Hanifi VAN in the department of Statistics has been accepted as an M.Sc. thesis according to Legislations of Graduate Higher Education on …..../......./2022 with unanimity/majority of votes members of the jury.

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This thesis has been approved by the committee of The Institute of Natural and Applied Science on 08 /03./2022. With decision number 2022 /14- 1

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Director of Institute

THESIS STATEMENT

All information presented in the thesis was obtained in the frame of ethical behavior and academic rules. In addition, all kinds of information that does not belong to me have been cited appropriately in the thesis prepared by the thesis writing rules.

Rebaz Abbas SULAIMAN

ABSTRACT

THE RELATIONSHIP BETWEEN ECONOMIC DEVELOPMENT AND INCOME INEQUALITY: PANEL DATA ANALYSIS

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For many years, economists and policymakers have focused their attention on the link between economic progress and income inequality, as well as the characteristics of that relationship. The main objective of this research is to analyze the role of GINI as indicated by income inequality (dependent variable), GDP per capita (income), GDP per capita squared (income2), inflation rate (inf), total investments (inv), current account balance (cab), and unemployment rate (unep) as independent variables in the relationship between economic growth and income disparity in the context of the Kuznets inverted-u hypothesis, which has been examined for 38 OECD countries. According to the Kuznets hypothesis, income disparity rises during the early stages of economic development and then decreases after a certain point. In this study, we used panel data regression. The fixed effect model (FEM), the random effect model (REM), and the pooled regression model (POLS) were the statistical models employed in the investigation. For a large sample of panel data of 38 OECD countries covering the period 1995 to 2019, we used 950 observations. We obtained panel data from the World Bank, the World Development Index (WDI), the World Income Inequality Database (WIID), and the International Monetary Fund (IMF). According to the findings of this study, GDP square, inflation rate, unemployment rate, and current account balance all have a statistically significant positive relationship impact on income inequality. GDP has a negative and statistically significant effect. Total investment has no statistically significant effect on income inequality. Also, the Kuznets inverted U-shaped hypothesis was not supported by the results.

Keywords: Economic development, Income inequality, Panel data analysis.

ÖZET

EKONOMİK GELİŞME İLE GELİR EŞİTSİZLİĞİ ARASINDAKİ İLİŞKİ: PANEL VERİ ANALİZİ

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Uzun yıllar boyunca, ekonomistler ve politika yapıcılar, dikkatlerini ekonomik ilerleme ile gelir eşitsizliği arasındaki bağlantıya ve bu ilişkinin özelliklerine odakladılar. Bu araştırmanın temel amacı, gelir eşitsizliği (bağımlı değişken), kişi başına düşen GSYİH (gelir), kişi başına düşen GSYİH karesi (gelir2), enflasyon oranı (inf), toplam yatırımlar (inv), GINI'nin rolünü analiz etmektir. 38 OECD ülkesi için incelenen Kuznets ters-u hipotezi bağlamında ekonomik büyüme ve gelir eşitsizliği arasındaki ilişkide cari işlemler dengesi (cab) ve işsizlik oranı (unep) bağımsız değişkenler olarak kullanılmıştır. Kuznets hipotezine göre, gelir eşitsizliği ekonomik gelişmenin ilk aşamalarında artar ve belirli bir noktadan sonra azalır. Bu çalışmada panel veri regresyonu kullanılmıştır. Sabit etkiler modeli (FEM), rasal etkiler modeli (REM) ve havuzlanmış regresyon modeli (POLS) araştırmada kullanılan istatistiksel modellerdir. 1995-2019 dönemini kapsayan 38 OECD ülkesinin geniş bir panel veri örneği için 950 gözlem kullanılmıştır. Dünya Bankası, Dünya Kalkınma Endeksi (WDI), Dünya Gelir Eşitsizliği Veritabanı (WIID) ve Uluslararası Para Fonu'ndan panel verileri elde edilmiştir. Bu çalışmanın bulgularına göre, GSYİH karesi, enflasyon oranı, işsizlik oranı ve cari işlemler dengesi, gelir eşitsizliği üzerinde istatistiksel olarak anlamlı bir pozitif ilişki etkisine sahiptir. GSYİH, negatif ve istatistiksel olarak anlamlı bir etkiye sahiptir. Toplam yatırımın gelir eşitsizliği üzerinde istatistiksel olarak anlamlı bir etkisi yoktur. Ayrıca, Kuznets'in ters U-şekilli hipotezi sonuçlar tarafından desteklenmemiştir.

Anahtar kelimeler: Ekonomik kalkınma, Gelir eşitsizliği, Panel veri analizi.

ACKNOWLEDGMENTS

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SYMBOLS AND ABBREVIATIONS

Some symbols and abbreviations used in this study are presented below, along with descriptions.

Symbols	Description
$\overline{y}$	Mean of variable
X_{it}	Independent variable
Y_{it}	Dependent variable
t	Time
U_{it}	error term
α	Alpha
β	Beta
v_{it}	Indicates the stochastic regression disturbance.
ρ_{ij}	i. and j. shows the instantaneous correlation between the units
$\hat{\rho}_{ij}$	The pairwise residual correlation sample estimate
H_0	null hypothesis
H_1	alternative hypothesis
μ_{it}	error term
β_1	Independent variable coefficient
E	Expectation value
σ	Standard deviation
λ	Lambda
ρ	Rho
δ	Delta
θ	Theta
μ	Mean of variables
σ^2	Variance

Abbreviations	Description
ADF	Augment Dickey Fuller
CD	Cross section dependency
DV	Dependent Variable
FEM	Fixed Effect Model
GDP	Gross Domestic Product
GLS	generalized least squares
GMM	Generalized Method of Moments
IMF	International Monetary Fund
IPS	Im, Pesaran and Shin
LLC	Levin Lin Chu
LLC	Levin, Lin and Chu
LM	Lagrangian Multiplier
LSDV	Least Square Dummy Variable
OECD	Organization for Economic Cooperation and Development
PRM	Pooled regression model
REM	Random Effect Model
WDI	World Development Index
WIID	World Income Inequality Database

1. INTRODUCTION

Inequalities in income and economic development have long been two of the most pressing concerns for economists and politicians. Inequality of income and economic progress are also critical for long-term economic viability. Recent empirical research in the field of economic growth has also attempted to explain the link between income disparity and growth. According to certain empirical research, income inequality and economic growth have a negative association. Others discovered a positive correlation between the two variables. Studies on income inequality are quite old. One of the first basic theoretical studies to evaluate the situation of income inequality belongs to Kuznets (1955). According to Kuznets, income inequality follows an inverted-U-shaped course against economic development. While economic growth and income inequality rise in the early stages of economic development, income inequality reduces with economic growth in the later stages of economic growth.

The fact that income inequality "exploded" in the 19th century, so to speak, is one of the important reasons why scientists dwell on this issue. According to separate research during the same time period, the Gini coefficient climbed by 30% and the Theil index increased by 60% between 1820 and 1992. The huge growth in inequality between countries or between various sections of the world is regarded as the primary cause of this transformation (Bourguignon and Morrisson, 1999).

Income inequality has become an inevitable phenomenon in both developed and developing countries. The improvement in the standard of living over the past decade has also witnessed a worsening of income inequality in much of the world. This means that the standard of living has improved, while income inequality still persists.

This study is divided into five parts as follows: In the first part, about introduction the link between income inequality and economic growth. The second section covered the theoretical and empirical foundations of the relationship between income inequality and economic growth, as well as the supporting variables that influence this relationship. In the third part, the determinants of economic development, determinants of income inequality,

and the measure of inequality are discussed. In the fourth part, about methodology and application, panel data analysis is explained. The data used in the study, the variables used in the application, the research method, and empirical findings are explained. Here again, based on the empirical analysis results, important inferences have been made. In the study, the relationship between economic growth and income inequality with data from 38 OECD countries between 1995 and 2019 and 950 observations is tested with the panel data method within the scope of the Kuznets hypothesis. In the last part of the study, there is a conclusion part about the findings obtained.

In this study, the dependent variable is the Gini coefficient, which measures income inequality (Gini). GDP per capita is the independent variable that reflects economic development (income2). Other control variables included in the research are GDP per capita squared (income2), inflation rate (inf), total investments (inv), and current account balance (cab).

The primary aim of this study is to look at the link between income inequality and economic development. Is there a link between income disparity and economic growth? And what is the role of the variables used in this study? Also, when economic growth rises, inequality either increases or decreases. What will happen to the increase in income inequality? Are their economies growing fast, or are their economies lows, or are their economies moderately correlated between economic development and income inequality in those countries? What is the effect of uneven income? Using panel data since the beginning of economic development, income inequality has been a hot topic of discussion. This is a very important topic in today's economy, because the gap between rich and poor seems to be getting bigger even in countries that have a lot of money.

2. LITERATURE REVIEW

Income inequality and economic development have always been two of the most important issues among economists and politicians. Also, income inequality and economic development are important for economic sustainability. Since the inequality issues have arisen at the same time as the very recent era of globalization, internationalization of trade, and the integrity of the financial markets worldwide, the role of financial growth has started to be questioned in terms of the share and distribution of wealth and income. Over the past three decades, there have been many books that focus primarily on the link between real economic growth and inequality. The relationship between economic development and inequality has been questioned by some people. Others have tried to find a link between economic development and inequality.

Theoretical literature is reviewed in the first part of this section and empirical literature is reviewed in the second part of this section.

2.1. Theoretical Background

In the 1950s and 60s, there was a widespread view that theoretically high levels of income inequality contributed to economic growth in two ways. The first is that income inequality increases growth by encouraging individuals to work and invest. In other words, when highly educated people have high productivity, differences in productivity will lead many people in society to increase their education levels. Secondly, given that high income groups have a high propensity to save and invest; income inequality will result in higher growth through investment.

Lewis (1954)'s dual economy model pioneered Kuznets (1955)'s work in explaining changes in income inequality and economic growth. Accordingly, with the transition of countries from an agricultural economy to an industrial economy, due to rising wages as a result of increased productivity, income inequality, which is low at first, increases and tends to decrease after a certain threshold value. The marginal productivity (wages) of the labor

force in rural areas is quite low. Limited incomes from low wages are also shared among rural household members. Therefore, individuals with zero marginal productivity in production also receive a share of the income, and, as a result, income inequality decreases.

Lewis (1954)'s model, income inequality is accepted as a prerequisite for growth. An unequal distribution of income leads to higher growth through higher savings. If personal savings increase with income level, the reallocation of economic resources from high-income groups to low-income groups decreases the total savings rate, which reduces capital accumulation and slows growth. It is argued that the increase in the propensity to save, which is related to the unfair distribution of income, is due to the effect of the rising profit share.

Kuznets (1955) analyzed limited data sets belonging to Germany, England, and the United States. The Kuznets hypothesis is the first systematic study of economic development literature. In the literature, there are many studies about the Kuznets hypothesis. while some studies examine the Kuznets hypothesis theoretically. One of the first basic theoretical studies to evaluate the situation of income inequality belongs to Kuznets (1955). According to Kuznets, income inequality follows an inverted-U-shaped course against economic development. Economic growth and income disparity increased in the early phases of economic development, but they reduced in the later stages of economic development.

Kuznets (1955) states that the only group that can save in the early stages of growth is the high-income group, while the lowest income part of the population does not save at all. The fact that capital is a scarce factor at this stage will cause high-income individuals to gain higher profits and become even richer due to their savings. This will automatically increase income inequality. However, the abundance of capital, which is a scarce factor in the later stages of growth, will increase the savings and income levels of those in the low-income group. Ultimately, income distribution will improve over time decreasing the share of agricultural production in an economy; the increase in the share of industry, construction and services sector is the main dynamic that leads to economic growth. The factors that increase income inequality in the early stages of growth are population growth and the relative loss of agriculture. Due to the more unequal distribution of income in other sectors

compared to agriculture, income distribution justice will deteriorate as non-agricultural sectors come to the fore in economic development during the growth process. In addition, the population of the low-income group will increase more rapidly than the high-income group, and this will cause a small amount of income to be divided among fewer people in the low-income group. In addition, industrialization that emerged as a result of growth will further increase the share of the high-income group in national income. However, as the economic growth continues, population growth and technological developments will reduce the savings income of high-income people, and the incomes from production and entrepreneurship activities will increase (Kuznets, 1955).

The claim of Lewis (1954), Kuznets (1955) and neo-liberal thought that there is a tradeoff between economic growth and income inequality has been questioned by different studies in the 1990s. Today's studies, on the other hand, mostly show that income distribution justice increases growth by reducing poverty.

Galor and Zeira (1988) developed a model explaining the theoretical relationship between income distribution and aggregate economic activity. Under this model, the economy has one good and it can be produced by either skilled labor or unskilled labor. If the capital market is imperfect, the level of skilled and unskilled labor is determined by the distribution of wealth. Individuals who acquire education in the first period of their life might be employed as skilled labor. On the other hand, individuals who can't have an education are employed as unskilled labor. The acquirements, which are the acquisition of skills, are limited for individuals because of capital market imperfections, leading to blocking for investments in human capital. The level of inheritance of wealth may differentiate the ability and income of individuals. Thus, the level of skilled and unskilled labor is limited by the distribution of wealth, determining the aggregate level of output.

Banerjee and Newman (1993) focused on the interactions between occupational choice and economic development. The level of borrowing depends on the level of wealth because the wealth is used as collateral in the presence of imperfect capital markets. The poor have to choose to work for others since they can borrow a limited amount and cannot afford to be an entrepreneur that requires a high level of investment. The only reason for borrowing is to finance investments. In this case, it requires becoming an entrepreneur or

self-employed. Thus, individuals who have lower wealth may be confined to being workers.

Aghion and Bolton (1997) constructed a model of the distribution of income and economic growth within the existence of an imperfect capital market. In theory, if capital accumulation is sufficiently high in the economy, the poor can obtain more funds to invest. However, persistent income inequalities arise because of capital market imperfections. The poor are restricted to their limited wealth and they avoid getting into investment projects. Thus, they worry that they can't protect themselves perfectly against income risk.

Barro (2000) examined the relationship between income inequality and growth and investment rates in a variety of countries. The findings suggest that inequality slows economic growth in developing countries, supporting the Kuzntz curve, which shows that inequality rises at first and then declines as a country develops.

Isagiller (2007) there are three main views that have come to the fore in this regard recently. The first view is that wealth and other income-generating assets have been unevenly distributed throughout history. Economic growth increases the level of income inequality in society by increasing the savings, investment, and thus income levels of the rich. The second view concerns the composition of the workforce and human capital. Technological innovation naturally benefits the skilled and educated workforce, raising the marginal productivity of relatively skilled labor. As a result, income gaps between skilled and unskilled labor are getting bigger. The third view is about borrowing capacity and states that only asset owners have the right to provide collateral and, thus, only these people can use investment loans.

In Hermes (2014) Microfinance programs have an important role in tackling income inequality because they provide collateral-free loans or low-cost loans. Thus, microfinance programs offer an opportunity for the poor to increase their income and provide an investment opportunity. If the poor benefit disproportionally from financial development, income inequality will be expected to reduce.

Milanovic (2016) On the other hand, further develops the Kuznets hypothesis and explains the past and present income inequality before the Industrial Revolution. The author names the changes in the direction of increase and decrease in income distribution

inequality in the last 500 years (modern historical age) as "Kuznets Cycles". In this theory, which is also called "Kuznets Waves", countries are considered in two groups: fixed-income (pre-Industrial Revolution) countries and countries where the average income is constantly increasing (modern age). Milanovic mentions two main forces that are effective in reducing income inequality, and they are "evil forces" (war, natural disasters, epidemics, etc.) and "benevolent forces" (ease of access to education, high social transfers, political participation, progressive taxation, etc.) are subject to a distinction. In the study, the role of wars due to insufficiency of total demand, the search for new economic resources to make profit and the high domestic income inequality are also mentioned. According to Milinkovic's approach, the fluctuations in wage levels and income inequality in pre-industrial society resulted from some specific issues, such as new discoveries (new trade routes between Continental America or Europe and Asia, etc.), epidemics, enemy invasions, and wars. Wars cause income inequality and, more importantly, the average income to fall. In other words, in times of war, economic growth and income inequality decrease together. In the theory of Kuznets Cycles, it is emphasized that income inequality basically fluctuated around a fixed average income level before the Industrial Revolution, and increases and decreases in income inequality are explained by changes in the population.

