

# Forecasting inequality\_JEP UNSRI

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Research article

## Forecasting the Inequality of Income Distribution in Consequence of the Covid-19 Pandemic

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**Abstract:** This study aims to forecasting the Covid-19 Pandemic's effect on income inequality distribution in Kulon-Progo Regency during of 2020 to 2028. The study analysis tools utilized forecast are linear and non-linear trend. The historical data use during of 2010 to 2019, data source obtained from Central Bureau of Statistics Yogyakarta in statistical series book of 2020. The findings of forecast result show that the Covid-19 pandemic directly impact on the increased income inequality distribution. The implication is to carry out the process of economic recovery due to the Covid-19 pandemic case by identifying community groups who are vulnerable to decreased income through strengthening social safety nets. In addition, government policies can also optimize the utilization and transportation services to increase farmer exchange rates, because most people work in the agricultural sector.

**Keywords:** Income inequality; Gini Index; Covid-19; Regional economy; Kulon-Progo

**JEL Classification:** R11, R12, R13

**Abstrak:** Penelitian ini bertujuan untuk meramalkan pengaruh Pandemi Covid-19 terhadap distribusi ketimpangan pendapatan di Kabupaten Kulon-Progo selama tahun 2020-2028. Metodologi penelitian yang digunakan adalah trend linier dan non-linier. Data historis yang digunakan selama tahun 2010 sampai 2019 yang diperoleh dari Badan Pusat Statistik Yogyakarta dalam buku seri statistik tahun 2020. Hasil estimasi menunjukkan bahwa pandemi Covid-19 berdampak langsung pada peningkatan ketimpangan distribusi pendapatan. Implikasinya adalah proses pemulihan ekonomi akibat kasus pandemi Covid-19 dengan mengidentifikasi kelompok masyarakat yang rentan terhadap penurunan pendapatan melalui penguatan jaring pengaman sosial. Selain itu, kebijakan pemerintah juga dapat mengoptimalkan pemanfaatan dan jasa transportasi untuk meningkatkan nilai tukar petani, karena sebagian besar masyarakat bekerja di sektor pertanian.

### How to Cite:

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## 1. INTRODUCTION

The Covid-19 pandemic has a negative impact on the increasingly unequal community income distribution. Directly this income inequality has a major impact on the growth and socio-economic development of the community. The unequal distribution of income is caused by limited economic activities in all sectors which have an impact on society, such as layoffs and income loss. The problem in economic development is to improve the welfare of the community in the form of increased income, but the distribution must also be distributed among community groups (Tolmachev et al., 2019). The most crucial thing in ensuring the sustainability of economic growth and socio-economic

development is how income distribution of rich community are not much different from the poor or the existing inequality is still reasonable (Choi, 2019).

The current challenge is that inequality in income distribution is on the rise again. Inequality of income distribution not only threatens economic aspects, the problem of inequality also significantly threatens social and political aspects which in turn can threaten the stability of society, especially in large, diverse and young democracies that are plagued by poverty and widespread vulnerability amid rising expectations (Tadjoeddin et al., 2020). Meanwhile, lower-income inequality in developing countries have different modalities and varying degrees of scope in developing social security programs, with their own success stories and shortcomings in implementation (Teka et al., 2019). Policy and program such as social security has gained popularity in recent decades, especially during the Covid-19 pandemic as a way of minimizing and minimizing the risk of the widening inequality of income distribution and maintaining sustainability development.

The several studies that the effect of the current Covid-19 outbreak has overwhelmingly impacted neighborhood-related historically disadvantaged populations, such as the proportion of racial and ethnic minorities, refugees, and lower-income households (Maroko et al., 2020). The effects of Covid-19 in countries has high impact include high insurance rates, policy deficiencies in pluralistic health services, high spending, the increased risk of non-communicable disorders, lost growth opportunities, and socio-economic consequences such as unemployment and deprivation (Rodela et al., 2020). The Covid-19 pandemic and subsequent food availability challenges have exposed deep gaps in the food supply and delivery network. The stressful situations such as this, customers often exhibit habits intended to minimize the likelihood that they will not be able to afford food or other products at a later date (Power et al., 2020). The disparity, however, was still the same range, that is to say, low impartation. Covid-19 does not discriminate, a dangerous myth has repeated, side by side with the increased vulnerability of the most socially and economically deprived (Patel et al., 2020).

