Population and Economic Growth Nexus: Evidence from Indonesia

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Abstract

The priority of this paper is to examine the relationship to and impact of population on economic growth and selected variables in Indonesia. This paper uses time-series data of total population, purchasing power parity, Gross Domestic Product (GDP) and unemployment rate in Indonesia for the period 1987-2020. The data are retrieved from the World Bank World Development Indicator, St. Louisfed and Trading Economics. The method applied to analyze the data is Ordinary Least Square (OLS) with the support of EViews software. The finding shows that the population has a significant impact on the purchasing power parity, unemployment and GDP which means that the population indirectly impacts the economic growth in Indonesia. Both economic and demographic factors used in this paper are important in explaining the total population and economic growth in Indonesia and hence in view of policy implications. The implications may also allow the policymakers to come up with a new policy that helps to control the population growth in order to boost the economic growth in Indonesia.

Keywords: GDP; purchasing power parity; standard of living; unemployment; population size; Indonesia

JEL: F62; E21; E24; J11

Introduction

Population is part of the universe. In 2015, the world's population reached about 7.3 billion people. Geohive (2015) reported China as the most populous in the world, followed by India and the USA, while Indonesia ranks fourth with 258,812,062 people. It also reported that Indonesia's yearly growth is 1.17 percent with a daily increase of 8,267 people.

However, during 1800, the world's women bore an average of seven to eight children each (Dao, 2012). Today, that number is just below three. Basically, there are two main reasons for this decline which is accounted for with marriage. First, delaying the marriage period or reduce the quality of time with family,

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especially when entering the productive age and more busy working, so there is less time to have children and miss the best moments with your partner. Second, because of the higher living-cost, they try to limit the number of children in the family because they think having more children means more cost (ZA et al., 2021).

Meanwhile, in a developing country such Indonesia, Peterson (2017) shows that the country is experiencing a tremendous increase in their population growth. It is estimated that the Indonesian population growth will continue to increase for a period of time. Indonesia is a country that is known as the fourth populous country in the world. Indonesia 2014 population is estimated at 252.8 million, an increase from 2013 estimate of 250.6 million (World Population Review, 2015). In 2015, as expected, the population in Indonesia already reached 255, 708, 785 people. This data is consistent with what Todaro & Smith (2011) stated in their book and provides evidence that the developing countries are getting populous, especially in the case of Indonesia.

Indonesia's population has grown to 249.9 million in 2013, from 162.5 million in 1985. There is a decline of population growth in Indonesia during the years. In relation to that, Indonesia's economy in terms of real GDP has also grown tremendously from about 5.8 percent in 2013 compared to 3.5 percent in 1985 (World Bank, 2015). This declining situation seems to indicate that there is a relationship between population growth and economic growth in Indonesia.

The growth of population in Indonesia doubled in 2020 compared to 1987. By examining this indicator, we could know whether the increase of the population is contributing to economic growth. For standard of living, they assumed that the higher the economic growth and development of a country, the better the standard of living. This is because with the higher GDP, the infrastructure of a country is expected to be better and improved. Last, unemployment rate is another economic indicator which could explain how the economic growth reacts. If there is higher unemployment, then the country is expected to be still experiencing a low economic growth.

In short, this paper will focus on the possibility of population growth being associated with economic growth. It aims to determine the correlation between the population and economic growth. Apart from that, if there is a correlation between economic growth and population growth, then what impact does it have on the standard of living of those people? At the same time, if there is a correlation between economic growth and population growth, then what is the impact of population and economic growth on the country's unemployment rate? Hence this piece of research aims to study the relationship and impact of population on economic growth in Indonesia. Apart from that, it also aims to study what other indirect relationship and impact does the population have on the selected variables in the short and long run.

Literature Background

Review of the relationship between population and economic growth

Puleston & Tuljapurkar (2008) review Marquis de Condorcet's understanding which says that unlimited population is good because the larger the population, the more people are available to increase the means of subsistence. At the same time, Rehorick (1979) reviews Godwin's view based on the

Reason's saying that population can be under control as long as people can overcome their sexual desires by their intellectual mind.