2.2. Empirical Background

Bussmann et al. (2002) explained the effects of foreign investment on economic development and income inequality. They analyzed data for 72 countries from 1970-1990. They use the Kuznets (1955) curve, indices of political institution character, and many characteristics of the economy and society that have been highlighted in recent studies in their tests. They used a fixed-effects model to analyze this study. Globalization has little effect on income disparity inside countries, according to this study's findings. Foreign direct investment as a percentage of GDP has nothing to do with income distribution. In both emerging and developed countries, multinational corporations have no effect on income disparity. Indicators of alternative economic openness, such as trade turnover with

GDP and the scale of free trade policies by Sachs and Warner (1995), were not associated with an increase in inequality. The economic impact of foreign investment is unaffected by the rate of income earned by the lowest 21st percent of society. As he reiterates above, if foreign investment improves the overall income of the developed nations, while it has no effect on the distribution of income, it should benefit all sections of society in such countries.

Panizza (2002) investigated income inequality and economic growth using evidence from US data. He collected data from the yearly reports Statistic of income, the goal of his research is to look at the link between income inequality and development using panel data of income distribution data from the United States from 1940 to 1980. The method of analysis utilized standard fixed effects and the GMM model. The findings of this study show that there is no a positive relationship between inequality and economic growth, but there is a negative relationship. In any case, the study shows that minor changes in the way it is used to define inequality, as well as the relationship between inequality and high growth, can make a significant difference in the predicted relationship between inequality and economic growth.

Ortega-Daz (2006) studied and analyzed the examination of the relationship between income inequality and economic growth by using panel data analysis of Mexico's 32 federal entities from 1960 to 2002. The objective of his study is to see what will be seen. Income inequality in Mexico's 32 states impacts economic growth. He used variables such as household income, education, and per capita Gross State Product (GSP).Two types of data were used, one of which was used from 1960 to 2000 on a decade-long basis. To calculate inequality, personal income is collected and collected from the data. The data was collected between 1984 and 2002. The dynamic panel data analysis was utilized to analyze the panel data and the GMM estimation model, for aggregated data, both urban personal income and household income from national surveys were used. Inequality and progress are positively associated, according to the findings of this study. This link is consistent across variable definitions and data sets, but it varies with region and trade period.

Majeed (2010) Using a panel data set for 18 Asian countries from 1970 to 2008, this study investigates the relationship between economic development and income inequality,

with a special focus on the impact of credit market flaws on determining the linkage. Credit market flaws in emerging nations are identified as the most likely cause of the positive link between income inequality and economic growth, according to the study. Countries in the region with a high level of financial intermediation grow faster than those with a low level of financial intermediation. Furthermore, increased physical and human capital investment has a statistically significant and favorable impact on economic growth, according to this article. Finally, trade openness has been proven as favorable and significant in this region, meaning that outward-looking economies are growing faster.

Jauch and Watzka (2012) investigated financial development and income inequality by using a panel data set. The goal of their study is to look at the link between financial growth and income inequality in 138 developed and developing countries between 1960 and 2008. As a metric of financial development, researchers employed credit-to-GDP ratios. To evaluate the panel data set, they employed fixed effect estimates. The findings refute theoretical models that suggest that financial development has a negative influence on income inequality as assessed by the Gini coefficient. After adjusting for the nation's fixed factors and GDP per capita, they show that financial growth has a favorable impact on income disparity. The results are unaffected by other measurements of financial development, econometric parameters, or control variables.

Khattak et al. (2014) explained to determine the links among economic growth, income distribution and inflation, to investigate the existence of the Kuznets Hypothesis in Pakistan. From 1980 to 2002, researchers collected data on economic growth (GDP), income distribution (GINI), and inflation from the WDI for 22 years, the data was analyzed using Johnson's Cointegration model. The outcome of their study is that inflation and income distribution have a long-term link. Another finding is that, despite the fact that inflation has a beneficial effect on inequality, the Kuznets hypothesis exists in Pakistan. To reduce income disparity, the government should keep inflation under control. Because indirect taxes result in an unequal allocation of revenue, the government must alter its tax policies. Those with higher incomes should be subjected to direct taxation.

Bakkeli (2016) examines the relationship between economic inequality and health in China using panel data. The purpose of this study was to avoid confusing the link

between income disparity and health with other time-constant county-city variables, as well as secular trends in health outcomes. The data for this study came from the Chinese Health and Nutrition Survey, a panel data collection spanning 1989 to 2011. Data from 9 provinces (72 counties/cities) in China's eastern, middle, northeastern, and western regions are included in the Chinese Health and Nutrition Survey. This study used data from 1991, 1992, 1997, 2000, 2004, 2006, 2009, and 2011.Observations are limited to those who have a job and are between the ages of 16 and 69. He utilized a fixed effects model for his study. The outcome of the study is that income disparity has no significant effect on people's chances of developing health problems. When comparing multiple income inequality indicators, this effect remains consistent.

Niyimbanira (2017) investigated the Impact of Economic Growth on Income Inequality and Poverty in South Africa, The Case of Mpmalanga Province. The goal of this research is to see if there is any empirical evidence for such relationships. The study also looks into the limit to which similar nexuses occur in South Africa, with an emphasis on the Mpumalanga province. From 1996 to 2014, the author used data from 18 local municipalities in Mpumalanga province. He utilized the fixed effect model and random effect model to analyze variables. The findings of his article clearly show that future research on income inequality and its impact on economic growth should remain a focus for scholars and researchers, particularly in politics and development economics. The Gini coefficient was employed as a proxy for income disparity by the author. The fixed effect model and pool regression models were used in the analysis. The results indicate a negative link between economic growth and poverty on the one hand, and a positive relationship between growth and income disparity on the other. Furthermore, the findings show that economic growth in Mpumalanga Province is responsible for around 64% of the changes in income disparity and 63 percent of the changes in poverty. The findings show that while economic expansion decreases poverty, it does not diminish income inequality. The outcome of this study has implications for policymakers in South Africa as they develop methods to reduce economic disparity.

Bouincha and Karim (2018) evaluated Income Inequality and Economic Growth. They analysis Panel Data in Morocco. Kuznets' revolutionary hypothesis is used to explain

income disparity. The goal of their research is to rule out a causal link between growth and inequality. In their study, they used the following variables: Gini coefficient, GDP per capita, HDI, unemployment, inflation, health expenditure, and unemployment. They gathered information from the World Bank's database (WDI). The data was used in 189 countries for the period between 1990 and 2015. Additionally, they used the Kuznets curve and panel data model to analyze the data. even if its sign is positive. The result is the same in both the developing and moderately developed country models. Economic growth, on the other hand, is statistically and negatively associated with inequality in the developed countries' model. Economic growth is statistically and negatively connected with income inequality in the developed-country model. Only when human development indicators are used instead of growth is the Kuznets curve approved in their study. In their study, growth only explains inequality movement within the model of developed nations, and its component is negative.

Thornton and Tommaso (2019) explained the long-run relationship between financial and income inequality. The goal of this research is to assess the long-run impact of financial development on income inequality utilizing heterogeneity panel cointegration methods. They gathered panel data from the Standardized World Income Inequality Database (SWIID). The panel data was obtained from 119 countries in the 1980 to 2015 period. They deal with cross-sectional data dependency that arises as a result of unobserved shared factors, and they include real GDP per capita only in cointegration relationships. The findings of their analysis show that in panels of 119 industrialized and emerging economies, financial growth reduces income inequality over time. This result is consistent across all income classifications in the country and is a strong nuke for many indicators of financial progress. It is based on the idea that as countries become richer, financial development works as a buffer against widening economic disparities.

Bittencourt et al. (2019) looked at how financial development in the United States influences income inequality. The goal of this study is to look at the influence of financial development on income disparity in 50 states from 1976 to 2011. the study's data, which included the stock market wealth of the United States, human capital indicators, the unemployment rate, and three measures of income inequality and the Gini coefficient, The

income inequality and human capital data set was sourced from Professor Mark W. Frank's website. Also the unemployment rate data is based on data from the Federal Reserve .They used fixed-effect panel regression estimation for analysis data. The findings of this study show that financial development raises income disparity in all fifty states in a linear fashion. When 50 states are divided into two groups of states with inequality above and below the level of inequality, instead of the difference in the average state, the effect of financial growth on income inequality is evidently non-linear. For states with above-average income inequality, the effect grows at a faster pace as financial development improves, whereas states with below-average income inequality have an inverted U-shaped connection.

Ozdemir (2019) Investigated Rethinking the financial Kuznets curve in the framework of income inequality. The goal of this study is to evaluate the determinant connection between financial sector development and income inequality in the within-country sample using panel data from 1993 to 2013. He utilized those variables, which include the Gini Coefficient, the Financial Development Index, the Human Capital Index, and GDP per capita. The data was gathered from the standardized world income inequality Database, panel fixed-effects models and also (GMM) have been used for a large sample of countries covering the period 1993 to 2013. In the early stages of financial and economic development, he has introduced a new consequence. The degree of income disparity fell, but as a result of the continued evolutionary process, the latter phases of the financial Kuznets curve demonstrate that the above-mentioned link between finance and inequality has turned positive. In the case of the financial inequality nexus, he discovered that neither markets nor institutions have a significant impact on reducing income disparity. When the outcomes are measured in this setting, the study finds that the U-shaped financial Kuznets curve theory holds true in the sample countries.

Hult (2019) investigated Income inequality and economic growth of the OECD countries. The major goal of this study was to look at the link between income inequality and economic growth, as well as the influence of other factors like human capital and investment. Education level data was collected from the Barro-Lee Dataset, while those from the rest of the World Bank were collected. The panel data set of 34 OECD countries

was utilized for the time period from 1990 to 2010. The author used the Fixed effect regression model and White's robust standard error regression to analyze panel data. The findings show that overall inequality is strongly and favorably associated with growth, but inequality at the bottom and top ends is significantly and negatively related to growth. Economic growth is thought to be influenced by GDP per capita, education, and population increase.

Sayed and Peng (2020) Analyzed to determine the income inequality curve during the last 100 years. The purpose of this research is to explore the link between economic growth and income disparity during the previous 100 years using panel data, this research looks at the shape of the curve that shows the long-term link between income inequality and economic growth. The panel data was collected in the World Inequality Database (WID) included the statistics for the entire period (1915–2014). For the years 1915 to 2014, the authors used annual data from 4 developed countries: the U.k., French, the U.s., and Germany. The researchers used two variables in this paper: the income share (INQ) and the real GDP per capita. The researchers utilized panel data with a random effects model (RE) and a panel with an interactive fixed effects model (IFE). They found that this curve has the shape of an N-shape in the long run, and that the Kuznets curve doesn't really explaining this way. Researchers also provide a number of elements that could influence whether inequality rises or falls. Political, economic, and demographic factors are the most essential. Technological advancements, globalization, social transfers, economic policies, trade unions, taxation, education, conflict, and illnesses are some of the issues that have been discussed and are all examples of this. Their findings suggest that there is no inescapable link or causal relationship among equality and a country's economic progress. As a result, Kuznets' causal relationship cannot account for the evolution of inequality.

Law et al. (2020) Explained is it possible to reduce income inequality through innovation. They used panel data; the goal of this research is to find out how innovation has affected income inequality in 23 industrialized nations from 1990 to 2015. They collected panel data from the University of North Texas Inequality Project, the Standardized World Income Inequality Dataset, and the Estimated Household Income Inequality Database to compile their findings. The variables that were used in this study are human capital,

globalization, real GDP per capita, and inflation; they utilized the common correlated effects (CCE) estimator to estimate the parameters. The results indicate that income inequality is reduced by the interaction factors between innovation and these two variables, but innovation does not reduce income inequality. Income disparity is observed to be driven by globalization and financial development. Different income inequality and innovation measures, as well as different estimate approaches, had no effect on the empirical results.

Kavya and Shijin (2020) examined the economic development, income inequality and financial development nexus. The purpose of this study is to use an unbalanced dynamic panel to investigate the impact of economic and financial development on income inequality, taking into account Kuznets' hypothesis. Data that was gathered the analysis comprises an unbalanced panel of 85 nations over the years from 1984 to 2014. It is based on the classification of the new countries provided by the International Monetary Fund in 2016, It consists of twenty-eight high-income countries, forty-one middle-income countries, and sixteen low-income countries. They used unbalanced dynamic panel GMM estimation models. The study's findings show that there is no conclusive evidence to support the idea that combining economic and financial growth can help to alleviate income disparity. Furthermore, the majority of advanced or highly developed high-income countries do not profit from financial development.

Brida et al. (2020) studied clustering and regime dynamics for economic growth and income inequality. The goal of this study is to use a non-parametric method and numerical taxonomy as a research tool based on data symbolization and clustering approaches to investigate the dynamic relationship between income disparity and economic development. The authors utilized data from two databases: the standard worldwide income inequality database and the estimated household income inequality dataset, as well as the starting GDP growth rate (economic development variable).The data set for this study was taken from 38 countries, for the time period 1980 to 2015, and other samples contained 23 countries during the period 1980 to 2010. The information was gathered using the (SWII) database, the estimated household income disparity data set, and the economic growth variable, Per Capita GDP Growth Also Granger causality and dynamic panel data were used for this study. The results of this study show that in the developed economy there is a

policy of economic growth that supports the distribution of income, while in the poor or developed economy the growth of the economy in terms of income increases.

Chatland (2020) investigated the impact of income inequality on life expectancy across Europe. The purpose of this study is to use Panel Data Analysis to evaluate the association between income inequality as assessed by the Gini Coefficient and life expectancy across European countries. The data was used for the European Union member states for a period between 2003 and 2017, the variables that were used in this study are Life Expectancy at Birth (LE), Gini Coefficient (GINI), Healthcare Expenditure Per Capita (HEPC) and Education Attainment. He used the Fixed Effects method and a random effects model to analyze panel data. According to the results of this Panel Data research, both healthcare spending per capita and educational attainment play important roles in predicting life expectancy in Europe. For Belgium, Estonia, Latvia, Portugal, the Netherlands, and the United Kingdom, the results of the second line of inquiry strongly imply the existence of such a negative link between income disparity and life expectancy.

Karacan et al. (2021) explained the impact of the regime on economic growth and income inequality. The purpose of this study is looked at the link between economic development and inequality in terms of management styles. The authors collected the data for this study from the International Monetary Fund (2021), the United Nations Development Program (2020), the World Bank 2021, and the United Nations Development Program (2020). The variables that were used in this study are GDP, GINI and RE. Their model involves North America and Sub-Saharan Africa, The Panel data model used in this study covers the period from 2006 to 2020. They used the fixed-effect model and random effects models in this study. The Eviews-11 Program was used to analyze panel data. According to the findings of this study, there is a positive relationship between economic growth and income disparity in North American countries. This link was shown to be very weak in Sub-Saharan African countries ruled by authoritarian regimes.

3. ECONOMIC DEVELOPMENT AND INCOME INEQUALITY

For many years, economists and policymakers have focused their attention on the link between economic progress and income equality, as well as the characteristics of this relationship. Income inequality is not only an economic but also a socio-economic issue that is intimately linked to the country's social peace and wellbeing. As a result, establishing fairness in income distribution is a necessity for guaranteeing peace and order in society and becoming a highly developed society in all aspects. In this part, economic development, determinants of development, and inequality, and how to measure inequality, are explained.

3.1. Definition of Economic Development

Economic development, in general, covers a broad variety of economic, social, political, and institutional processes aimed at raising people's living standards and allocating low-income people's resources for sustainable economic growth. In other words, economic growth implies both the change and regeneration of social and cultural institutions, as well as long-term economic prosperity (Todaro and Smith, 2012).

Economic development is a notion that has this ability and has implications that go beyond numerical growth. To put it another way, economic growth is a necessary but insufficient notion for progress. When it comes to a child's development, growth refers to the rise in the child's height and weight, whereas development refers to the development of the child's abilities, such as physical coordination and learning skills. In this context, economic development can be defined as an increase in the living standards of individual people in the lowest income group, the compensation of a decrease in the share of the agricultural sector with an increase in the service and industry sectors, as well as the development of new skills and structural change in an economy, in addition to numerical growth (Nafzinger, 2012).