The Gini index is a standard indicator of wealth inequality, such as disparities in employment, education, and ability (Furman et al., 2019). Increases equal income through lower economic growth, biased tax systems are favoring wealthy and well-connected lower levels and social expenditure efficiency, and unfair access to education and public services (Policardo et al., 2019). Comprehensive literature analyzed the relationship between urbanization on the one hand and economic development and income equity on the other (Sulemana et al., 2019).

The global development cycle reduced income inequality by raising the per capita income. At the beginning of a development cycle, it shows a spike in income inequality followed slowly by a decrease in income inequality (Fawaz & Frey, 2020). The popularity of the Gini index is attributed to its simplicity and ease of analysis thanks to its straightforward graphical association with the Lorenz curve; also, many valuable decompositions by origins and classes, strong inferential properties, as well as initial formulations and extensions proposed later by many researchers have helped to illustrate its applicability in different ways (Giorgi & Gigliarano, 2017; and Banerjee et al., 2020). To simultaneously overcome the limitation of the Gini index in that it is less sensitive to income distribution inequality and to limit the inter-decade ratios that ignore difference during income distribution, an index of inequality is introduced (Sitthiyot & Holasut, 2020). Income is associated with numerous social health determinants, such as education, living conditions, and community resources, and whether people can afford health work (Simon et al., 2020).

The regional climate in which it is present, career precariousness degrades working and living conditions. This precariousness facilitates labor migration to areas with better incomes and working conditions, a scenario that exacerbates inequality and establishes relationships between the middle and the periphery. From this point of view, the central regions or representatives, where the agglomeration powers and the presence of improved returns are greater, are often those with a better quality of life. The economic impact the Covid-19 is expected to be large and will drive millions into poverty, including children poverty. The rate of poverty among children is a vital indicator of wellbeing for children. The child poverty rate, as a metric, shows us how many children at a time live in households with annual earnings or financial services below a defined level considered inadequate to fulfill basic needs (Chaudry & Wimer, 2016).

Covid-19 also suspended manufacturing operation and study forecast instantaneously using in-person methods. It urged researchers to reorganize their programs to include non-in-person tasks or to explore electronic and remote ways (Lieggio & Caragata, 2020). Poverty reduction has been a core subject for researchers in the social sciences, from economics to banking, management, and entrepreneurship. Generally speaking, in recent decades, faster and wider economic growth has helped large numbers of people to move out of poverty, so that severe poverty has dropped to less than 10 percent of the world's population. Poor urban populations are frequently underestimated, such as those living in informal settlements, and metrics used to quantify basic deprivations do not provide policymakers with the knowledge they need to devise and enact policies to fix urban deprivations.

Poverty has a broad and multidimensional perspective so that this condition of debt, ultimately results in inequality between low-income and high-income groups, and this is what is called inequality (Robles Aguilar & Sumner, 2020). The same condition has been experienced by Indonesia, previously, inequality of income distribution in Indonesia had reached a record high of 0.41, this rate is calculated on the Gini index of household consumption spending during 2011-2014. Inequality of income distribution has become the current challenge because it will threaten the main goal of increasing growth and the sustainability of economic development.

The study location was carried out at Kulon-Progo Regency, this area is one of five regencies in the province of Yogyakarta's with the highest economic growth before the Covid-19. The high economic growth is triggered by the development of international airports and the development of an airport city. From its economic structure, sector that shapes economic growth in Kulon-Progo in 2020, almost all areas experienced a decline in growth, except for the health services and social activities, transportation and warehousing, and information and communication sectors. The central government's budget reallocation policy of at least 50 percent has a significant effect on the economic structure in Kulon-Progo Regency. The budget will be focus on handling the settlement of the Covid-19 pandemic case so that several regional strategic program have to be postponed or rescheduled (Badan Pusat Statistik, 2020).

This paper assesses the impact of Covid-19 on the inequality of income distribution during the Covid-19 period and estimates until 2024. It predicted that the economic effects would be significant, lowering the economic growth forecast from 5 percent in 2020 to between 4.2 percent and -4.7 percent (Suryahadi et al., 2020). Before the Covid-19 pandemic, this group's healthcare needs also needed more significant consideration, especially concerning drug use, but these issues were ignored mainly during this pandemic (Webster et al., 2020). The number of economic activities conducted online also resulted in inequality towards people who are unable to have access to technology (Beaunoyer et al., 2020).