With the improvement in the people's mind, they can control the growth of population, which is inconsistent with Malthus' theory. In some other views, intervention to control the population is an alternative to avoid malnutrition due to hunger, food crises, reduce poverty, and prevent the depletion of natural resources (Scoones et al., 2019).

Simon (1987) stated that a big size of population will have a negative impact on the country's economic growth as it also depends on their level of education than the overcapacity of the population. If a country has a big size of population but their people have low education, then their size of population will not impact their economic growth. In addition, in the very short run, additional people will be a burden. However, under conditions of freedom, population growth poses fewer problems in the short run and brings more benefits in the long run under the condition of government control, as their government has to consider the source of food that they have in place and the size of the people that they need to feed before implementing a policy. Again, on the other hand he stated that the rate of population does not determine the rate of economic development, but in his studies, he did not deny that population affects the size, growth and the density in economic progress. It is not yet proven that population growth in the more developed world increases the income per person, while higher population density in less developed countries is associated with a higher rate of economic growth (Furuoka, 2009).

Another positive view from Sinding (2009) they related mentions that population can be beneficial to an economy because population growth boosts technological advancement. A rising population promotes the need for some sort of technological change in order to meet the rising demands for certain goods and services.

Consistent with Simon (1987), Muharromy & Auwalin (2021) found out that there is a positive relationship between the population growth and economic growth in the long-run. Other researchers, Ashraf et al. (2013) and Stuckler (2008) using standard neoclassical theory, argued that the movement in observed relative prices can account for over 60 percent of the fall in fertility and over 50 percent in the increase in per-capita income in England during the key years of the demographic transition.

Review of the relationship between standard of living and economic growth

Cantillon (2013) and Fleurbaey & Gaulier (2009) explained that in order to understand the differences in living standards, it is important to understand the reasons for different growth experiences in different countries. In this study, several variables have been used to show the standard of living, such as per capita output rate, capital per worker, rate of return to the capital, and growth rate per worker.

The standard of living, according to Easterlin (2000) is affected by what people themselves say about their source of well-being. In addition, it also concerns happy family life and relations, personal and family health, work, their personal character and social life values. The improvement in the quantity of goods and services that people consumed is also a part of a standard of living level measurement. Apart from that, the improvement in people's quality of life, such

as convenience and comfort availability, is another measurement of the improvement in the standard of living of the people. Other than that, the increase in the people's life expectancy is another way to detect the standard of living of the people. In this research, they used annual growth rate, GDP per capita and share of world population to proxy the standard of living (Easterlin, 2000).

Another study by Golley & Tyerswhich (2013) compares China's and India's economic growth, and is related to their population size. Per capita income, technological advancement, education level and fertility rate have been used to proxy the standard of living. Then, Chen (2013) used Thermo-dynamics as variables in his study. These variables used are related to biological systems, including human societies.

Review of the relationship between unemployment rate and economic growth

Another study by Furuoka (2013) on population and economic growth in Thailand shows the existence of a long-run equilibrium relationship between population growth and economic development in Thailand. Mulok et al.'s (2011) study shows that there is no existence of a long-run relationship between the economic growth and the population growth. Their findings also show that there is no causal relationship between economic growth and population growth in Malaysia.

Apart from that, Maqbool et al. (2013) examined the determinants of unemployment in Pakistan in the period 1976 to 2012 with the unemployment rate, foreign direct investment, gross domestic product, inflation, and external debt and Autoregressive Distributed Lag (ARDL) has been applied to test effects of unemployment. In another view, Maddah (2012) relates the increase of

theft in Iran to the increasing unemployment in the country. He claimed that the increase in their population raised the unemployment rate, which indirectly increased the crime rate in that country. People commit crimes when there is a high rate of unemployment. In addition, their poverty also worsens their situation and, as a result, they tend to commit crimes.

Besides that, Al-Saraireh (2014) examined that there is a negative correlation between unemployment rate and migration labor force and positive correlation with government expenditure, and higher expenditure increased unemployment in the native labor force. Their finding shows that unemployment will have a negative impact on their economic growth. They suggest that government should reduce their expenses in order to reduce the unemployment rate.