3.2. Determinants of Economic Development

Economic Growth's Primary Sources It's hard to define clear lines between the causes of economic growth, which are influenced by a variety of factors such as political, social, and cultural influences. Each country's growth rate is different. The economic structures of the nations must be taken into account when assessing the sources of growth that explain this disparity. For many periods, economists have identified factors that are predictors of growth. Economic development variables are crucial in establishing what types of actions should be done or which policies should be followed to assure growth, which is one of society's most desirable aims. Although it is discussed, there are basically many a factor with which consensus is reached. These will be explained in this section.

3.2.1. Inflation

Inflation is defined as a continual rise in the general level of prices in its broadest sense. Inflation, which is one of the most significant elements determining income distribution in an economic framework, is a complex and difficult problem to solve. Inflation has a usually negative impact on income distribution. While an increase in the inflation rate has a structure that exacerbates economic inequality, a fall in the inflation rate has no direct beneficial impact on income distribution. High-income groups, on the other hand, are less affected by inflation since they have more opportunities. Individuals on fixed incomes and those classed as low-income tend to be the most vulnerable to inflation since they have fewer resources (Akça and Ela, 2013).

3.2.2. Capital

Capital is another factor that contributes to economic progress. The term "capital" can be applied in both wide and restricted senses. Capital is a term used in economics to describe finished products that are used to make other things. Physical capital refers to things like machines, buildings, tools, and equipment. It is financial capital in the case of

money. Human capital is a term used to describe people. Capital refers to any assets that boost productivity, such as machinery, tools, and buildings, and are directly employed in the creation of products and services, in a restricted sense. The term "capital" refers to "human-made means of production" in a broad sense. The "means of production created by man" described here include physical capital, social fixed capital, and human capital, which is divided into three categories (Dwivedi, 2010).

3.2.2.1. Human capital

Human capital is an important component in achieving economic development. Many studies see human capital, which is one of the causes of economic growth, as a direct investment in education, with the problem of health being addressed as well. Individuals' capital is critical to their long-term success. Health and education, on the other hand, have a beneficial association. Health and education are the two most significant aspects of human capital from an economic standpoint. Nobel Laureates Theodore Shultz and Gary Becker have also claimed that these characteristics are the foundation of an individual's economic productivity, such as the household's economic wellbeing. Poverty reduction, economic growth, and long-term economic development are all influenced by population health (Grossman, 1972).

3.2.2.1.1. Education

One of the most important elements of human capital is education. Education has long been considered as the most essential component of social and human development, particularly since the United Nations was established. As a result, in the years following World War II, governments prioritized education, and educational systems developed rapidly. Adult skills, according to several economic models, are the most important component of schooling for economic development. However, international comparisons are hampered by the lack of a dataset that explicitly assesses adult abilities. As a result, in the literature, several representative factors are employed instead of adult abilities (Green

and Green, 2007). The literacy rate is one of these factors. Because there aren't many people with low literacy rates, which is one of the most common characteristics of industrialized nations. In terms of geography, the literacy rate in impoverished nations is biased towards rural areas and against women in terms of gender. Other variables that are used to represent the degree of education include the proportion of education spending in the national product, the number of pupils per teacher, and the schooling rate (Green and Green, 2007).

3.2.2.1.2. Health

Health is the other component of human capital, which is one of the most important inputs in economic development. Because abilities for social, economic, and political growth are developed It all comes down to having healthy consumers and producers. It promotes individual and family health, economic security for the future, and personal growth, as well as laying the groundwork for productivity, school learning ability, and intellectual, physical, and emotional development. To put it another way, there is a significant link between a healthy society and economic progress. Simultaneously, research shows that economic development boosts life expectancy and wellbeing while lowering child mortality and birth rates. As a result, increased work productivity leads to a better health structure. The fact that there is a causal link between economic development and health, whether from economic development to health or from health to economic development, is undeniable (Smith, 1999; Preston, 1975).

3.2.2.2. Per capita (GDP)

The most significant indication of economic development, whether in a developing or developed country, is the GDP per capita number. GDP is inextricably linked to social indices and is therefore a required seed for change. However, this is insufficient evidence of economic progress. This is due to the fact that economic growth is a multifaceted notion,

and the beginning of GDP only reflects one aspect of economic development (Hicks and Streeten, 1979).

3.2.3. Technological change and innovation

The most important factor in the fast rise in living standards has been technological advancement. Changes in the manufacturing process or the availability of new goods and services are referred to as technological change. Information technology has witnessed some of the most significant advancements in the contemporary era. Economists have long debated how to stimulate technological advancement because of its relevance to increasing living standards. As a result, it's become clear that technological development isn't only a matter of discovering better goods and processes. Instead, promoting the entrepreneurial spirit is necessary for quick invention (Samuelson and Nordhaus, 2005). A component such as technology is also required for economic growth, in addition to increasing the number and quality of resources in the economy, which will enhance their efficiency. In international commercial rivalry, technological development gives numerous benefits to nations where new ideas, new equipment, or new production organizations may enhance growth. Countries that can generate new technology or swiftly absorb technologies produced elsewhere (as most emerging countries choose to do) may have quicker economic growth than others (Perkins et al., 2013).

3.2.4. Population and workforce growth

The population growth rate has both good and negative consequences on a country's economy, according to economic research. While some studies discover a link between population increase and economic growth, others suggest that such a link will not exist in the future. However, according to current growth theory, there is a negative link between production and population growth rate, and whereas impoverished nations are said to have significant population growth, industrialized countries' population growth rate is considered to be near to zero. The population growth rate, national income growth rate, and quality of

living are all connected because per capita income is a stronger predictor of economic progress than national income. As a result, the relationship between the rate of population growth and the rate of growth in national income is crucial. Aside from that, the population's composition, i.e., whether it is young or old, is also important. The elderly have a low rate of employment, savings, and economic growth; on the other hand, the younger population has a higher rate of employment and savings (Feldstein, 2006).

Population growth and the resulting rise in the workforce have long been seen to be beneficial to economic growth. A larger workforce implies more productive employees, and the fact that the productive working class makes up such a significant percentage of the population boosts the potential size of domestic markets. However, it is unclear whether emerging nations' labor surpluses and quickly rising labor supply have a good or detrimental effect on economic development. The direction of this effect changes depending on the country's economic system's ability to absorb the rise in the number of employees and put them to productive use (Todaro and Smith, 2012).

3.2.5. Low savings and investments

Capital accumulation is one of the most significant markers of economic development. The most essential source of both revenue and increased productive capacity is capital accumulation. The element that hinders the rise in the quantity of capital in an underdeveloped country with a low national income and a fast growing population is the increase in the amount of consumption. Because in a culture where the per capita income is low, a large percentage of the income is spent and just a small portion is preserved. Typically, less than 15% of a developing country's net national product is invested. In industrialized countries, on the other hand, this percentage exceeds 15%. This explains why progress is impossible and third-world countries are falling further behind. The average growth rate of GDP per capita was determined to be 1.8 percent in a study of 112 nations done between 1960 and 2000, while the ratio of investments to GDP was assessed to be 16 percent. However, the same rates remained at 0.6 percent and 10% for 38 Sub-Saharan African nations, respectively, while an average growth rate of 4.9 percent was followed by

a 25% investment rate for 9 East Asian countries. Economic development and investment have a definite beneficial link, according to observations (Barro and Martin, 2004).

3.3. Income Inequality

In economics, the discussion on income inequality is extremely important, partially because inequality has a large impact on people's lives, but also because inequality has an impact on society, the current economy, and policy development. Also from an economic standpoint, inequality is a tough term to describe, and it is clear that this word is applied to a wide range of social and economic issues that can occur in every sector of life. The word inequality comes from the word equality, which means that two or more things are not equal in the most basic sense. However, whereas equality may be described simply as having the same numerical size and magnitude, inequality's definition and measurement cannot be as straightforward until it is limited to a specific region.

Income inequalities are a collection of economic problems that include diminishing savings and investment possibilities for a significant portion of society, slowed capital accumulation, reduced capital and worker margins of return, and lower income levels as market failures increase. Income inequality, on the other hand, is one of the most significant indicators of whether an economy's growth is development or prosperity. Only by preventing income monopolization can economic expansion help to alleviate poverty. Income equality is a component of development in this perspective (Seers, 1969).

3.3.1. Definition of income

The most basic and basic concept in economics is income. Despite its apparent simplicity, when used as a measure of living standards, it needs a specific definition. Income refers to the money that comes in in its broadest meaning. As a result, it may be used to express a wide range of meanings in a number of contexts. In economics, personal income is defined as the amount of money that a person may spend on consumption without influencing the value of his or her assets over time (Simons, 1938).

Economists frequently assume that economic growth, such as shifting from agriculture to industry and services and adopting new technology, initially benefits just a tiny fraction of the population. The benefits of economic growth become more evenly distributed as new manufacturing methods become more prevalent, and higher per capita GDP tends to reduce inequality (Barro, 2008).

3.3.2. Determinants of income inequality

Understanding the sources and determinants of income inequality is critical for interpreting the positive or negative effects on the economy. In this section, the main factors affecting inequality will be briefly mentioned. Income inequality is determined by many factors, such as trade liberalization, financial liberalization, technological change, and employment policies. Furthermore, several new factors determining income inequality have emerged, including economic growth, education, health expenditure, unemployment, and wealth inequality (Cornia and Court, 2001).

3.3.2.1. Financial liberalization

Today, it is widely acknowledged that the financial sector has an impact on many economies, whether directly or indirectly. although it is unclear how financial liberalization impacts income inequality on a theoretical level, Arestis and Caner (2004) point to three primary routes. The first is that, according to the McKinnon and Shaw (1973) theory, financial liberalization influences inequality through economic development. Second, income inequality is influenced by changes in macroeconomic volatility and sensitivity brought on by financial crises following financial deregulation. Finally, financial liberalization, credit availability, and the financial system all have a significant influence on income inequality (Arestis and Caner, 2004).

Income inequality is influenced by financial changes. Along with financial liberalization and financial instability in the majority of developing nations, most results suggest that financial liberalization has increased income inequality more than other

measures such as trade and labor market liberalization and privatization. Borrowers, including government entities, as well as lenders and renters, gain from the increase in the real interest rate. Interest on public loans is quickly rising; in many middle-income nations, a significant portion of the government budget must be devoted to interest payments rather than social spending. It is important for economies to determine to what extent they should implement financial liberalization policies. It is important to prevent inequality. As a result, it's clear that the financial system's deregulation is having a detrimental impact on income inequality in a variety of ways (Cornia and Court, 2001).

3.3.2.2. Trade liberalization

Trade liberalization is another factor that affects income inequalities. The economic theory deriving from the Stolper-Samuelson theorem explains the fundamental link between income inequality and trade liberalization. In developing nations where low-skilled labor is plentiful, a two-country tariff is imposed. Increased international commerce can result in higher wages for low-skilled employees and lower wages for high-skilled people, due to the discount rate. A country's availability of low-skilled workers increases once barriers on imports are cut. Wages of low-skilled employees and the price of intensive items (exportable) are increasing. The (importable) cost of highly skilled labor-intensive items is dropping, as are the wages of scarce, highly trained employees. Increased trade openness creates increased inequality in developed economies, because highly skilled workers are generally plentiful (Jaumotte et al. 2013). Also, Barro (2000) found that trade openness leads to higher income inequality.

3.3.2.3. Technological change

Technology change is another factor in determining income inequality, Technological change, by increasing the relative productivity of skilled labor, causes it to be more popular than unskilled labor. The skill premium may increase and, concurrently, cause an increase in income inequality. According to Goldin and Katz (2009), fast growth

in information technology and broad use of technology in the workplace shifted in the 1980s and 1990s, after a relatively steady lengthy period of technical progress. The increase in the demand for skilled labor has led to an increase in wage inequality, leaving behind the development of education in developed and developing countries.

3.3.2.4. Employment policies

The issue of employment, which is expressed under the title of unemployment, is one of the foremost issues of the economy. With the capitalist system, as economies industrialized, the financial sector increased its influence and the population became more urban, employment began to be all or nothing. In today's conditions, new types of employment are added every day. Prior to this situation, the concept of employment was generally associated with regular jobs, but today it is part-time jobs, working from home. Employment policies have been an important factor in the emergence of inequality. Employment policies developed following the Washington Consensus's structural adjustment measures have worsened income inequality in all nations where they have been implemented (Cornia, 2004).

3.3.2.5. Economic growth

How economic growth affects income inequality may be explained in a variety of ways. If people have to rely on the credit market to fund their human and physical capital investments, the link between growth and inequality is likely to be negative. The major reason behind this is because poor people lack assets that may be used as security for lending. In his cross-sectional data analysis, Kuznets discovered an inverted-U-shaped connection between the two variables. That is, whereas extremely low and extremely high GDP per capita are linked with low income disparity, income inequality at the medium income level is extremely high. This connection depicts how income inequality will vary over time as the economy develops. Inequality should rise in the early phases of economic growth and decline afterwards, according to this theory (Philippe et al. 1998). Also, income

inequality leads to political and economic instability that reduces investments (Alesina and Perotti 1993).

3.3.2.6. Education

One of the reasons leading to income inequality is seen as education. Because the education that individual receive in accordance with their opportunities has a significant impact on the professions and hours that they will work in the future. This issue, which can be considered as a human capital investment, forms the basis of income differences and inequality among individuals. By reducing inequalities in qualifications and earnings, education can contribute to a rise in the degree of income inequality. Education allows for increased worker productivity and wealth. Lewis (1970) demonstrated that as the economy expands and educational possibilities extend to a larger proportion of the population, skilled labor will rise in the long term, resulting in lower skilled labor wages. Wage disparities between skilled and unskilled workers will narrow, and income inequality will increase (Lewis, 1970).

3.3.2.7. Health expenditures

The state of being healthy is one of the most fundamental factors affecting the economic growth and development of society. Good human capital or progress in human capital will support economic growth and increase income inequality. Ehrlich (2000) and Ehrlich and Becker (1972) developed a theoretical framework for optimum insurance and self-protection analysis that takes health into account as a kind of human capital. The presence of insurance (or insurance completely financed by public funds) increases the likelihood that greater healthcare equipment (reduced moral risk) will increase demand for life insurance, decreasing life expectancy inequalities (Ehrlich and Becker, 1972).

3.3.2.8. Unemployment

Unemployment is one of the main causes of determinant income inequality. The labor market plays an important role in restoring distribution efficiency and dynamic efficiency, as well as improving earnings equality and social justice among labor force participants (Cornia and Court, 2001). Therefore, increased employment opportunities will help to distribute income more evenly by reducing wage inequalities. Martinez et al (2001) concluded that unemployment has only a limited effect on income inequality (Martinez et al. 2001).

3.3.2.9. Wealth inequality

Due to the extremely unequal distribution of land and land and dubious privatization practices in transition countries, wealth inequality, which is high in developing countries, has tended to grow even more. Davies (2008) claimed that the Gini index of individual wealth distribution ranged between 55 and 80. This is higher or much higher than in the primary market income distribution for all countries (Davies 2008).