This study analyzes and forecasting the impact of the Covid-19 pandemic on the inequality of income distribution in Kulon-Progo Regency. The basic theory used is the income distribution theory from the Gini Index. The Gini index is a scaled measure of distribution inequality based on the Lorenz curve that ranges from 0 to 1. The Lorenz curve is a graph in economics that depicts income or wealth inequality as the cumulative distribution of a nation's income or wealth (or some other economic criterion of interest) (Domicolo & Mahmoud, 2020). The benefits of this study are especially for the Kulon-Progo Regency government to determine the impact of the Covid-19 pandemic on community income inequality and to formulate policies to minimize this impact. For other authors, the results of this study are useful in finding out how the impact of the pandemic on the income distribution of the affected community. The study question is how the impact of the Covid-19 pandemic in Kulon-Progo Regency until 2028 and efforts to anticipate it.

## **2. RESEARCH METHODS**

### **2.1. Data**

The data used in this study is Gini index series data from 2010 to 2019. The data used in this study is Gini index series data from 2010 to 2019. The data used in this study is the Gini index series data from 2010 to 2019. The data source is obtained from D.I. Yogyakarta in Figures for 2020. This

amount of data starts from 2010 because it assumes that before that year, there were several shocks in the Indonesian economy and the world economy that would disrupt forecast, for example the economic crisis, bailout in the United States, and the global crisis. The amount of data for 9 years is sufficient to carry out forecast, especially for income inequality between residents. The data is then forecasted using eleven forecast methods and selected the best models by choosing the best goodness of fit value. The data is then forecasted using eleven forecast methods and selected the best models by choosing the best goodness of fit value.

## 2.2. Gini Index and Forecasting Methods

The Gini concentration index, also known as the concentration ratio, is probably the most common statistical index used in social sciences to measure concentration when a positive random variable is distributed (Giorgi & Gigliarano, 2017). After dividing along a particular dimension, the Gini index measures the integrity of a given class. Better separation increases the simplicity of the splitting pairs.

A statistical estimator of Gini index is defined as follows (1). Suppose  $X_j - X_i$ , are the observations of a sample of size  $n \geq 1$  independent, identically distributed random variables from a common distribution of known mean  $\mu > 0$  (Domicolo & Mahmoud, 2020). The Gini index is estimated by:

$$G_n = \frac{\sum_{1 \leq i \leq j \leq n} |X_j - X_i|}{n^2 \mu} \quad (1)$$

If  $\mu$  is not known, it is replaced by an estimator of it. The Gini coefficient varies between 0 (case of perfect equality) and 1 (perfect inequality), and it is invariant under scale transformations. It is equal to 0 if all individuals have the same income value, and equal to 1 if all individuals except one have zero income. In contrast, one individual holds the entire income amount (Giorgi & Gigliarano, 2017).

The methods used for forecast are linear and non-linear. The selection of the forecast method in this study was carried out to select one of the existing methods as the best method to represent the method used to be the forecast method. A good forecast method is seen from the largest and most significant R-square value and F-statistic value. The Gini Index is presented in the following equation:

$$\text{Linear } Y_t = \beta_0 + \beta_1 T \quad (2)$$

$$\text{Logarithmic: } Y_t = \beta_0 + \beta_1 \ln(T) \quad (3)$$

$$\text{Inverse: } Y_t = \beta_0 + \frac{\beta_1}{T} \quad (4)$$

$$\text{Quadratic: } Y_t = \beta_0 + \beta_1 T + \beta_2 T^2 \quad (5)$$

$$\text{Cubic: } Y_t = \beta_0 + \beta_1 T + \beta_2 T^2 + \beta_3 T^3 \quad (6)$$

$$\text{Compound: } Y_t = \beta_0 \beta_1 T \quad (7)$$

$$\text{Power: } Y_t = \beta_0 T \beta_1 \quad (8)$$

$$S: Y_t = \epsilon \left( \beta_0 + \frac{\beta_1}{T} \right) \quad (9)$$

$$\text{Growth: } Y_t = e(\beta_0, \beta_1, T) \quad (10)$$

$$\text{Exponential: } Y_t = \beta_0 e \beta_1 T \quad (11)$$

$$\text{Logistic: } Y_t = \left( \frac{1}{u} + \beta_0 \cdot \beta_1 T \right) - 1 \quad (12)$$

Where:  $Y_t$  is variable predicted, the Gini index value for each type of forecast method to be calculated;  $T$  is Year, calculation year for each period;  $\ln$  is smoothing method by using natural



logarithm;  $e$  is constant numbers in the equation 2.718282;  $\beta_0$  is the value of the constant coefficient that shows the value of the predictive variable when the independent variable is zero,  $\beta_1, \beta_2, \beta_3$  The parameter coefficient that shows the magnitude of the influence of the independent variables on the predictive variable (Y).