Methodology

Econometrics Model

We construct the empirical model in this study based on the theoretical framework used by Simon (1987) and Wijaya et al. (2021). The econometric model that is used in this study is to measure the relationship and impact on each of the selected variables that have been used in this study, which are population, GDP, purchasing power parity, and unemployment rate. The econometric model that is used in this study is written at below:

$$LGDP_t = + {}_1 LPPP_t +$$
$$\qquad {}_2 LPOP_t + {}_3 LUNEM_t + {}_t \qquad (1)$$

Where, = Constant; $LGDP_t$ = Log of GDP for period t; = Constant; $LPPP_t$ = Purchasing Power Parity for period t; $LPOP_t$ = Total population for period t; $LUNEM_t$ = Log of unemployment rate for period t; ${}_t$ = Error term.

Data collection

Secondary time series data is used in this study and the data are retrieved from the World Bank World Development Indicator, St. Louisfed and Trading Economics. The data frequency is in annual data and the sample period of study is from 1987 to 2020. The dependent variable that will be examined is the economic growth which is measured in GDP while the independent variables are standard of living which is measured by the Purchasing Power Parity (PPP), unemployment rate and total population. GDP and total population obtained from Trading Economics. The PPP obtained from St. Louisfed and unemployment rate obtained from the World Bank World Development Indicator. Throughout the analysis, all variables are transformed into a logarithm form.

Demarcation

In this paper, total population can be defined as all persons falling within census. In the broadest sense, the total may comprise either of all usual residents of the country or all persons present in the country at the time of the census (Perez & Hirschman, 2009; Alba, 2018). Purchasing Power Parity (PPP) can be defined as the calculation of GNI using a common set of international prices for all goods and services, to provide more accurate comparisons of living standards (Todaro & Smith, 2015), the unemployment rate can be defined as the number of unemployed persons as a percent of the total of people from a total labor force, rather than the number of unemployed (Darma et al., 2022). In Irwansyah et al. (2022) studies also stated that Gross Domestic Product (LGDP) is defined as the total final output of goods and services produced by the country's economy, within the country's territory by residents and nonresidents, regardless of its allocation between domestic and foreign claims.

Data analysis

Augmented Dickey-Fuller (ADF) unit root test is used to examine the integration order of each selected variable for its stationary properties (e.g. Yijo et al., 2021). The purpose of the running unit root test is to ensure that the used time series data in this study do not comprise the variable that only stationary at second differences because the limitation of the Co-integration test used in this study. Ordinary Least Square (OLS) method which the ADF equation can be written estimated the ADF auxiliary regressions as below:

$$LGDP_t = LGDP_{t-1} + {}_t LGDP_{t-1} + {}_t \qquad (2)$$

$$LGDP_t = {}_1 + LGDP_{t-1} + {}_t LGDP_{t-1} + {}_t \qquad (3)$$

Equation 2 showed the ADF equation that comprises intercept only, while equation 3 indicated the ADF equation that consists of intercept and trend. Y indicated the tested variable, α showed the constant, showed the estimated parameters, t indicated index of time, 1 denoted variable with lagged in first differences, and e showed error term. If the null hypothesis is rejected at 5% level of significant, it indicated that the tested variable is stationary and contained no unit root problem. The null hypotheses of ADF unit root test are:

H_o : The tested variable has unit root.

H_A : The tested variable has no unit root.

Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) unit root test is used in this study to get a consistence results to prove that the level of integration of tested variables is valid. Kwiatkowski et al. (1992) suggested that the standard unit root test should not reject the null hypothesis. The null hypotheses of KPSS unit root test are different with ADF and PP

unit root test, which our write the hypotheses of KPSS unit root as follow:

H_o: The tested variable has no unit root.

H_A: The tested variable has unit root.