3.4. Income Inequality Measures

Economists have developed many different measurement methods to measure income inequality. Although the Lorenz curve and Gini coefficient are the most well-known and widely used, there are other methods for measuring income inequality, including the Kuznets curve, Decile ratios, Atkinson index, and Theil index are explained in this section:

3.4.1. Gini coefficient

One of the most common methods of measuring income inequality is GINI. Many summary statistics have been proposed that contain the information given by the Lorenz

curve and convert it into a number. One of them, the Gini coefficient, is directly related to the Lorenz curve. By dividing the whole region under the line of perfect equality by the area between the Lorenz curve and the line of perfect equality, the Gini coefficient is computed. The Gini concentration ratio, sometimes known as the Gini coefficient, was developed in 1912 by an Italian statistician. A full equality line of 45 in Figure 3.1 indicates that every household has the same income. the Gini coefficient ranges from 0 (perfect equality) to 1 (perfect inequality) (the extreme, where all income is owned by a single household) (Todaro and Smith (2012).
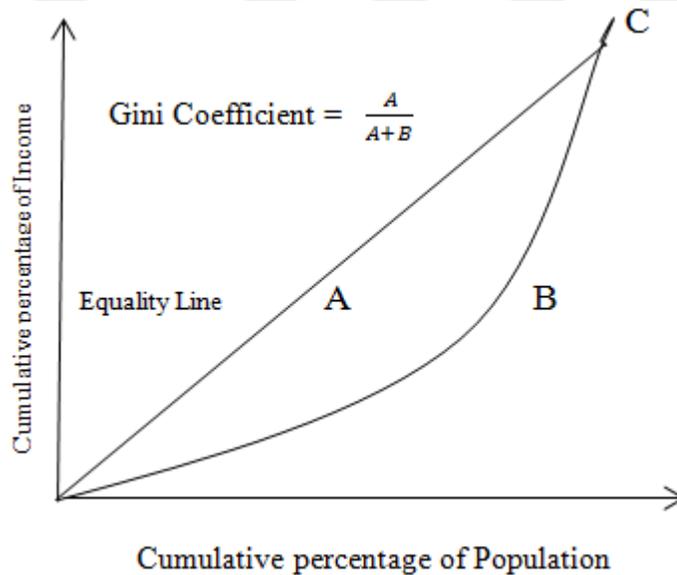
Figure 3.1. Gini Coefficient (Todaro and Smith, 2012).

In other words, when the Gini coefficient approaches zero, income disparity reduces, resulting in a more equal society. The closer to 1, the greater the income inequality. 0 and 1 ratios appear as a statistically impossible situation compared to all other inequality measurement methods, the Gini coefficient is the most frequently used; the most important reason for this is that it meets most, if not all, of the criteria for inequality measurement methods. The Gini coefficient is an inequality measure (Todaro and Smith, 2012).

3.4.2. Lorenz curve

In 1905, the Lorenz curve was introduced as a powerful method for describing income inequality. The Lorenz curve is a graphical depiction of the cumulative distribution of income that is not a statistic in and of itself. This curve depicts families' cumulative proportion of income at a specific moment in time, based on regular income statistics; this curve forms the basis of the Gini coefficient (Bourguignon and Atkinson, 2015). The Lorenz curve depicts the numerical relationship between the percentage of income holders and the income-to-national-income ratio for a particular year. (Todaro and Smith, 2012).

In figure 3.2 the number of earners is shown in cumulative percentages rather than exact on the horizontal axis, and is ranked from 0 to 100, from lowest to highest. For example, the poorest 20% of the population is represented at point 20, 60% of the population is represented at point 60, and 100% of the population is represented at the end of the axis. The curve depicts the percentage of total income earned by whatever percentage of people with cumulative income (Perkins, et al. 2013; Todaro and Smith, 2012). The proportion of total income obtained by each percentage of the population is shown on the vertical axis. The proportion of income earned at each point on the 45-degree line is exactly equal to the percentage of income earners; in other words, the midpoint on the line represents 50% of the income distributed to 50% of the population. It is specified at the three-quarter point of the line that 75% of the revenue will be given to 75% of the people (Todaro and Smith, 2012).
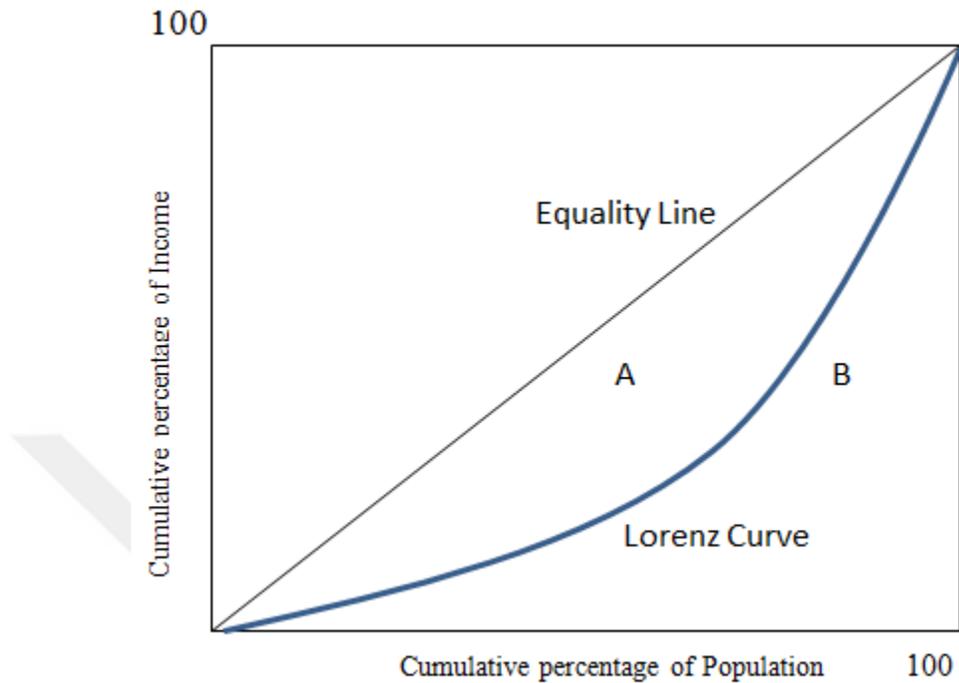
Figure 3.2. Lorenz curve (Perkins et al., 2013).

The Lorenz curve intersects both the bottom left and upper left corners (0 percent of income earners receive 0 percent of income) and the top right corner's 45-degree line (100 percent of income earners receive 100 percent of income). The Lorenz curve would lie along a 45-degree line if everyone had the same income, and this line would signify absolute equality. The greater the degree of disparity depicted, the farther the Lorenz curve moves away from the 45-degree line, in other words, the larger the area A (perfect equality line). The Lorenz curve's congruence with the bottom horizontal and right vertical axes depicts the most severe case of perfect inequality (that is, when one individual receives all of the national income and the other receives nothing). Because no nation has complete equality or perfect disparity in income distribution, the Lorenz curves for various countries will all lie to the right of the 45-degree line. The higher the degree of inequality, the closer the Lorenz curve will be to the horizontal axis. When comparing Lorenz curves, it is possible for different Lorenz curves to intersect for the same country in different periods or for different countries (Todaro and Smith, 2012; Perkins et al., 2013).

3.4.3. Kuznets curve

Another measure of inequality called the Kuznets ratio after Simon Kuznets won the Nobel Prize is expressed as the ratio of the share of the upper 20% of income to the share of the lower 40% of income. According to Kuznets (1955), income inequality rises in the early stages of economic growth, reaches a peak, and then reduces in the later stages. This relationship has shown in figure 3.3 (Todaro and Smith, 2012).
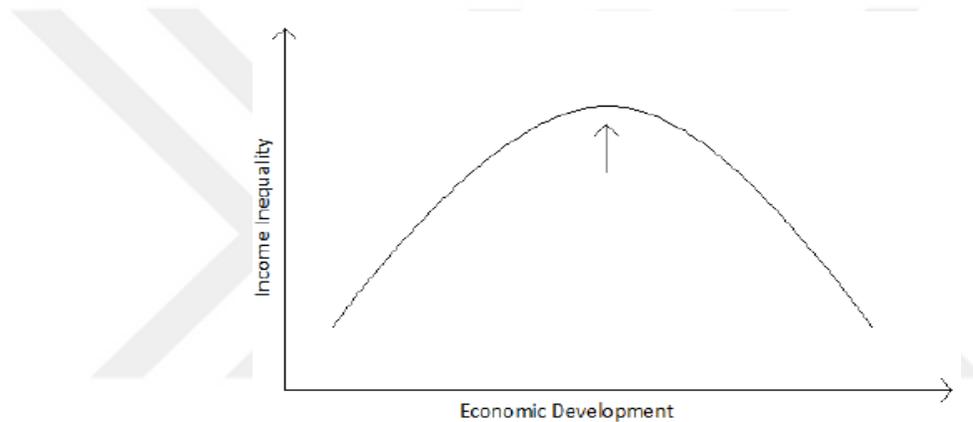
Figure 3.3. Kuznet curve (Todaro and Smith, 2012).

Simon Kuznets, in the early stages of economic growth, will worsen the income distribution; states that it will only improve in later stages. Kuznets describes this observation as an "inverted-U" curve; Due to temporal changes in the income distribution, an inverted-U-shaped curve appears in some of the observed Kuznets cases when gross domestic product per capita increases (Kuznets, 1955, p. 4). Kuznets has employed USA, England and Germany's data to test the relationship between economic development and income inequality. Countries data include different years. Kuznets determines the trend of inequality by using the GDP per capita variable as an indicator of growth. Although the data set was insufficient for that period, the relationship between the two variables indicates a high and low level of gross domestic product, low income inequality; a medium level of GDP represents high income inequality. He made explanations and determinations as to why inequality could worsen before it finally improves in the early stages of economic

development (Kuznets, 1955, p. 4-5). Almost the majority of these explanations and determinations are related to the nature of structural change in the economy. The contemporary industrial sector, where employment is scarce but earnings and productivity are high, accounts for the majority of early growth. The Kuznets curve can be produced as a country evolves from a traditional economic system to a modern economy with a stable modern sector expansion growth process (Todaro and Smith, 2012).

3.4.4. Atkinson method

The Atkinson index, just like the Gini coefficient, gives information about the entire income distribution. Unlike Gini, it can be decomposed to identify different groups or sources of income that contribute differently to inequality. Unlike the other measurements, the Atkinson approach includes the social welfare function in the calculation of income inequality. The underlying assumption is that after-tax revenues are more fair than pre-tax income. The Atkinson index ranges between 0 and 1, so if the value of the Atkinson index decreases, the distribution becomes more even. There is perfect equality when Atkinson is equal to 0, and complete inequality when the Atkinson index is equal to 1. If Atkinson equals 0.3, it is interpreted as: If income were evenly distributed, 70% of the current national income would be needed to maintain the same level of social welfare (Atkinson, 1970).

3.4.5. Theil index

The Theil index may be viewed as an oblique communication that translates the primary probable population shares into the next most probable income shares. This index is used as a powerful tool to understand the dynamics and examples of inequality and to generate data. Theil index is an index based on the concept of 'entropy'. The concept of entropy, which means 'confusion, disorder' in thermodynamics, can be interpreted as 'deviation from complete equality' in economics. A value of 0 indicates complete equality, and a value of 1 indicates maximum inequality. Theil index shows the same sensitivity to

the distances between different income groups. Theil index, which can take values between zero and infinity, means that as the value increases, the injustice occurring in the income distribution is more, and as the value decreases, the injustice occurring in the distribution is less. It satisfies the basic measurement conditions for injustice. The Theil index, which allows one to differentiate the injustice in income distribution as an injustice between and within the groups, is a method that is not only independent of scale, but also symmetrical, and the transfer principle is valid (Theil, 1967).

4. METHODOLOGY AND APPLICATION

There have been many theoretical and empirical studies examining the relationship between economic growth and income inequality. Despite all these studies, it still remains unclear between these concepts.

4.1. Panel Data Analysis

In this study, panel data analysis was used to look at the relationship between economic growth and income inequality. Three types of data are utilized in econometric analysis: cross-section data, time series data and panel data. Time series data includes the variation of used variables according to time units. Cross-section data includes data collected from different economic units at a certain time. Panel data analysis is created by bringing together the time series observations of economic units in the form of cross sections. The fact that panel data analysis has both a cross-sectional and time dimension makes it more effective in modeling economic relations; it allows for producing results (Baltagi, 2005).

Panel data models are expressed as follows (Baltagi, 2005):

$$Y_{it} = \alpha + X'_{it}\beta + u_{it} \tag{4.1}$$

$$t = 1, \ldots, T; \quad i = 1, \ldots, N$$

In Equation (4.1), where i shows a cross-section dimension such as households, individuals, and firms, it also shows the time-series dimension. (Y_{it}): the dependent variable of (i) observation. β is Kx1 and X_{it} is the itth observation on K explanatory variables. U_{it} is the error term. The error term is considered to have a constant variance and a zero mean. Also, the error term is uncorrelated with other variables.

Mostly one-way error component is used in panel data analysis as;

$$u_{it} = m_i + v_{it} \qquad\qquad\qquad (4.2)$$

Where:m_i: indicates the individuals- specific variation of y, v_{it} : indicates the stochastic regression disturbance.

There are two forms of panel data: balanced panel data and unbalanced panel data. In the balanced panel data, each participant has the equal amount of time observations (no missing observations). For unbalanced panel data, the number of time observations may be different for some individuals (there are missing observations). It's also a short panel when the number of slices or individual units is more than the number of timeslots. When the length of the panel exceeds the number of sections or individual units, it is called a long panel (Baltagi, 2005).

4.2. Advantages of Using Panel Data

There are many significant and useful reactions to panel data that we must mention in the following points (Baltagi, 2005):

1. When compared to time series or cross-section data, panel data offers several advantages. Considering the difference of units that are heterogeneous in panel data, this heterogeneity can be controlled, unlike in time series and cross-section analysis.

2. Because panel data contains more observations, collinearity in explanatory variables decreases, degrees of freedom increase, and more efficient data means more informative data, which leads to better parameter estimates.

3. For this and other more exciting reasons, panel data makes it possible for researchers or analysts to study more serious and important economic questions that are probably impossible to focus on the aim of the study by using only cross-section or time series data sets. So researchers and analysts can get better parameter estimates, which results in more precise and unbiased estimates, because more data means more variation and more information can be performed.

4. Panel data are more accurate and measurable than cross section or time series data alone, and because time-invariant variables can be included in panel data, it is better explained than cross section and time series data.

4.3. Assumptions of Panel Data Models

There have been two assumptions made in panel data models. Uncorrelated errors and no correlation of errors with explanatory variables are explained in this section.

1. Uncorrelated errors:

It can be seen that errors in each unit can be correlated over time (T) and with (N) clusters that represent units, because errors and any of the clusters can be correlated. So, with this correlation, the ordinary least square estimation acts upon standard errors to be biased and with unbiased parameter estimates. As we need to fit for clustering with full estimates of standard errors, cluster-robust standard errors are likely to be required (Gujarati et al., 2012).

2. No correlation of error with explanatory variables:

It is possible for any correlation of error term with any explanatory variable, but when error is correlated with an explanatory variable, a biased estimate is produced due to the ordinary least square estimator. Here, instrumental variable estimation is likely to be applied (Gujarati et al. 2012).

The method of estimating economic correlations using panel data models generated from cross-sectional data with a time dimension, or panel data, is referred to as "panel data analysis."

4.4. Cross Section Dependence

The presence of cross-sectional dependency between nations is one of the most crucial considerations in panel data analysis. In panel data, it is investigated whether the

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change in the units has an effect on other units. It is investigated whether the error terms of the same period are related, Cross-section dependency refers to the degree to which all units are affected by any situation that may arise (Baltagi and Pesaran, 2007).

4.4.1. Breusch and Pagan LM test

In the literature, many tests are used to test the correlation between units in panel data, and one of these tests is the Breusch and Pagan (1980) LM test. Breusch and Pagan (1980) The LM test is a Lagrangian Multiplier (LM) test based on the correlation coefficients of the residuals in the case of N constant and T→∞. However, it is not appropriate to use the test in N→∞ situations (Breusch and Pagan, 1980).
The test statistics of the Breusch and Pagan (1980) LM test are as follows:

$$LM = T \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}^2_{ij} \tag{4.3}$$

This test statistic is distributed $\chi2$ with N (N-1)/2 degrees of freedom. In addition, the null hypothesis of the test means that there is no correlation between the residuals obtained from each unit.

ρij i. and j. shows the instantaneous correlation between the units and is calculated as follows (Baltagi, et al. 2012):

$$\hat{\rho}_{ij} = \hat{\rho}_{ji} = \frac{\sum_{t=1}^{T} \hat{u}_{it}\hat{u}_{jt}}{\left(\sum_{t=1}^{T} \hat{u}^2_{it}\right)^{\frac{1}{2}} \left(\sum_{t=1}^{T} \hat{u}^2_{jt}\right)^{\frac{1}{2}}} \tag{4.4}$$

Where $\hat{\rho}_{ij}$ is the pairwise residual correlation sample estimate.