The method of constructing the model that can predict values for new events is known as predictive modeling. It forecasts future events based on historical evidence. There are many different types of predictive modeling techniques including ANOVA, linear regression (ordinary least squares), logistic regression, ridge regression, time series, decision trees, neural networks, and many more (Zhang & Sun, 2020). The Gini index is the most frequently used of several summary measures of inequality derived from the Lorenz curve, which plots cumulative income shares against the cumulative percentage of the population. A hypothetical Lorenz curve following an upward slanting 45° diagonal would indicate perfect equality (the bottom 10 percent receives 10 percent of all income, the bottom 50 percent receives 50 percent, etc.). The Gini coefficient is a measure of the degree of deviation from the diagonal, indicating the extent of income inequality.

### 3. RESULTS AND DISCUSSION

The Covid-19 pandemic during of 2020 has an impact to almost all sectors experienced growth decline, except for the health services and social activities, transportation and warehousing, and information and communication sectors in Kulon-Progo Regency. The central government's budget reallocation policy of at least 50 percent has a significant effect on the economic structure in Kulon-Progo Regency. The budget will be focused on handling the settlement of the Covid-19 pandemic case so that several regional strategic forecast have to be postponed or rescheduled.

The health services sector and social activities, for example, will experience a very significant percentage increase of 218.25 percent compared to 2019. This is due to the reallocation of the regional budget for health and distribution of social assistance to community groups affected by the Covid-19 pandemic case. The Transportation and Warehousing sector will also increase significantly by 38 percent because Yogyakarta International Airport (YIA) has started operating even though it has not fully run normally during the Covid-19 pandemic. The number of passengers who will arrive at YIA will not reach the ideal target due to government policies that limit community mobility and also the implementation of the Covid-19 health and safety protocol, especially in semester-one, but it is estimated that by semester-two YIA can operate optimally.

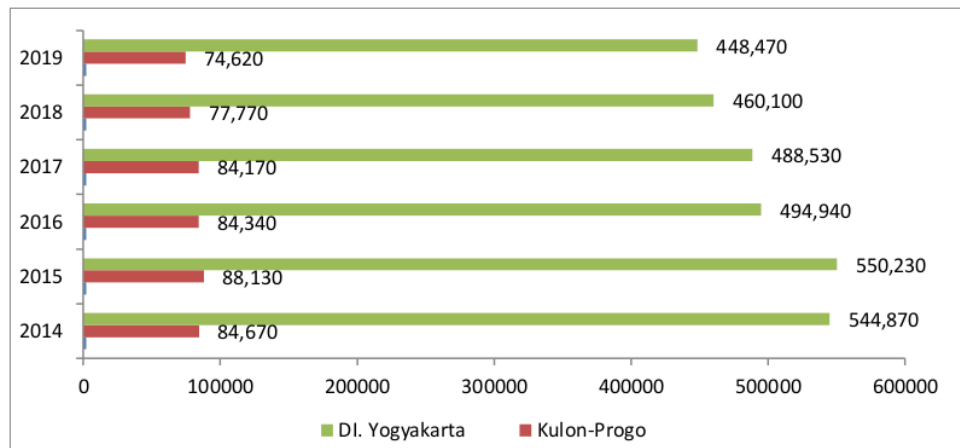
Another sector that will also increase significantly is the information and communication sector. This sector is predicted to increase by 30 percent. One of the reasons is the use of access to information via the internet due to community activities carried out online. The case of the Covid-19 pandemic has indeed directed people to work and study from home by utilizing internet access. The sector that experienced the highest decline was the construction sector, which was predicted to decline by -20 percent. The reason is that the construction phase of the YIA construction forecast is almost complete and has entered the finishing stage. The high contribution of this forecast at the start of its construction was enough to boost the construction sector so that when this forecast is completed it will certainly have a lot of impact on the decline in the construction sector. Meanwhile, the sectors supporting construction growth also experienced a decline such as mining and quarrying which fell -3.61 percent.