The rejection rules are still the same as ADF and PP unit root test, but the rejection of null hypothesis brings a different meaning. If the null hypothesis is rejected, it means that the time series data comprises the unit root problem or it is not stationary. The regression of KPSS equation is written as below:

$$n_i = \frac{\frac{1}{T^2} - \Sigma \, iS_{it}^2}{S_{it}^2(\sigma)} \qquad (4)$$

Where, ni indicated the sum of residual, S while indicated variance of residual, which it denoted the lag parameter, and T indicated the number of observation.

After the integration order of the variables is identified with no present of I (2) variable, Johansen Co-integration Test is conducted to examine the long run relationship between the examined variables. The equation of Johansen Co-integration Test is written below:

$$Y_t = {}_tY_{t-1} + {}_iY_{t-k} + {}_t \qquad (5)$$

Where, Y_t indicated the number of co-integration vectors which contained the long run information needed for investigation. Two likelihood tests are used to examine the number of co-integration vector which are trace test and maximum Eigen value test. The regression of trace test is written in the following equation:

$$T_{trace} = -T[(1 - r_i)]^2 \qquad (6)$$

Where, T is the number of observations, N is the number of variables, and r is the biggest estimated Eigen value. The hypotheses of trace test are represented as follows:

H_o: The number of co-integration vector is less than or equal to r

H_A: The number of co-integration vector is the most at r

The regression of maximum Eigen value test is written below:

$$T_{max} = -T \, In(1 - {}_{r-1}) \qquad (7)$$

Where, T indicated the number of observations and is the largest estimated Eigen value. The hypotheses of maximum Eigen value test are represented below:

H_o: There is r number of co-integration vectors.

H_A: There is r +1 number of co-integration vectors.

According to Johansen & Juselius (1990), if there is a conflict results between trace test and maximum Eigen value test, the result of maximum Eigen value should be taken into account because the maximum Eigen value test is more powerful. However, in the report, we include the trace test result too because according to Lutkepohl et al. (2001), in particular, the trace test are advantageous if there are at least two more co-integrating relations in the process than specified under the null hypothesis.

Once the co-integration is detected in the test of Johansen Co-integration, the Vector Error Correction Model (VECM) is implies to the model. The granger causality test also can be detected through the VECM derived from the long run co-integrating vector. The VECM granger causality test is to distinguish between the short run and long run relationship between the GDP, PPP, population and unemployment rate. It expressed example of the regression below:

$$LGDP = + {}_{0i}LPPP_{t-1} + {}_{1i}LPOP_{t-1}$$
$$+ {}_{2i}LUNEM_{t-1} + {}_{4}ECT_{1t-1} + {}_{1t} \quad (8)$$

$$LPPP = + {}_{5i}LGDP_{t-1} + {}_{6i}LPOP_{t-1}$$
$$+ {}_{7i}LUNEM_{t-1} + {}_{9}ECT_{2t-1} + {}_{2t} \quad (9)$$

$$LPOP = + {}_{10i}LGDP_{t-1} + {}_{11i}LPPP_{t-1}$$
$$+ {}_{12i}LUNEM_{t-1} + {}_{14}ECT_{3t-1} + {}_{3t} \quad (10)$$

$$LUNEM = + {}_{15i}LGDP_{t-1} + {}_{16i}LPPP_{t-1}$$
$$+ {}_{17i}LPOP_{t-1} + {}_{19}ECT_{4t-1} + {}_{4t} \quad (11)$$

Where, is constant, $_i$ is indicated the estimated parameters, K is the lag length, ECT_{t-1} is indicated the error correction term and $_t$ indicated the random error term. The hypotheses of VECM test are represented at below:

$$H_{o:\ li} = {}_{2i} / {}_{3i} = {}_{4i} = 0 \quad (12)$$

$$H_A :\ {}_{li} = {}_{2i} / {}_{3i} = {}_{4i} \neq 0 \quad (13)$$

The rejection rules are reject the null hypothesis when the t-statistic is bigger than critical value or probability value is smaller than alpha value. If the null hypothesis is rejected, that means either X can Granger cause Y or Y can Granger Cause X.