4.4.2. CD test

Breusch and Pagan (1980) test, which is one of the tests used to test the correlation between units, is a test that can be used and is valid in the case of T → ∞ when N is constant. The Breusch and Pagan test loses its consistency when N is large and T is finite.

Pesaran (2004) developed an alternative test to the Breusch and Pagan test to test the correlation between units in cases where T is small and N is large and this test is as follows:

$$CD = \sqrt{\frac{2T}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij} \right) \quad (4.5)$$

$\hat{\rho}ij$: i and j. is the correlation coefficient of the residual.

The null hypothesis of this test is that there is no cross-sectional dependence. It is also valid if CD → N is the limit of the function (0,1) and N → ∞ and T are large enough. Unlike the LM statistic, the CD statistic means exactly zero for fixed T and N values under a wide variety of panel-data models (Hoyos et al. 2006).

Pesaran (2004) suggests a significantly modified version of Pesaran's formula for unbalanced panels of equation (4.6).

$$CD = \sqrt{\frac{2}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \sqrt{T_{ij}} \, \hat{\rho}_{ij} \right) \quad (4.6)$$

The hypotheses for all test statistics of cross-section dependency are as follows:

H_0: $Cov\left(\varepsilon_{it}, \varepsilon_{jt}\right) = 0$ (no cross-section dependency)

H_1: $Cov\left(\varepsilon_{it}, \varepsilon_{jt}\right) \neq 0$ (there is a cross-section dependency)

The H1 hypothesis is rejected and the H0 hypothesis is accepted if the probability values produced as a consequence of the test are larger than the significance levels (1%, 5%, and 10%). On the contrary, if the probability values are less than the significance levels, the H1 hypothesis is accepted and the H0 hypothesis is rejected.

4.5. Panel Unit Root Test

The most common issue in panel unit root testing is determining if the panel's cross sections are independent of one another. They are vital to check if the variables in a time series and the process are stationary throughout time before evaluating it. Unit root tests are used in stationarity analysis. At this moment, panel unit root tests are classified into two categories: first generation and second-generation panel unit root tests. The cross-sectional units that make up the panel are determined using first generation panel unit root testing.

The second-generation panel unit root tests do unit root analysis by taking into account cross-section dependence while assuming that the shock to one of the panel's units affects all cross-sections at the same level. That is, cross-sectional dependency is not taken into consideration. First, unit root tests are used to see if the variables have a unit root before commencing the panel data analysis, especially if the time dimension is extensive. If the series contains a unit root, it means that the series in question is not stationary. In this case, it is necessary to make the series stationary in order to continue the analysis and obtain effective estimation results. If the time series data is not stationary, a spurious regression relationship may arise between the variables, and in this case, the estimation results will not reflect the real relationship in the model (Granger and Newbold, 1974).

The most well-known of these tests are: Levin, Lin and Chu (2002), Im, Peseran and Shin (IPS, 2003), Fisher ADF (Maddala and Wu, 1999), Harris and Tzavalis (1999), Breitung (2000), Hadri (2000), Fisher Philips and Perron (Choi, 2001) Panel Unit Root tests. All of the tests developed for panel unit root analysis aim to analyze the stationarity of the series in the most accurate way. The deepening of the studies on this subject brings with it advances in panel regression, which are created by using panel unit root tests. In this study, we used Fisher ADF (Maddala and Wu, 1999) and Pesaran (2007) cross-sectionally augmented panel unit root test (CIPS).

4.5.1. Fisher ADF (Maddala and Wu, 1999)

The Mandala and Wu (1999) panel unit root test, known as the Fisher ADF test, is estimated using the ρ probability value of the ADF unit root test statistics applied for each unit root test. The test statistic for Maddla and Wu (1999) or Fisher ADF test is N →∞ and T →∞ while it has $\chi2$ distributions with 2N degrees of freedom and the probability value for Pi unit is as follows:

$$P = -2\sum_{i=1}^{N} ln\, p_i \tag{4.7}$$

Hypotheses for testing;

H_0: p i = 0 Panel has unit root.

H_1: p i < 0 Panel has no unit root.

4.5.2. Levin, Lin and Chu (2002)

The unit root test, which was developed by Levin, Lin and Chu and is known as the LLC test, examined the unit root state of the data using the Extended Dickey Fuller (ADF) equation, the unit root test used in time series analysis.

$$\Delta y_{it} = \alpha_{0i} + \rho y_{it-1} + \sum cj\, \Delta y_{it-j} + \varepsilon_{it}, \ i = 1,2.\dots N, t = 1,2\dots.T \qquad (4.8)$$

According to this equation, the following hypotheses are tested for unit root testing in the LLC test.

H_0: $\rho = 0$ Panel has unit root. (Series are not stationary.)

H_1: $\rho < 0$ panel No unit root. (Series are stationary.

4.5.3. Im, Pesaran and Shin (2003) panel unit root test

Another test used to determine whether there is a unit root in panel data analysis is the test known as IPS. Developed by Im, Pesaran, and Shin. The IPS test is an extended version of the LLC test; Im, Peseran, and Shin (2003) offer a unique panel unit root testing method based on the mean of Augmented Dickey Fuller statistics generated for each panel cross-section unit. The IPS test takes into consideration residual serial correlation and error variance heterogeneity (Osbat, 2004).

In addition, in the IPS test, it was predicted that the autoregressive coefficients should be heterogeneous, not homogeneous as in the LLC test, and in the alternative hypothesis of the IPS test, it is assumed that the first-order difference of the series in the panel is stationary. In the IPS test, the same model was used as the LLC test, and the hypotheses of the IPS test differed from the LLC test.

$$\Delta y_{it} = \alpha_{0i} + \rho y_{it-1} + \sum \varphi j\, \Delta y_{it-j} + \varepsilon_{it}, \ i = 1,2.\dots N, t = 1,2\dots.T \qquad (4.9)$$

H_0: ρ i=0, At least one cross-section is stationary. (Panel has unit root.)

H_1: ρ i < 0, At least one cross-section is not stationary. (There is no panel unit root for some i's.)

Unlike the LLC test, the IPS test deals with ρis notρ, by examining the unit root for each cross-section. With the IPS unit root test, the stationarity of N cross-section data is examined and the results are brought together.

4.5.4. Choi (2001) panel unit root test

This test, also known as the Fisher Phillips and Perron test, is calculated by using the p probability values of the ADF unit root test statistics applied to each cross-section unit. Choi (2001) recommends an alternative to the P test when N is large:

Where the P_m test is asymptotically normal with a mean of 0 and a variance of 1, as and N (Baltagi, 2008).

Choi (2001) model obtained for the panel unit root test is as follows:

$$P_m = \frac{1}{2\sqrt{N}}\Sigma_{i=1}^{N}(-2\ ln\ p_i - 2) \tag{4.10}$$

According to Choi (2001), the null hypothesis in the panel unit root test is that all time series are not stationary; the alternative hypothesis is generated differently depending on whether N is a finite or infinite number of cross-section units.

4.5.5. Dickey-Fuller (CADF) test

In the Dickey-Fuller (1979) test, all time series are expressed as first-order autoregressive processes. However, not all time series can be expressed as first-order autoregressive processes. There is an autocorrelation problem in the Dickey-Fuller test. In order to eliminate this problem, the lag value of the dependent variable is added to the Dickey-Fuller equation, enough to eliminate the autocorrelation on the right side of the equation. The lagged cross-sectional mean and its first difference are added to ADF regression in his technique to reflect the cross-sectional dependency that comes from a

single factor model (Baltagi, 2008). This is referred to as the Dickey–Fuller cross-sectional augmented (CADF) test (Dickey and Fuller, 1979). This simple CADF regression is as follows:

$$\Delta y_{i,t} = \alpha_i + \rho_i^* y_{i,t-1} + d_0 \bar{y}_{t-1} + d_1 \Delta \bar{y}_t + \varepsilon_{it} \tag{4.11}$$

$\bar{y}_t$ is the average over time. Through a factor structure, the presence of the lagged cross sectional average and its first difference explains the cross-sectional dependency. In the univariate scenario, if the error term or the factor exhibits serial correlation, the regression must be augmented as normal, but lagged starting differences of both y_i and y_t must be added, resulting in:

$$\Delta y_{it} = \alpha_i + \rho_i^* y_{i,t-1} + d_0 \bar{y}_{t-1} + \sum_{j=0}^{\rho} d_{j+1} \Delta \bar{y}_{t-j} + \sum_{k=1}^{\rho} c_k \Delta y_{i,t-k} + \varepsilon_{it} \tag{4.12}$$

The degree of augmentation can be determined by an information criteria or sequential testing. Pesaran calculates the CIPS statistic by averaging the t-statistics on the lagged value (referred to as CADFi).

$$CIPS = \frac{1}{N} \sum_{i=1}^{N} CADF_i \tag{4.13}$$

The CADF unit root test null and alternative hypotheses are shown below:

$H_0: \rho_i = 0 \; for \; \forall i$

$$H_1: \begin{cases} \rho_i < 0 \; for \; i = 1, \dots N_1 \\ \rho_i = 0 \; for \; i = N_1 + 1, \dots, N \end{cases} \tag{4.14}$$

Once the stability of the whole process is confirmed by evaluating the calculated CIP values, the critical values of Pesaran (2007) must be compared with them (Pesaran, 2007; Baltagi, 2008).

4.6. Panel Data Regression Models

There are some techniques for performing panel data analysis, such as the pooled least squares method (POLS), fixed effects (FE) and random effects (RE) models. Panel

data models are divided into five different groups depending on the values of the parameters according to unit and/or time (Hsiao, 2014):

1. Both constant term and slope parameters are constant model with respect to unit and time:

$$Y_{it} = \beta_0 + \sum_{k=1}^{k} \beta_k \, X_{kit} + \mu_{it} \quad t=1,.., \, T \quad i=1,..., \, N \tag{4.15}$$

2. The model in which the slope parameter is constant and the constant term varies from unit to unit:

$$Y_{it} = \beta_{0i} + \sum_{k=1}^{k} \beta_k \, X_{kit} + \mu_{it} \quad t=1,\ldots, \, T \quad i=1,...,N \tag{4.16}$$

3. The model in which the slope parameter is constant and the constant term varies according to unit and time:

$$Y_{it} = \beta_{0it} + \sum_{k=1}^{k} \beta_k \, X_{kit} + \mu_{it} \quad i=1,...,N \quad t=1,\ldots,T \tag{4.17}$$

4. Model where all parameters are variable with respect to units but constant with time:

$$Y_{it} = \beta_{0i} + \sum_{k=1}^{k} \beta_{ki} \, X_{kit} + \mu_{it} \quad i=1,...,N \quad t=1,..., \, T \tag{4.18}$$

5. Model in which all parameters vary according to both unit and time:

$$Y_{it} = \beta_{0it} + \sum_{k=1}^{k} \beta_{kit} \, X_{kit} + \mu_{it} \quad t=1,..,T \quad i=1,...,N \tag{4.19}$$

4.6.1. Pooled least squares method (POLS)

The pooled least squares method can be used when the pooled groups are relatively similar or homogeneous. This is one of the simplest panel-data models, as all parameters are constant (reject any effect of time). In this method, there is no autocorrelation between observations, given the units. Errors across unit and time have constant variance. Error

terms are zero mean, constant variance, independent, and uniform distribution. The estimation of this model is quite simple and its assumptions are similar to those of the classical model. Level differences can be eliminated with "mean-centering." The model can directly use the least squares method on cascading groups. A large standard error of the model (small T-statistic) may be a warning that the group is not that homogeneous and that a more advanced method such as the random effects model may be more appropriate (Johnston and Dinardo, 1997; Greene, 2012):

$$y_{it} = \beta_1 X_{it} + \alpha + \mu_{it} \qquad i = 1..., N \qquad t = 1..., T \qquad (4.20)$$

where α is the unknown intercept, Y_{it} Where i = entity and t = time, is the dependent variable (DV), X_{it} is indicates the independent variable (IV), β_1 is the coefficient for that IV, μ_{it} is the error term.

In the use of panel data analysis, there are some steps to be followed before the proposed regression model is used to estimate the function. First, it is necessary to determine which of the pooled least squares, fixed effects, or random effects models applied in panel data regression is the best. In this step, the Chow test and the Hausman test are applied to determine the best model. A detailed explanation of these tests is given below.

4.6.2. Fixed effect model

The fixed effects model is used to analyze the effects of variables that change over time, and it is used to analyze the effects of a country, individual, company, etc. It examines the relationship between predictive and outcome variables within the scope of units, such that each unit has its own individual characteristics, which may or may not affect the predictive variable. When the fixed effects model is used, it is assumed that something in particular can affect or influence predictive or outcome variables and must be controlled. This is the rationale for the assumption of correlation between the error term of the unit and its predictor variable. The fixed effects model is based on these time-invariant attributes. Thus, the net effect of the estimators on the outcome variable can be determined.

The term "fixed effects" refers to the fact that the parameters for each cross-section do not vary over time (they are time invariant), but only the data set changes (Gujarati, 2003). The unit error term and the constant should not be related because each unit is different. The fixed effects model is not suitable and a model is needed because the results may not be correct when the error terms are related. This is the main rationale for the Hausman test. The fixed effects model is formulated as seen in Equation (4.21) (Greene, 2012):

$$Y_{it} = \beta_1 X_{it} + \alpha_i + \mu_{it} \qquad t=1,\ldots, T \ \ i=1,\ldots, N \tag{4.21}$$

There α_i (i=1...N) unknown constant term for each unit (n unit-specific constant unit), Y_{it} is dependent variable where i = unit and t = time, X_{it} is represents an independent variable, β_1 is independent variable coefficient, μ_{it} is error term.

Another way to understand the FEM is that binary variables are to use. Thus, the equation of the fixed effects model is as follows:

$$Y_{it} = \beta_0 + \beta_1 X_{1,it} + \cdots + \beta_k X_{k,it} + \gamma_2 E_2 + \cdots + \gamma_n E_n + u_{it} \tag{4.22}$$

Time effects can also be added to the unit effects model to have a time and unit fixed effects regression model:

$$Y_{it} = \beta_0 + \beta_1 X_{1,it} + \cdots + \beta_k X_{k,it} + \gamma_2 E_2 + \cdots + \gamma_n E_n + \sigma_2 T_2 + \cdots + \sigma_1 T_1 + u_{it} \tag{4.23}$$

Where :

Y_{it} Where i = entity and t = time, is the dependent variable (DV),X_k,it denotes the presence of independent variables (IV),β_k is the coefficient for the IVs, u_{it} is the error term, E_n is the n entity, You have n-1 entities in the model since they are binary (dummies). γ_2 Is the binary repressors' (entities') coefficient. σ_2 Is binary regressor (units) coefficient, T_1 is time as binary variable (dummy) with time period t-1.

The only source of uncertainty under the fixed effect model is sampling or estimation error in the included studies. In the random effects model, the same sources are valid, and in addition to these reasons, there may be an error due to the variance between studies. Accordingly, the variance, standard error and confidence interval values for the

summary effect size in the random effect model. Will always be larger or wider than in the fixed effects model (Borenstein et al. 2013).

4.6.3. Random effects model

In contrast to the fixed effects model, the random effects model assumes that unit change is random and unrelated to the estimator or independent variable used in the model. The key distinction between fixed and random effects is whether the unobserved individual effect has elements related with the model's regressor, rather than whether these effects are stochastic. The random effect should be employed if there is reason to think that the unit difference has an influence on the dependent variable. Random effects have the benefit of allowing time-invariant variables to be incorporated (Greene, 2008).