The sector that was also heavily affected by the restrictions on access related to Covid-19 was the provision of accommodation and food and drink, which fell to -4.67 percent. Apart from that, the sectors with minus growth were real estate at -1.17 percent, corporate services at -2.79 percent, and other services at -0.65 percent. The case of the Covid-19 pandemic has indeed contracted all sectors that form economic growth in Kulon-Progo Regency so that growth can decrease by 12.69 percent in 2020 to 0.81 percent from 13.49 percent in 2019.

Then 2021 is predicted to be the year of economic recovery after the Covid-19 pandemic. The forecast results under the optimistic scenario of 7.10 percent growth based on the assumption that development, especially physical development, which was previously delayed, can resume

operations so that the construction sector is estimated to grow 15 percent at the same time the highest. Likewise, in the moderate and pessimistic scenario, construction is also a sector that is estimated to grow 10 percent. Besides, sectors that are predicted to grow quite significantly are wholesale and retail trade; repair of cars and motorcycles, transportation and warehousing, and provision of accommodation and food and drink. In each scenario, it is forecasted that the sector will grow 7 -10 percent based on economic activity returning to normal coupled with the operation of Yogyakarta International Airport as a booster for economic activity in Kulon-Progo Regency.

Kulon-Progo Regency supported by three main sectors, namely: the construction sector (19,95%), the agriculture, forestry, and fisheries sector (15,86%); large and retail trade; car repair and motorcycle (12,36%). In the third sense the industry can donate, 17 percent of the total economy of Kulon-Progo Regency in 2019. The number of poor people in Kulon-Progo Regency in 2019 has decreased compared with the year 2014, although in the process there are several fluctuations. In 2014, the population was 84.67 thousand. However, in 2015 there was an increase in the number of poor people that was quite significant to 88.13 thousand souls. In the next year 2016, the government of Kulon-Progo was able to reduce the number to 84.34 thousand people. This decline is quite significant because it is below the year number 2014.



**Figure 1.** The Poor Population in Kulon-Progo Regency and Yogyakarta Province, 2014-2019

Source: Processed data

At the time of 2014-2016, there were substantial fluctuations due to considerable increase and decline. Only in the next two years is 2017 and 2019 there is a significant decline in numbers. In 2017, the number of poor people decreased to 84.17 thousand, and then it declined again in 2018 to 77.77 thousand. In the year 2019, the decline in poverty figures reached 74.62 thousand. While in Yogyakarta Province, in 2019 the number of poor people was 448.47 thousand inhabitants. The spread of poor people in Yogyakarta Province is dominant in the urban area of 304.66 thousand inhabitants. The rural area is 143.81 thousand inhabitants. Compared to the data from Kulon-Progo and Yogyakarta Province, Kulon-Progo Regency accounted for 16.64 percent of the poor people in Yogyakarta Province. This percentage experienced a reasonably high increase. Because in the year 2014, Kulon-Progo only accounted for 15.54 percent. This percentage indicates that despite the decline in Kulon-Progo regency, it will increase if the number is pair with the Data on the percentage of the number of poor people in the Yogyakarta Province level (Progo, 2020).

Economic growth in 2022-2024 in Kulon-Progo Regency is estimated to continue to increase. The sector whose growth continues to show a significant increase in Transportation and Warehousing by 10.97 percent in 2022 to 19.29 percent in 2024. Also, the Accommodation and Food and Drink Provision sector show the same pattern, in 2022 the growth is 10 percent, 16 percent to 19.98 percent in 2024. Maintaining economic growth during the Covid-19 pandemic is not easy, therefore the Kulon-Progo Regency government continues to focus on three things. First, health and

humanitarian problems must be addressed. Second, to ensure the condition of the community, especially the social safety net, to the lowest communities and how to protect the economic business sector so that it does not suffer damage or survive in difficult situations. Next is protecting financial sector stability.