In the fixed effect model, these variables were observed with constant terms. The random effects model is:

$$Y_{it} = \beta_1 X_{it} + \alpha_i + \mu_{it} + \varepsilon_{it} \qquad i=1,..,N \qquad t=1,\dots,T \qquad (4.24)$$

α_i (i=1...N) unknown constant term for each unit, Y_{it} dependent variable where i = unit and t = time, X_{it} indicate the independent variable, β_1 is independent variable coefficient, As previously stated, the error term consists of two parts: μ_{it}, individual error and ε_{it} , random element that vary both over time and across units. The total of two error terms is the composite error. The REM assumes that the unit's error term is not associated with predictive variables, which allows time-invariant variables to play a role as independent variables. In the REM, the individual characteristics of the predictive variables that can or cannot be affected should be specified in detail. The difficulty with this is that certain variables that should be there may not be, resulting in model deviation caused by variables that were overlooked. The random effects model enables us to extrapolate the results beyond the model's sample size (Gujarati, 2004).

4.7. Hausman Test

The Hausman test compares the fixed effects and random effects models in questioning the best model for the panel data regression model (Gujarati, 2012). The Hausman test is compatible with k degrees of freedom and chi-square (X2) distribution (Baltagi, 2008). The Hausman test compares FEM and REM under the null hypothesis that individual effects are not correlated with any regression in the model (Hausman, 1978). The least squares dummy variable (LSDV) and generalized least squares (GLS) are consistent and biased if the uncorrelated null hypothesis is not violated (Greene, 2008). Under the null hypothesis, the LSDV and GLS estimates should not vary consistently. To achieve a zero difference, the Hausman test employs the covariance of an efficient estimator (Greene, 2008). it is more suitable. In the Hausman test, the null hypothesis is based on the absence of correlation between the error term and the independent variables, while the alternative hypothesis is based on the presence of correlation. In case the null hypothesis cannot be rejected, the random effects model will be valid (Tatoğlu Yerdelen, 2012). The Hausman test can be examined directly with the following hypothesis.

H_0 = Random Effects Model

H_1 = Fixed Effects Model

If the p-value is less than (0.05), H_0 is rejected, and if the p-value is higher than (0.05), H_0 is accepted (Tatoğlu Yerdelen, 2012).

4.8. Panel Co-Integration Tests

Although theoretically, many panel co-integration tests have started to take place in the econometrics literature recently, approaches that can be applied with computer package programs are still limited today.

The advantage of using panel cointegration tests, such as Panel Unit Root Tests, over applying cointegration to the time series is that it increases the power of the tests. Pedroni Cointegration Test; Pedroni (1999, 2004) proposed seven panel cointegration tests with the basic hypothesis of "no cointegration" and heterogeneity is allowed under the

alternative hypothesis. These tests can be divided into two groups. The average of the cointegration tests determined independently for the time series of all units is utilized in the first category. Averages were calculated from portions in the second category (Tatoğlu, 2013).

4.8.1. Pedroni cointegration test

Pedroni has developed seven different test statistics to test. General features of these test statistics; the errors allow heterogeneity along the cross-sections, contain multiple explanatory variables, and the cointegration vector of the panel, It is diversified into different parts. Four of the test statistics were within the group (panel-v, panel-ρ, parametric panel-t and non-parametric panel-t), and the other three were between groups (group-ρ, parametric group-t, and non-parametric group-t).

Heterogeneous coefficients panel regression model is considered by (Pedroni, 1999):

$$y_{it} = \alpha_i + \gamma_i t + \beta'_i x_{it} + u_{it}, \quad i = 1,...,N \quad t = 1,...,T \tag{4.25}$$

Where $\{y_{it}\}$ and $\{x_{it}\}$ are scalar and have $k \times 1$ I (1) dimensions. In order for the functional central limit theorem to apply, $\{y_{it}$ and $\{x_{it}\}$ must meet the requirements and be independent over i (Baltagi, 2015).

The null (H_0) and alternative (H_1) hypotheses for these tests are defined as follows (Pedroni, 1999):

H_0: There is no cointegration relationship for all i's.

H_1: There is a cointegration relationship for all i's.

If the panel-v statistic is positive and the other statistics are negative, the H_0 (no cointegration relationship) hypothesis is rejected and it is decided that there is a long-term cointegration relationship between the variables. Calculate any of the following seven test statistics, and then compare the mean and variance with the tabular value below (Pedroni, 1999):

In-group panel cointegration statistics:

4.8.2. Kao Panel Co-integration Test

It is one of the panel cointegration tests developed to examine the long-term relationship within the panel series. Kao (1999) proposes the cointegration test, residual-based testing approach. For this purpose, Dickey Fuller (1979) and Extended Dickey Fuller (ADF) type tests are used (Kao, 1999).

Kao (1999) model for cointegration:

$$Y_{it} = \alpha_{it} + \beta X_{it} + e_{it} \quad i= 1,..., N \quad t=1,..., T \tag{4.33}$$

Format is created. Y_{it} And X_{it} series are non-stationary panel series. Dickey Fuller type Kao (1999) error term for co-integration test e_{it}.

$$\hat{e}_{it} = \rho \hat{e}_{it-1} + v_{it} \tag{4.34}$$

Is defined as, Hypotheses for analyzing unit root in error terms

H_0: $\rho = 1$. There is no cointegration has occurred

H_1 : $\rho < 1$. There is cointegration has occurred

ρ is the estimator of the autoregressive parameter obtained by the least square's estimation method, the hypothesis is established as $H_0 = \rho = 1$. The least squares estimation of ρ is (Baltagi and Kao, 2001).

$$\hat{\rho} = \frac{\sum_{i=1}^{N}\sum_{t=2}^{T} \hat{e}_{it}\hat{e}_{it-1}}{\sum_{i=1}^{N}\sum_{t=2}^{T} \hat{e}_{it}^2} \tag{4.35}$$

Will be. The null hypothesis of $\rho = 1$, as tested. While the standard deviation of the test statistic calculated for the p= 1 test is S_e,

$$t_\rho = \frac{(\hat{\rho}-1)\sqrt{\sum_{i=1}^{N}\sum_{t=2}^{T} \hat{e}_{it-1}^2}}{s_e} \tag{4.36}$$

$$s_e^2 = \frac{1}{NT}\sum_{i=1}^{N}\sum_{t=2}^{T}(\hat{e}_{it}-\hat{\rho}\hat{e}_{it-1})^2 \tag{4.37}$$

Kao (1999) developed four different statistics for the long-term analysis of the co-integration test. Four types of Dickey-Fuller tests, assuming $Z_{it} = \{\mu_{it}\}$ of these tests, DF_ρ

and DF_t were developed for strong externality. $DF_\rho{}^*$ And $DF_t{}^*$ are statistics corrected for internal correlation. Identified statistics:

$$DF_\rho = \frac{\sqrt{N}T(\hat{\rho}-1)+3\sqrt{N}}{\sqrt{10.2}} \tag{4.38}$$

$$DF_t = \sqrt{1.25}t_\rho + \sqrt{1.875N} \tag{4.39}$$

$$DF_\rho{}^* = \frac{\sqrt{N}T(\hat{\rho}-1)+\frac{3\sqrt{N}\hat{\sigma}_v^2}{\hat{\sigma}_{0v}^2}}{\sqrt{3+\frac{36\hat{\sigma}_v^4}{5\hat{\sigma}_{0v}^4}}} \tag{4.40}$$

And

$$DF_t{}^* = \frac{t_\rho+\frac{\sqrt{6N}\hat{\sigma}_V}{2\hat{\sigma}_{0v}}}{\sqrt{\frac{\hat{\sigma}_{0v}^2}{2\hat{\sigma}_v^2}+\frac{3\hat{\sigma}_v^2}{10\hat{\sigma}_{0v}^2}}} \tag{4.41}$$

Where $\hat{\sigma}_v^2 = \hat{\Sigma}_{yy} - \hat{\Sigma}_{yx}\hat{\Sigma}_{xx}^{-1}$ and $\hat{\sigma}_{0v}^2 = \hat{\Omega}_{yy} - \hat{\Omega}_{yx}\hat{\Omega}_{xx}^{-1}$ For the ADF test, we can run the following regression:

$$\hat{e}_{it} = \rho\hat{e}_{it-1} + \sum_{j=1}^{p}\vartheta_j\Delta\hat{e}_{it-j} + v_{it\rho} \tag{4.42}$$

Form is obtained. ADF test statistic, which approximates the normal distribution with 0 mean and 1 variance value by correcting the ADFt test statistic defined in this way, and If there is no cointegration, the ADF test statistic can be generated as follows:

$$ADF = \frac{t_{ADF}+\frac{\sqrt{6N}\hat{\sigma}_V}{2\hat{\sigma}_{0v}}}{\sqrt{\frac{\hat{\sigma}_{0v}^2}{2\hat{\sigma}_v^2}+\frac{3\hat{\sigma}_v^2}{10\hat{\sigma}_{0v}^2}}} \tag{4.43}$$

4.9. Subject and Purpose of the Application

The goal of this study is to test the Inverted U hypothesis, the income inequality model, put forward by Kuznets (1955), which predicts that income inequality will increase in the first stage of economic development, but decrease with the maturation of

industrialization, and to examine the impact of economic growth on income inequality in this direction.

4.10. Data Used in the Application

In this study, the Gini coefficient is the dependent variable that shows the income inequality (gini). GDP per capita (income) variable is also the independent variable that shows economic development. Other control variables used in the study are GDP per capita squared (income2), inflation rate (inf), total investments (inv) and current account balance (cab), respectively. In the study, we used 38 OECD data between 1990-2019. OECD countries are listed in Table 4.1. In this context, the econometric models used in the study are as follows:

$$\text{gini} = \beta_0 + \beta_1 \text{gdp} + \beta_2 \text{gdp}^2 + \beta_3 \text{Inv} + \beta_4 \text{Inf} + \beta_5 \text{unemp} + \beta_6 \text{cab1}$$

In the equation above, to test Kuznets' hypothesis GDP and GDP^2 variables were included in the model. If $\beta_3 > 0$ and $\beta_4 < 0$ the Kuznets (1955) hypothesis is accepted (Nasreddine and Mensi, 2016).

Table 4. 1. OECD countries

Australia	Finland	Korea, Rep.	Slovak Republic
Austria	France	Latvia	Slovenia
Belgium	Germany	Lithuania	Spain
Chile	Greece	Luxembourg	Sweden
Canada	Hungary	Mexico	Switzerland
Colombia	Iceland	Netherlands	Turkey
Costa Rica	Ireland	New Zealand	United Kingdom
Czech Republic	Israel	Norway	United States
Denmark	Italy	Poland	
Estonia	Japan	Portugal	

Regarding the data that was used in this study, the definition of the data, the unit of measurement, and the sources from which it was taken are given in detail in Table 4.2.

Table 4.2. Definition of variables

Variable	Definition	Unit of measurement	Source
gini	Estimated household income inequality		World Income Inequality Database (WIID)
gdp	GDP per capita (constant 2015 US dollars)	GDP per capita is calculated by dividing gross domestic product by the midyear population.	World Bank, World Development Index (WDI)
gdp^2	Squared GDP per capita (constant 2015 US$)	GDP per capita is calculated by dividing gross domestic product by the midyear population.	World Bank, World Development Index (WDI)
inf	Inflation of rate	Inflation of rate of GDP deflator (annual %)	International Monetary Fund
inv	Total investment	Total investments as a percent of GDP expressed as a ratio of total investment and GDP.	International Monetary Fund
unemp	Unemployment rate	Unemployment rate	International Monetary Fund
cab	Current account balance	Current account balance (annual)	International Monetary Fund

4.11. Panel Estimation Techniques

In econometric analysis, three types of data are used: time series, cross-section data, and panel data. There are three types of data: "time series," which offer information about the numerical values of variables across time, "cross section data," which provides information about individual units at any time, and "panel data," which is formed by joining cross sections at different times (Koutsoyiannis, 1989). Because the data used to determine the association between income inequality and economic development in this study are panel data with both cross-section and time series dimensions, "Panel Data Analysis" was used in this study.

According to Wooldridge (2013), panel data is comprised of N units and T observations per unit. Each cross-sectional unit in the data set has its own time series. Unlike cross-sectional data, longitudinal data are collected on discrete units such as individuals, households, cities, or countries.

The panel data model is commonly represented as,

$$Y_{it} = \alpha_{it} + \beta_{kit}X_{kit} + \varepsilon_{it} \tag{4.44}$$

i =1,..., N ; t=1,…,T

Baltagi, 2008; Tatoğlu, 2013. Where Y: Dependent variable X_k: Independent variables, α_{it}: constant variable, β_{kit}: slope coefficients and ε_{it}: error term.

4.12. Main Result and Interpretations

Tables 4.3 and 4.4 present descriptive statistics and correlation coefficients for the variables included in our analysis, respectively. We determined the mean, standard deviation, minimum, maximum, and sum for each variable. Correlation coefficients between the variables investigated are found to be quite low.

Table 4.3. Descriptive statistics

Variables	count	mean	S.d	min	max	sum
gini	950	34.43187	7.491323	23.182	60.597	32710.28
gdp	950	30096.54	21588.25	2167.793	118823.6	2.86e+07
gdp2	950	1.37e+09	1.99e+09	4699325	1.41e+10	1.30e+12
inf	950	3.967636	8.179412	-9.727519	143.6397	3769.254
inv	950	23.34335	4.341729	11.85	44.794	22176.18
unemp	950	7.769823	4.070088	1.703	27.475	7381.332
cab	950	-4.622891	89.59465	-816.647	295.118	-4391.746
N	950					

Table 4 4. Correlation coefficients

	gini	gdp	gdp^2	inf	inv	unemp	cab1
gini	1.0000						
gdp	-0.4038	1.0000					
gdp^2	-0.2651	0.9305	1.0000				
inf	0.3009	-0.2787	-0.1582	1.0000			
inv	-0.1429	-0.0806	-0.0521	0.0566	1.0000		
unemp	0.1218	-0.3853	-0.3181	-0.0036	-0.2998	1.0000	
cab	-0.1865	0.0072	0.0231	-0.0192	0.0532	-0.0260	1.0000

Before verifying the series' stationarity and selecting the correct model to employ in model estimation, it is required to determine whether there is a correlation between the units. As a result, if there is a cross-section dependency, it is critical to employ "second generation panel unit root tests" in stationarity tests, and it is critical to give correct results if there are no "first generation panel unit root tests." The "Pesaran (2004) CD Test" was employed in this context to determine "cross section dependence," and the results are described in Table 4.5. It displays CD-test sta1tistics, probability values (p-value), inter-unit correlation coefficient (corr), and absolute values (-Abs (corr)). The H_0 hypothesis

states that there is no cross-sectional dependency, while the H_1 hypothesis states that there is a cross-sectional dependence in the Pesaran (2004) test. The following are the cross-section dependence hypotheses:

$$H_o: \text{Cov}\left(\varepsilon_{it}, \varepsilon_{jt}\right) = 0$$

$$H_1: \text{Cov}\left(\varepsilon_{it}, \varepsilon_{jt}\right) \neq 0 \qquad (4.45)$$

According to the cross-section dependency test findings, in the results of the Pesaran CD test, the Ho hypothesis cannot be rejected, that is, there is no a cross-sectional dependence. In this case, second generation panel unit root tests, which are used in case of cross-sectional dependence between units, were preferred.

Table 4.5. Cross section dependency (CD) test

Variable	CD-test	p-value	corr	abs(corr)
gini	0.45	0.651	0.003	0.388
gdp	115.66	0.000	0.872	0.872
inf	27.58	0.000	0.208	0.319
inv	23.31	0.000	0.176	0.348
unemp	23.18	0.000	0.175	0.374
gdp^2	110.69	0.000	0.835	0.835
cab	7.01	0.000	0.053	0.436

Another important test to consider after the cross-section dependency test is the stationarity test. The presence of a time dimension as well as a unit size in the panel data requires an examination of the series' stationarity. Many unit root tests can be performed for this aim (Güriş, 2018). Pesaran (2007) cross-sectionally augmented panel unit root test (CIPS) and Fisher ADF tests were used from the second generation tests. The results of these tests are shown in tables 4.6 and 4.7. According to the CIPS and Fisher ADF test results, all variables are stationary at level I (0).

Table 4.6. Pesaran (2007) cross-sectionally augmented panel unit root test (CIPS)

Level	t-bar	cv10	cv5	cv1	Z[t-bar]	P-value	Result
Gini	-2.326	-2.040	-2.110	-2.230	-3.599	0.000	Stationary
GDP	-2.074	-2.040	-2.110	-2.230	-1.997	0.023	Stationary
GDP^2	-1.900	-2.040	-2.110	-2.230	0.892	-0.038	Stationary
inf	-2.696	-2.040	-2.110	-2.230	-5.949	0.000	Stationary
inv	2.075	-2.040	-2.110	-2.230	-2.004	0.023	Stationary
unemp	-2.072	-2.040	-2.110	-2.230	-1.984	0.024	Stationary
Cab	-2.318	-2.040	-2.110	-2.230	-3.545	0.000	Stationary
First Difference							
Gini	-2.758	-2.040	-2.110	-2.230	-6.340	0.000	Stationary
gdp	-2.883	-2.040	-2.110	-2.230	-7.134	0.000	Stationary
gdp^2	-2.545	-2.040	-2.110	-2.230	-4.986	0.000	Stationary
inf	-3.841	-2.040	-2.110	-2.230	-13.228	0.000	Stationary
inv	-3.330	-2.040	-2.110	-2.230	-9.978	0.000	Stationary
unemp	-2.605	-2.040	-2.110	-2.230	-5.370	0.000	Stationary
Cab	-3.574	-2.040	-2.110	-2.230	-11.527	0.000	Stationary

Table 4.7. Fisher ADF test result

Variables	P	Z	L*	Pm	Result
Gini	130.4720 0.0001	-2.2252 0.0130	-2.8864 0.0022	4.4183 (0.0000)	Stationary
GDP	140.1720 (0.0000)	-2.5920 0.0048	-3.3573 0.0005	5.2050 (0.0000)	Stationary
GDP^2	136.1272 (0.0000)	-2.5854 0.0049	-3.2350 (0.0000)	4.8770 (0.0000)	Stationary
inf	435.1155 (0.0000)	-14.7813 (0.0000)	-19.2434 (0.0000)	29.1281 (0.0000)	Stationary
inv	109.4309 (0.0000)	-2.8554 (0.0000)	-2.8559 (0.0000)	2.7116 (0.0000)	Stationary

Table 4.7. Fisher ADF test result (continued)

Variables	P	Z	L*	Pm	Result
unemp	356.1409	-13.4602	-15.7942	22.7224	Stationary
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	
Cab	122.5344	-3.0403	-3.3905	3.7744	Stationary
	0.0006	0.0012	0.0004	0.0001	
First Difference					Stationary
Gini	702.6966	-20.2759	-31.3719	50.8318	Stationary
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	
GDP	742.5691	-20.5135	-33.1020	54.0659	Stationary
	(0.0000)	(0.0000	(0.0000)	(0.0000)	
GDP^2	730.2657	-20.4714	-32.5809	53.0680	Stationary
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	
inf	1381.4294	-33.2883	-61.9359	105.8843	Stationary
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	
inv	647.5501	-20.7214	-28.9843	46.3588	Stationary
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	
unemp	1270.5497	-31.8964	-56.9644	96.8908	Stationary
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	
Cab	817.9129	817.9129	-36.6573	60.1771	Stationary
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	

The results of the model estimation are presented in Table 4.8. Three different models have been used to estimate the relationship between economic progress and income inequality. All coefficients are statistically significant in the first model, the pooled regression model. Contrary to predictions, while an increase in per capita income reduces income inequality, an increase in income at the subsequent stage increases income inequality. In this case, Kuznets's (1955) theory could not be confirmed in this model. A one-unit increase in the inflation rate results in a one-unit increase in income inequality. It demonstrates that inflation exacerbates income inequality. Similarly, when unemployment and the current account balance grow, income disparity grows. However, the increase in overall investment has contributed to the reduction of income disparity.

The results of the fixed effect and random effect analyses were comparable. Similar to the Pooled regression, while increasing per capita income raised income inequality during the first stage of growth, it did not diminish income inequality during the subsequent stage, but rather increased it. In both models, inflation, unemployment, and current account deficit all contribute to an increase in income inequality. No statistically significant relationship was discovered on income inequality of total investments. Taking all three models into account, no evidence was discovered to support the Kuznets hypothesis.

Table 4.8. Models result

	Pooled Regression	Fixed -effects (within) regression	Random-effects GLS regression
	Gini	Gini	Gini
main			
GDP	-0.00044***	-0.000047***	-0.000052***
	(0.000028)	(0.000012)	(0.000012)
GDP^2	3.27e-09***	4.84e-10***	5.14e-10***
	(2.85e-10)	(1.10e-10)	(1.11e-10)
inf	0.0862**	0.0350***	0.0352***
	(0.0264)	(0.00749)	(0.00757)
inv	-0.424***	0.0145	0.0114
	(0.0487)	(0.0179)	(0.0180)
unemp	0.312***	0.0897***	0.0874***
	(0.0572)	(0.0215)	(0.0217)
cab	0.0156***	0.00319**	0.00292*
	(0.00218)	(0.00117)	(0.00117)
_cons	55.13***	34.03***	34.21***
	(1.645)	(0.626)	(1.137)

Note: * indicates signification at the 10 percent level, ** indicates signification at the 5 percent level, *** indicates signification at the 1 percent level and gdp is real per capita GDP and gdp^2 is squared term of real per capita GDP

5. CONCLUSION

In this study, the relationship between economic development and income inequality was examined using data from 38 OECD countries between 1995 and 2019. This study tested the Kuznets (1955) hypothesis using the pooled regression, fixed effects and random effects model. The following conclusions were obtained based on the findings of the data analysis:

1. The pooled regression fixed effect and random effect analyses produced consistent outcomes. While increasing per capita income boosted income disparity during the first stage of growth, it did not decrease it but rather expanded it throughout the second stage. Both models assume that inflation, unemployment, and the current account deficit will all contribute to an increase in income disparity. No statistically significant association between income inequality and total investments was identified. Taking all.

2. It was discovered that GDP (real per capita) also, had a negative significant impact on the GINI coefficient (income inequality) GDP^2 had a positive significant impact on income inequality.

3. It was found that inflation rates, unemployment rates and current account balances have a positive impact on income inequality. Therefore, increases in any of these variables would lead to increases in income inequality (GINI).

4. It was discovered that total investment had a positive impact on the Gini coefficient but without a significant level in REM and FEM.

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EXTENDED TURKISH SUMMARY
(GENİŞLETİLMİŞ TÜRKÇE ÖZET)

EKONOMIK GELİŞME İLE GELİR EŞİTSİZLİĞİ ARASINDAKİ İLİŞKİ: PANEL VERİ ANALİZİ

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Uzun yıllar boyunca, ekonomistler ve politika yapıcılar, dikkatlerini ekonomik ilerleme ile gelir eşitsizliği arasındaki bağlantıya ve bu ilişkinin özelliklerine odakladılar. Bu araştırmanın temel amacı, gelir eşitsizliği (bağımlı değişken), kişi başına düşen GSYİH (gelir), kişi başına düşen GSYİH karesi (gelir2), enflasyon oranı (inf), toplam yatırımlar (inv), GINI'nin rolünü analiz etmektir. 38 OECD ülkesi için incelenen Kuznets ters-u hipotezi bağlamında ekonomik büyüme ve gelir eşitsizliği arasındaki ilişkide cari işlemler dengesi (cab1) ve işsizlik oranı (unep) bağımsız değişkenler olarak kullanılmıştır. Kuznets hipotezine göre, gelir eşitsizliği ekonomik gelişmenin ilk aşamalarında artar ve belirli bir noktadan sonra azalır. Bu çalışmada panel veri regresyonu kullanılmıştır. Sabit etki modeli (FEM), rastgele etki modeli (REM) ve havuzlanmış regresyon modeli (POLS) araştırmada kullanılan istatistiksel modellerdir. 1995-2019 dönemini kapsayan 38 OECD ülkesinin geniş bir panel veri örneği için 950 gözlem kullandık. Dünya Bankası, Dünya Kalkınma Endeksi (WDI), Dünya Gelir Eşitsizliği Veritabanı (WIID) ve Uluslararası Para Fonu'ndan panel verileri elde ettik. Bu çalışmanın bulgularına göre, GSYİH karesi, enflasyon oranı, işsizlik oranı ve cari işlemler dengesi, gelir eşitsizliği üzerinde istatistiksel olarak anlamlı bir pozitif ilişki etkisine sahiptir. GSYİH, negatif ve istatistiksel olarak anlamlı bir etkiye sahiptir. Toplam yatırımın gelir eşitsizliği üzerinde istatistiksel olarak anlamlı bir etkisi yoktur. Ayrıca, Kuznets'in ters U-şekilli hipotezi sonuçlar tarafından desteklenmemiştir.

Anahtar kelimeler: Ekonomik kalkınma, Gelir eşitsizliği, Panel veri analizi.

1. GİRİŞ

Gelir eşitsizlikleri ve ekonomik kalkınma, uzun zamandır ekonomistler ve politikacılar için en acil endişelerden ikisi olmuştur. Gelir eşitsizliği ve ekonomik ilerleme de uzun vadeli ekonomik canlılık için kritik öneme sahiptir. Ekonomik büyüme alanındaki son ampirik araştırmalar da gelir eşitsizliği ve büyüme arasındaki bağlantıyı açıklamaya çalıştı. Bazı ampirik araştırmalara göre, gelir eşitsizliği ve ekonomik büyüme arasında negatif bir ilişki vardır. Diğerleri, iki değişken arasında pozitif bir korelasyon keşfetti. Gelir eşitsizliği ile ilgili çalışmalar oldukça eskidir. Gelir eşitsizliğinin durumunu değerlendiren ilk temel teorik çalışmalardan biri Kuznets'e (1955) aittir. Kuznets'e göre, gelir eşitsizliği ekonomik kalkınmaya karşı ters U şeklinde bir seyir izliyor. Ekonomik kalkınmanın erken evrelerinde ekonomik büyüme ve gelir eşitsizliği artarken, ekonomik büyümenin sonraki evrelerinde ekonomik büyüme ile birlikte gelir eşitsizliği azalmaktadır.

19. yüzyılda dünyadaki gelir eşitsizliğinin adeta "patlaması", bilim adamlarının bu konu üzerinde durmalarının önemli nedenlerinden biridir. Aynı dönemde yapılan ayrı bir araştırmaya göre, 1820 ile 1992 yılları arasında Gini katsayısı %30, Theil endeksi ise %60 arttı. Ülkeler arasındaki veya dünyanın çeşitli bölgeleri arasındaki eşitsizlikteki devasa büyüme, birincil olarak kabul ediliyor. bu dönüşümün nedenidir (Bourguignon ve Morrisson, 1999).

Gelir eşitsizliği hem gelişmiş hem de gelişmekte olan ülkelerde kaçınılmaz bir olgu haline gelmiştir. Son on yılda yaşam standardındaki iyileşme, dünyanın çoğunda gelir eşitsizliğinin kötüleşmesine de tanık oldu. Bu, gelir eşitsizliği devam ederken yaşam standardının arttığı anlamına gelir.

Bu çalışma şu şekilde beş bölüme ayrılmıştır: Birinci bölümde, gelir eşitsizliği ile ekonomik büyüme arasındaki bağın tanıtılması hakkındadır. İkinci bölümde, gelir eşitsizliği ile ekonomik büyüme arasındaki ilişkinin teorik ve ampirik temelleri ile bu ilişkiyi etkileyen destekleyici değişkenler ele alınmıştır. eşitsizlik tartışılır. Dördüncü bölümde, metodoloji ve uygulama ile ilgili panel veri analizi anlatılmıştır. Araştırmada kullanılan veriler, uygulamada kullanılan değişkenler, araştırma yöntemi ve ampirik bulgular açıklanmıştır. Burada yine ampirik analiz sonuçlarına dayalı olarak önemli çıkarımlarda

bulunulmuştur. Çalışmada, 1995-2019 yılları arasında 38 OECD ülkesine ait veriler ve 950 gözlem ile ekonomik büyüme ve gelir eşitsizliği arasındaki ilişki Kuznets hipotezi kapsamında panel veri yöntemi ile test edilmiştir. Çalışmanın son bölümünde ise elde edilen bulgularla ilgili bir sonuç bölümü yer almaktadır.

Gelir eşitsizliğini ölçen Gini katsayısı bu çalışmada bağımlı değişkendir (gini). Ekonomik gelişmişliği gösteren bağımsız değişken kişi başına düşen GSYİH'dır (gelir). Kişi başına GSYİH karesi (gelir2), enflasyon oranı (inf), toplam yatırımlar (inv) ve cari işlemler dengesi (cab1) araştırmaya dahil edilen diğer kontrol değişkenlerinden bazılarıdır.

Bu çalışmanın temel amacı, gelir eşitsizliği ile ekonomik kalkınma arasındaki bağlantıya bakmaktır. Gelir eşitsizliği ile ekonomik büyüme arasında bir bağlantı var mı? Ve bu çalışmada kullanılan değişkenlerin rolü nedir? Ayrıca, ekonomik büyüme arttığında, eşitsizlik ya artar ya da azalır. Gelir eşitsizliğindeki artış ne olacak? Ekonomileri hızlı mı büyüyor yoksa ekonomileri düşük mü yoksa ekonomileri bu ülkelerdeki ekonomik kalkınma ve gelir eşitsizliği arasında orta derecede bir korelasyon mu? Düzensiz gelirin etkisi nedir? Panel verilerinin kullanılması Ekonomik kalkınmanın başlangıcından bu yana gelir eşitsizliği sıcak bir tartışma konusu olmuştur. Zenginler ve fakirler arasındaki uçurum, sanayileşmiş ülkelerde bile genişlemekte gibi göründüğünden, bu, günümüzün ekonomik dünyasında özellikle alakalı bir konudur.

2. EKONOMİK GELİŞME VE GELİR EŞİTSİZLİĞİ

Gelir eşitsizliği, ülkenin sosyal barışı ve refahı ile yakından bağlantılı bir sosyo-ekonomik sorundur. Sonuç olarak, toplumda barış ve düzenin sağlanması için gelir dağılımında adaletin sağlanması bir zorunluluktur. Bu bölümde ekonomik kalkınma, kalkınmanın belirleyicileri ve eşitsizlik anlatılmaktadır.

2.1. Ekonomik Kalkınmanın Belirleyicileri

Ekonomik büyüme, politik, sosyal ve kültürel etkiler gibi çeşitli faktörlerden etkilenir. Büyümenin kaynakları değerlendirilirken ulusların ekonomik yapıları dikkate

alınmalıdır. Ekonomik kalkınma değişkenleri, büyümeyi sağlamak için ne tür eylemlerin yapılması gerektiğini veya hangi politikaların izlenmesi gerektiğini belirlemede çok önemlidir.

2.2. Gelir Eşitsizliği

Gelir, en geniş anlamıyla gelen parayı ifade eder. Çeşitli bağlamlarda çok çeşitli anlamları ifade etmek için kullanılabilir. Kişisel gelir, bir kişinin varlıklarının değerini etkilemeden tüketim için harcayabileceği para miktarı olarak tanımlanır.

Ekonomideki en temel ve temel kavram gelirdir. Görünür sadeliğine rağmen, yaşam standartlarının bir ölçüsü olarak kullanıldığında, belirli bir tanıma ihtiyaç duyar. Gelir, en geniş anlamıyla gelen parayı ifade eder. Sonuç olarak, çeşitli bağlamlarda çok çeşitli anlamları ifade etmek için kullanılabilir. Ekonomide kişisel gelir, bir kişinin zaman içinde varlıklarının değerini etkilemeden tüketim için harcayabileceği para miktarı olarak tanımlanır (Simons, 1938; Hicks, 1946; Atkinson, 1983).

3. YÖNTEM VE UYGULAMA

Ekonomik büyüme ile gelir eşitsizliği arasındaki ilişkiyi inceleyen birçok teorik ve ampirik çalışma yapılmıştır. Tüm bu çalışmalara rağmen, bu kavramlar arasında hala belirsizliğini koruyor.