**Table 1.** Forecasting Methods Selection

Approach	Adj. R <sup>2</sup>	F-Stat	df1	df2	Sig.
Linear	0.031	0.190	1	6	0.678
Logarithmic	0.063	0.403	1	6	0.549
Inverse	0.085	0.556	1	6	0.484
Quadratic	0.093	0.256	2	5	0.784
Cubic	0.203	0.339	3	4	0.800
Compound	0.020	0.123	1	6	0.738
Power	0.049	0.312	1	6	0.597
S	0.075	0.484	1	6	0.513
Growth	0.020	0.123	1	6	0.738
Exponential	0.020	0.123	1	6	0.738
Logistic	0.020	0.123	1	6	0.738

Source: Authors calculations

From 2021 to 2024, it is estimated that it will continue to show an increase of up to 10.06 percent in 2024. The decline in Gross Regional Domestic Product (GRDP) growth in 2020 was caused by the construction sector which experienced a significant decline reaching -31.12 percent. The accommodation and food and beverage provision sector also experienced a decline in growth at -1.64 percent. Meanwhile, the Health Services and Social Activities sector was the sector with the highest increase reaching 246.47 percent. The communication and information sector also increased significantly by 35.57 percent. Other sectors that have experienced an increase will not have significant growth. This is because the economy will still focus on efforts to restore the people's purchasing power, which has dropped dramatically due to the Covid-19 pandemic case.

In 2020, the Gini index of the Kulon-Progo Regency is predicted to increase from 0.360 in 2019 to 0.383 in 2020. However, from 2021 to 2024 the Gini index is predicted to continue to decline. This is due to the entry of several long-term forecast investments such as the construction of the Tanjung Adikarta port, the construction of the Borobudur Temple Buffer Zone, and the construction of the Menoreh Surgical road. Besides, there are also other forecast such as the development of rail access from Kedundang Station to the airport, construction of an airport underpass, the Kamijoro Government Business Entity Cooperation Plan, and Tanjung Adikarta Port. The growth rate is predicted to increase in 2022 where the GRDP figure will reach Indonesian IDR.10,073.35 billion. Until 2024, the growth based on constant prices in Kulon-Progo Regency is at IDR.11,796.35 billion with a growth rate of 8.40 percent. GRDP at current prices will slowly improve along with the recovery of economic conditions due to the Covid-19 pandemic case.

In 2021 the poverty line will increase by IDR.10,174 to IDR.352,140 per capita per person per month with the percentage of poor people decreasing to 18.58 percent. The year 2022 is predicted to be a turning point in improving poverty in Kulon-Progo Regency. The poverty line will increase by IDR.9,810 to IDR 361,950 per capita per person per month with the percentage of poor people returning to decline to 18.33 percent. This excellent graph in 2022 is due to the effects of the Covid-19 pandemic which is estimated to have ended and economic activity has returned to normal. In addition to the large forecast already operating, it will revive the economy of the Kulon-Progo Regency. In 2023, the increase in the poverty line will slow down from IDR.9,446 to IDR.371,396 per capita per person per month with the percentage of poor people reducing to 18.10 percent. Until the end of 2024, the poverty line is predicted to increase again to IDR.380,477 with the percentage of poor people reducing to 17.88 percent.

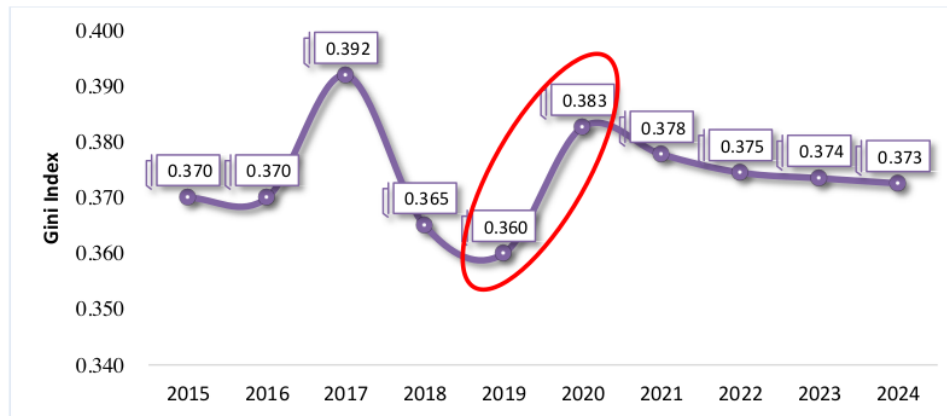


**Table 2.** Comparative Results of Estimating Income Inequality in Kulon-Progo Regency

Approach	Gini ratio results									
	2020	2021	2022	2023	2024	2025	2026	2027	2028	
Linear	0.361	0.359	0.357	0.355	0.352	0.350	0.348	0.345	0.343	
Logarithmic	0.363	0.362	0.361	0.360	0.359	0.358	0.357	0.357	0.356	
Inverse	0.366	0.366	0.366	0.366	0.365	0.365	0.365	0.365	0.365	
Quadratic	0.401	0.419	0.439	0.462	0.489	0.519	0.552	0.588	0.628	
Cubic	0.270	0.175	0.038	-0.146	-0.386	-0.686	-1.056	-1.500	-2.026	
Compound	0.362	0.360	0.359	0.357	0.355	0.353	0.351	0.350	0.348	
Power	0.363	0.362	0.361	0.360	0.359	0.358	0.358	0.357	0.357	
S	0.365	0.365	0.365	0.365	0.364	0.364	0.364	0.364	0.364	
Growth	0.362	0.360	0.359	0.357	0.355	0.353	0.351	0.350	0.348	
Exponential	0.362	0.360	0.359	0.357	0.355	0.353	0.351	0.350	0.348	
Logistic	0.362	0.360	0.359	0.357	0.355	0.353	0.351	0.350	0.348	

Source: Authors calculations

The number of poor people is also predicted to continue to decrease until 2024. In 2020, the number of poor people was 83.39 thousand people, an increase of 8.77 thousand from 2019 of 74.62 thousand people. The high number of poor people in 2020 is mainly due to disrupted economic activity and affecting population income due to the Covid-19 pandemic. Besides, Covid-19 has also resulted in many people losing their jobs, decreasing purchasing power, and still limited employment opportunities. The economy is getting sluggish because of this case forcing many companies to reduce the number of employees as a form of rationalization of reduced incoming turnover. In 2021, marked by the normal operation of the YIA, it will have an impact on increasing community mobility and affecting formal and informal economic sectors. So it is predicted that the number of poor people will decrease to 79.83 thousand people.



**Figure 2.** Forecast Gini Index from 2015-2024

Source: Authors Calculation

To show the level of equal distribution of community income distribution, high, medium, or low inequality can be quantitatively analyzed using the Gini Index. The Gini Index values range from 0 to 1. The closer to one, it is said that the level of income inequality of the population is widening, or approaching perfect inequality. Conversely, the closer to 0 the income distribution is more evenly distributed, or closer to perfect equality.

In 2021, the Gini index is predicted to be at 0.378. Then it dropped slightly to 0.375 in 2022. The same thing happened in 2023, where the Gini index will decline to 0.374. Until the end of 2024, the Gini index of Kulon-Progo Regency is predicted to be 0.373 (Figure 2). Several experts explained that the Gini Index is not only based on the value of income inequality but also influenced by other

factors such as the composition of sectoral economic growth and demographic structure. One of the predictions of the high Gini index in Kulon-Progo Regency is because the high Gini ratio is influenced by high economic growth in the service sector and the relatively large composition of the unproductive age population.

Inequality will get worse if the welfare level of the lower-income group grows slowly or even falls, while the welfare level of the upper-income group proliferates. Inequality will always exist in the development process, especially in the early stages of development. The widening gap will give birth to various dissatisfaction, which if it continues to accumulate, can cause unrest that leads to several types of horizontal conflicts that occur in society. In 2022, it is predicted that the poor population will again decrease to 79.33 thousand people. One of the reasons is that the tourism and industrial sectors will continue to increase given the strategic position of Kulon-Progo Regency which is the link between Yogyakarta and Central Java Provinces. The forecast for the construction of the south ring line and the development of industrial designated areas in Sentolo and Temon Districts will affect the increase in community economic activity. It is predicted that the poor population in Kulon-Progo Regency will continue to decline until 2024, with the number of poor people reaching 78.43 thousand people.

The various efforts have been made by the Kulon-Progo Regency Government to reduce the impact of the Covid-19 pandemic on the economy, such as labor-intensive program as a policy in overcoming income distribution inequality, there are 63 labor-intensive programs in Kulon-Progo Regency, all of which are physical infrastructure forecast such as road works (conblock) and dam. The package details include 52 packages worked on in the 2020 revised APBD, and the remaining 11 packages in pure regional budgets. The total funds disbursed for the entire package reached IDR.5 billion. For the municipal budget of IDR.400 million, for the pure regional budget of IDR. 700 million, and for the Revised Regional Budget of IDR.4 billion. The progress of labor-intensive development carried out in pure regional budgets, there are seven points that have reached 99 percent and one point 45-50 percent. The remaining one point will be worked on in the Amendment budget which is currently still waiting for the evaluation results at the provincial level along with the other 51 packages being worked on in the revised APBD. These programs and policies are expected to influence the course of the economy due to the Covid-19 pandemic and expand employment to reduce poverty. This program also supports the Kulon-Progo Regency policy in fulfilling community resources, and the labor-intensive structure of this infrastructure, especially in unemployment.