3.1. Panel Veri Analizi

Bu çalışmada, ekonomik büyüme ile gelir eşitsizliği arasındaki ilişkiye bakmak için panel veri analizi kullanılmıştır. Ekonometrik analizde üç tür veri kullanılır: yatay kesit verisi, zaman serisi verisi ve panel veri. Zaman serisi verileri, kullanılan değişkenlerin zaman birimlerine göre değişimini içerir. Kesit verileri, belirli bir zamanda farklı ekonomik birimlerden toplanan verileri içerir. Panel veri analizi, ekonomik birimlerin zaman serisi gözlemlerinin kesitler halinde bir araya getirilmesiyle oluşturulur. Panel veri analizinin hem

kesitsel hem de zaman boyutuna sahip olması, ekonomik ilişkilerin modellenmesinde daha etkili olmasını sağlamakta; sonuç üretmeyi sağlar (Baltagi, 2005).

$$Y_{it} = \alpha + X'it\beta + u_{it} \qquad\qquad (4.1)$$
$$t=1,2,..,T; \quad i= 1,2,….,N$$

i'nin hane halkı, bireyler ve firmalar gibi bir kesit boyutunu gösterdiği Denklem (4.1)'de, zaman serisi boyutunu da göstermektedir. (Y_{it}): (i) gözlemin bağımlı değişkeni. β, Kx1'dir ve Xit, K açıklayıcı değişkenler üzerindeki i. gözlemdir. Uit, hata terimidir. Hata teriminin sabit bir varyansa ve sıfır ortalamaya sahip olduğu kabul edilir. Ayrıca, hata terimi diğer değişkenlerle ilişkisizdir.

3.1.1. Kesit bağımlılığı

Ülkeler arasında yatay kesit bağımlılığının varlığı, panel veri analizinde en önemli hususlardan biridir. Panel veride, birimlerdeki değişimin diğer birimlere etkisinin olup olmadığı araştırılır. Aynı döneme ait hata terimlerinin birbiriyle ilişkili olup olmadığı araştırılırken, Kesit bağımlılığı ortaya çıkabilecek herhangi bir durumdan tüm birimlerin ne derece etkilendiğini ifade etmektedir (Baltagi vd. 2007).

3.1.1.1. CD testi

Birimler arası korelasyonu test etmek için kullanılan testlerden biri olan Breusch ve Pagan (1980) testi, N sabit olduğunda $T \to \infty$ durumunda kullanılabilen ve geçerli olan bir testtir. N büyük ve T sonlu olduğunda Breusch ve Pagan testi tutarlılığını kaybeder. Pesaran (2004), T'nin küçük ve N'nin büyük olduğu durumlarda birimler arasındaki korelasyonu test etmek için Breusch ve Pagan testine alternatif bir test geliştirmiştir ve bu test aşağıdaki gibidir:

$$CD = \sqrt{\frac{2T}{N(N-1)}}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}\right) \qquad\qquad (4.2)$$

$\hat{\rho}_{ij}$: i ve j . kalıntının korelasyon katsayısıdır.

Bu testin sıfır hipotezi, yatay kesit bağımlılığının olmadığıdır. CD → N fonksiyonun limiti (0,1) ve N → ∞ ve T yeterince büyükse de geçerlidir. LM istatistiğinden farklı olarak, CD istatistiği, çok çeşitli panel veri modelleri altında sabit T ve N değerleri için tam olarak sıfır anlamına gelir (Hoyos ve diğerleri 2006).

Pesaran (2004), denklemin (4.3) dengesiz panelleri için Pesaran formülünün önemli ölçüde değiştirilmiş bir versiyonunu önerir.

$$CD = \sqrt{\frac{2}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \sqrt{T_{ij}} \, \hat{\rho}_{ij} \right) \tag{4.3}$$

Kesit bağımlılığının tüm test istatistikleri için hipotezler aşağıdaki gibidir:

H0: Cov (εit,εjt)=0 (kesit bağımlılığı yok)

H1: Cov (εit,εjt)≠0 (kesit bağımlılığı var)

Test sonucunda üretilen olasılık değerleri anlamlılık düzeylerinden (%1, %5 ve %10) büyükse H1 hipotezi reddedilir ve H0 hipotezi kabul edilir. Aksine, olasılık değerleri anlamlılık düzeylerinden küçükse H1 hipotezi kabul edilir ve H0 hipotezi reddedilir.

3.1.2. Panel birim kök testi

Panel birim kök testindeki en yaygın sorun, panelin kesitlerinin birbirinden bağımsız olup olmadığının belirlenmesidir. Bir zaman serisindeki değişkenlerin ve sürecin zaman içinde durağan olup olmadığını değerlendirmeden önce kontrol etmek hayati önem taşır. Durağanlık analizinde birim kök testleri kullanılmaktadır. Şu anda panel birim kök testleri iki kategoriye ayrılmaktadır: birinci nesil ve ikinci nesil panel birim kök testleri. Paneli oluşturan kesit birimleri, birinci nesil panel birim kök testi kullanılarak belirlenir. İkinci nesil panel birim kök testleri, panel birimlerinden birine gelen şokun tüm yatay kesitleri aynı düzeyde etkilediğini varsayarak yatay kesit bağımlılığını dikkate alarak birim kök analizi yapmaktadır. Yani yatay kesit bağımlılığı dikkate alınmamaktadır. İlk olarak, özellikle zaman boyutunun kapsamlı olması durumunda, panel veri analizine başlamadan

önce değişkenlerin birim köke sahip olup olmadığını görmek için birim kök testleri kullanılır. Serinin birim kök içermesi söz konusu serinin durağan olmadığı anlamına gelir. Bu durumda analize devam edebilmek ve etkin tahmin sonuçları elde edebilmek için serilerin durağan hale getirilmesi gerekmektedir. Zaman serisi verileri durağan değilse, değişkenler arasında sahte bir regresyon ilişkisi ortaya çıkabilir ve bu durumda tahmin sonuçları modeldeki gerçek ilişkiyi yansıtmaz (Granger ve Newbold, 1974).

Bu testlerin en bilinenleri şunlardır: Levin, Lin ve Chu (2002), Im, Peseran ve Shin (IPS, 2003), Fisher ADF (Maddala ve Wu, 1999), Harris ve Tzavalis (1999), Breitung (2000).), Hadri (2000), Fisher Philips ve Perron (Choi, 2001) Panel Birim Kök testleri. Panel birim kök analizi için geliştirilen testlerin tamamı serilerin durağanlığını en doğru şekilde analiz etmeyi amaçlamaktadır. Bu konudaki çalışmaların derinleşmesi, panel birim kök testleri kullanılarak oluşturulan panel regresyonundaki gelişmeleri de beraberinde getirmektedir. Bu çalışmada Fisher ADF (Maddala ve Wu, 1999) ve Pesaran (2007) yatay kesitsel olarak artırılmış panel birim kök testi (CIPS) kullanıldı.

3.2. Başvurunun Konusu ve Amacı

Bu çalışmanın amacı, Kuznets (1955) tarafından ortaya atılan ve ekonomik kalkınmanın ilk aşamasında gelir eşitsizliğinin artacağını, ancak sanayileşmenin olgunlaşmasıyla azalacağını öngören gelir eşitsizliği modeli olan Ters U hipotezini test etmek ve ekonomik büyümenin gelir eşitsizliği üzerindeki etkisini bu doğrultuda incelemektir.

3.3. Uygulamada Kullanılan Veriler

Bu çalışmada Gini katsayısı gelir eşitsizliğini (gini) gösteren bağımlı değişkendir. Kişi başına GSYİH (gelir) değişkeni de ekonomik gelişmeyi gösteren bağımsız değişkendir. Çalışmada kullanılan diğer kontrol değişkenleri sırasıyla kişi başına düşen GSYİH karesi (gelir2), enflasyon oranı (inf), toplam yatırımlar (inv) ve cari işlemler dengesidir (cab1). Çalışmada 1990-2019 yılları arasında 38 OECD verisi kullandık. OECD

ülkeleri Çizelge 1'de listelenmiştir. Bu kapsamda çalışmada kullanılan ekonometrik modeller aşağıdaki gibidir:

$$gini = \beta_0 + \beta_1 gdp + \beta_2 gdp^2 + \beta_3 Inv + \beta_4 Inf + \beta_5 unemp + \beta_6 cab1$$

Yukarıdaki denklemde Kuznets'in hipotezini test etmek için GSYİH ve GDP2 değişkenleri modele dahil edilmiştir. $\beta\_3 > 0$ ve $\beta\_4 < 0$ ise Kuznets (1955) hipotezi kabul edilir (Nasreddine ve Mensi, 2016).

Çizelge 1. OECD ülkeleri

Avustralya	Finlandiya	Kore, Rep.	Slovak cumhuriyeti
Avusturya	Fransa	Letonya	Slovenya
Belçika	Almanya	Litvanya	ispanya
Şili	Yunanistan	Lüksemburg	İsveç
Kanada	Macaristan	Meksika	İsviçre
Kolombiya	İzlanda	Hollanda	Türkiye
Kosta Rika	İrlanda	Yeni Zelanda	Birleşik Krallık
Çek Cumhuriyeti	İsrail	Norveç	Amerika Birleşik Devletleri
Danimarka	İtalya	Polonya	
Estonya	Japonya	Portekiz	

Bu çalışmada kullanılan verilerle ilgili olarak verilerin tanımı, ölçü birimi ve alındığı kaynaklar ayrıntılı olarak Çizelge 2'de verilmiştir.

Çizelge 2. Değişkenlerin tanımı

Değişken	Tanım	Ölçü birimi	Kaynak
gini	Tahmini hane geliri eşitsizliği		Dünya Gelir Eşitsizliği Veritabanı (WIID)
gdp	Kişi başına GSYİH (sabit 2015 ABD doları)	Kişi başına GSYİH, gayri safi yurtiçi hasılanın yıl ortası nüfusa bölünmesiyle hesaplanır.	Dünya Bankası, Dünya Kalkınma Endeksi (WDI)
gdp2	Kişi başına düşen GSYİH (sabit 2015 ABD Doları)	Kişi başına GSYİH, gayri safi yurtiçi hasılanın yıl ortası nüfusa bölünmesiyle hesaplanır.	Dünya Bankası, Dünya Kalkınma Endeksi (WDI)
inf	oran enflasyonu	GSYİH deflatörü oranı enflasyonu (yıllık %)	Uluslararası Para Fonu
inv	Toplam yatırım	GSYİH'nın yüzdesi olarak toplam yatırımlar, toplam yatırım ve GSYİH'nın bir oranı olarak ifade edilir.	Uluslararası Para Fonu
unemp	İşsizlik oranı	İşsizlik oranı	Uluslararası Para Fonu
cab	cari hesap bakiyesi	Cari hesap bakiyesi (yıllık)	Uluslararası Para Fonu

3.4. Ana Sonuç ve Yorumlar

Çizelge 3 ve 4 sırasıyla analizimize dahil edilen değişkenler için tanımlayıcı istatistikleri ve korelasyon katsayılarını sunmaktadır. Her değişken için ortalama, standart sapma, minimum, maksimum ve toplamı belirledik. İncelenen değişkenler arasındaki korelasyon katsayıları oldukça düşük bulunmuştur.

Model tahmininin sonuçları Tablo 4.8'de sunulmuştur. Ekonomik ilerleme ile gelir eşitsizliği arasındaki ilişkiyi tahmin etmek için üç farklı model kullanılmıştır. Birinci model olan havuzlanmış regresyon modelinde tüm katsayılar istatistiksel olarak anlamlıdır. Tahminlerin aksine kişi başına gelirdeki artış gelir eşitsizliğini azaltırken, sonraki aşamada gelirdeki artış gelir eşitsizliğini artırmaktadır. Bu durumda Kuznets'in (1955) teorisi bu modelde doğrulanamamıştır. Enflasyon oranındaki bir birimlik artış, gelir eşitsizliğinde bir

birimlik bir artışa neden olur. Enflasyonun gelir eşitsizliğini artırdığını göstermektedir. Benzer şekilde, işsizlik ve cari işlemler dengesi büyüdüğünde, gelir eşitsizliği büyür. ancak, toplam yatırımdaki artış, gelir eşitsizliğinin azalmasına katkıda bulunmuştur.

Sabit etki ve rastgele etki analizlerinin sonuçları karşılaştırılabilirdi. Havuzlanmış regresyona benzer şekilde, büyümenin ilk aşamasında kişi başına düşen gelirin artması gelir eşitsizliğini artırırken, sonraki aşamada gelir eşitsizliğini azaltmadı, aksine artırdı. Her iki modelde de enflasyon, işsizlik ve cari açık gelir eşitsizliğinin artmasına katkıda bulunur. Toplam yatırımların gelir eşitsizliği üzerinde istatistiksel olarak anlamlı bir ilişki bulunamamıştır. Her üç model de dikkate alındığında Kuznets hipotezini destekleyecek hiçbir kanıt bulunamadı.

Çizelge 3. Model sonuçları

	Havuzlanmış Regresyon gini	Sabit etkiler (içeriden) regresyon gini	Rastgele etkiler GLS regresyonu gini
Ana			
GDP	-0.00044***	-0.000047***	-0.000052***
	(0.000028)	(0.000012)	(0.000012)
GDP^2	3.27e-09***	4.84e-10***	5.14e-10***
	(2.85e-10)	(1.10e-10)	(1.11e-10)
inf	0.0862**	0.0350***	0.0352***
	(0.0264)	(0.00749)	(0.00757)
inv	-0.424***	0.0145	0.0114
	(0.0487)	(0.0179)	(0.0180)
unemp	0.312***	0.0897***	0.0874***
	(0.0572)	(0.0215)	(0.0217)
cab	0.0156***	0.00319**	0.00292*
	(0.00218)	(0.00117)	(0.00117)
_cons	55.13***	34.03***	34.21***
	(1.645)	(0.626)	(1.137)

Not: * yüzde 10 düzeyinde anlamlandırmayı, ** yüzde 5 düzeyinde anlamlandırmayı, *** yüzde 1 düzeyinde anlamlandırmayı göstermektedir.

4. SONUÇ

Bu çalışmada, 1995-2019 yılları arasında 38 OECD ülkesinden alınan veriler kullanılarak ekonomik kalkınma ve gelir eşitsizliği arasındaki ilişki incelenmiştir. Bu çalışmada havuzlanmış regresyon, sabit etkiler ve rastgele etkiler modeli kullanılarak Kuznets (1955) hipotezi test edilmiştir. veri analizinin bulgularına dayalı olarak elde edilen:

1. Havuzlanmış regresyon sabit etki ve rastgele etki analizleri tutarlı sonuçlar üretti. Kişi başına düşen gelirin artması, büyümenin ilk aşamasında gelir eşitsizliğini artırırken, ikinci aşamada azaltmadı, aksine genişletti. Her iki model de enflasyon, işsizlik ve cari açığın gelir eşitsizliğindeki artışa katkıda bulunduğunu varsaymaktadır. Gelir eşitsizliği ile toplam yatırımlar arasında istatistiksel olarak anlamlı bir ilişki tespit edilmedi. Her üç model de dikkate alındığında Kuznets teorisini destekleyen hiçbir kanıt bulunamadı.

2. GSYİH'nın (kişi başına reel) GINI katsayısı (gelir eşitsizliği) üzerinde negatif, anlamlı bir etkisi olduğu, ayrıca GSYİH2'nin gelir eşitsizliği üzerinde pozitif ve anlamlı bir etkisi olduğu keşfedilmiştir.

3. Enflasyon oranları, işsizlik ve cari işlemler dengesinin gelir eşitsizliği üzerinde olumlu etkisi olduğu tespit edilmiştir. Bu nedenle, bu değişkenlerden herhangi birinin artması, gelir eşitsizliğinde (GINI) artışlara yol açacaktır.

4. Toplam yatırımın gini katsayısı üzerinde olumlu etkisinin olduğu, ancak REM ve FEM'de anlamlı düzeyde olmadığı keşfedilmiştir.

CURRICULUM VITAE

He lives in Erbil province, Iraq. He completed primary, secondary and high school in Erbil province. He graduated from the Statistic Department taken seventh degree in more than one hundred students in his class at Salahaddin University-College of Administration and Economics in 2013. He started his postgraduate study at the department of Statistic, Institute of Natural Applied Sciences at Van Yüzüncü Yil University in Turkey in February 2020.

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