The poverty line in Kulon-Progo Regency is predicted to increase slightly in 2020 even though the prolonged case of the Covid-19 pandemic affects people's economic activities. Mainly the impact on people's income is decreasing. The poverty line is the minimum standard of community income in meeting their basic needs. If a person's income is below the poverty line, they are categorized as poor. The ideal condition that must be achieved is to increase the poverty line gradually but followed by a decrease in the number of poor people. This shows that the community's income has gradually increased and the poor has decreased.

The forecast graph of the poverty line and the percentage of poor people in Kulon-Progo Regency, it is quite good. The poverty line gradually increases every year and is indicated by the percentage of poor people decreasing. Even though in 2020, the increase in the percentage of poor people was quite high due to the Covid-19 pandemic. In 2020, the poverty line rate is IDR.341,966 with a percentage of the poor at 19.56 percent. The poverty line will increase by IDR.10,174 to IDR.352,140 with the percentage of poor people decreasing to 18.58 percent. The year 2022 is predicted to be a turning point in improving poverty in Kulon-Progo Regency. The poverty line will increase by IDR.9,810 to IDR.361,950 with the percentage of poor people returning to decline to 18.33 percent. This excellent graph in 2022 is due to the effects of the Covid-19 pandemic which is estimated to have ended and economic activity has returned to normal. In addition to the large forecast already operating so that it will revive the economy of Kulon-Progo Regency.

Compared with some of the other findings of the recent study, some similarities and differences can be compared. During the recession, a large increase in the size of compensation partly compensated for the loss of consumer income for all people, regardless of their role in the household disposable income distribution (O'Donoghue et al., 2020 and Teguh & Bashir, 2019).

Impacts on GDP's income components are presented (at factor cost) in Africans. When both direct and indirect (knock-on) effects are taken into account, GDP at factor cost decreases by 34 percent. Direct lockdown policy shocks account for about 14 percent of the 34, while indirect impacts account for about 20 percent. Notably, the negative effect on wages is greater for employees with fewer qualifications (Arndt et al., 2020). In case of South Africa, Jiwani & Antiporta (2020) findings that differences between the richest and poorest households are troubling, with disparities of up to 63.7 percentage points. In Burundi, the lowest access in the country, with just 3.8 percent of rural residents and 1.7 percent of the poorest households having access to water and soap (Jiwani & Antiporta, 2020).

#### 4. CONCLUSIONS

The Covid-19 increased the income inequality in the Kulon-Progo regency. This discrepancy is caused by a decrease in the buying power of some communities that losing work due to pandemics. Income inequality in the year 2020, the Gini index of Kulon-Progo Regency predicted to increase from 0.360 in 2019 to 0.383 in 2020. Nevertheless, in the year 2021 to 2024, the Gini index is expected to continue to decline with long-term investment. One of the alleged heights of the Gini index in Kulon-Progo because the high Gini ratio is influenced by the high economic growth in the service sector and the composition of the relatively sizeable unproductive age population. It can be done by implementing the process of economic recovery due to Covid-19 pandemic cases through: (1) vulnerable group identification and strengthening the social safety net of the community, and (2) optimizing the utilization and transportation services. Inequality will get worse if the welfare level of the lower-income group grows slowly or even decreases, while the welfare level of the upper-income group grows rapidly. Inequality will always exist in the development process, especially in the early stages of development, but the widening inequality must be controlled. The widening inequality will give rise to various dissatisfaction, which if it continues to accumulate, can cause unrest that leads to various kinds of horizontal conflicts that occur in society.

#### LIMITATION AND STUDY FORWARD

The contribution of this study is to use the alternative twelve forecast methods using time series data. Study carried out so far only uses one or two approaches in making forecast. Also, the impact of the Covid-19 pandemic, which has not occurred for a year, is analyzed for its impact on the economy, especially income inequality. Kulon Progo Regency is an area that has experienced very high growth due to the construction of an international airport. To improve future study, it is advisable to use the addition of two different test analysis tools to clarify the impact of a pandemic between the period before and after the pandemic.

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