Empirical Findings

Unit root test

The results of the unit root and stationary test in level and first difference for the variables used, including total population (LPOP), purchasing power parity (LPPP), unemployment rate (LUNEM) and nominal GDP (LGDP). The variables are stationary at the first difference for ADF and DFGLS tests.

As for the KPSS results, all variable proved to stationary since the results do not reject the null hypothesis at 5 percent level at first difference (see Table 1). Thus, it allows for proceeding to the Johansen-Juselius co-integration test to determine the existence of a long-run equilibrium relationship.

Table 1. Unit Root and Stationarity

	Test Statistics					
	ADF		DFGLS		KPSS	
	u	*t*	*u*	*T*	*u*	*t*
A: Level						
LGDP	0.1988 (0)	-2.1175 (0)	0.4886 (0)	-1.9475 (0)	0.6173 (5)*	0.1464 (4)*
LPOP	-3.0761 (2)*	-1.5592 (3)	0.4300 (2)*	-1.1720 (2)*	0.6830 (5)*	0.2056 (4)*
LPPP	0.4963 (0)	-1.7731 (0)	0.4434 (1)*	-1.6567 (0)*	0.6790 (4)*	0.1295 (4)
LUNEM	-1.1544 (0)*	-1.3015 (0)	-0.9533 (0)*	-1.4730 (0)*	0.5321 (5)*	0.1571 (4)*
B: First Differences						
LGDP	-5.5980 (0)*	-5.7077 (0)*	-5.6155 (0)*	-5.8743 (0)*	0.1767 (1)	0.0580 (2)
LPOP	-4.8895 (0)*	-3.8106 (12)*	-0.2532 (1)*	-2.8563 (1)*	0.4602 (9)	0.1402 (7)
LPPP	-4.0887 (0)*	-4.1452 (0)*	-1.7109 (6)*	-2.7896 (2)*	0.1832 (0)	0.0834 (1)
LUNEM	-5.6829 (0)*	-4.9198 (1)*	-1.5884 (2)*	-1.7713 (3)*	0.1794 (3)	0.1414 (4)

Notes: Refer to the main text for the notations. Asterisks (*) indicate statistically significant at 5% level.

Johansen co-integration test

Table 2 present the empirical result of the co-integration procedure. Both results from the maximum eigenvalue and the trace statistics show that the null hypothesis (r=0)

was rejected at 5% significant level of number co-integrating vector. As a conclusion, the result implies that GDP, population, purchasing power parity and unemployment rate are co-integrated in the long run.

Table 2. Co-integration Results

Null	Alternative	k=1 r=1			
		max		Trace	
		Unadjusted	95 percent C.V.	Unadjusted	95 percent C.V.
r = 0	r = 1	32.7383*	27.5843	53.1015*	47.8561
r < = 1	r = 2	10.2974	21.1316	20.3632	29.7970
r < = 2	r = 3	8.8609	14.2646	10.0657	15.4947
r < = 3	r = 4	1.2047	3.8414	1.2047	3.8414

Notes: Asterisks (*) denote statistically significant at 5 percent level. The k is the lag length and r is the co-integrating vector(s). Chosen r: number of co-integrating vectors that are significant under both tests.

Table 3. VECM Granger Causality

Dependent Variable	LGDP	LPOP	LPPP	LUNEM	ECT	
	^{2}-statistics				Coefficient	t-ratio
LGDP	-	0.4172 (0.8117)	37.6063 (0.0000)*	1.2511 (0.5349)	-0.2077	-1.3217
LPOP	13.2119 (0.0014)*	-	4.8917 (0.0867)*	30.1852 (0.0000)*	-0.0004*	-4.9998
LPPP	1.7857 (0.4095)	8.1666 (0.0169)*	-	9.8229 (0.0074)*	-0.1051	-1.0951
LUNEM	3.0015 (0.2230)	0.6374 (0.7271)	1.3936 (0.4982)	-	0.1827	0.6270

Notes: The 2-statistic tests the joint significance of the lagged values of the independent variables, and the significance of the error correction term(s) is the first different operator. Asterisks (*) indicate statistically significant at 5 percent level.

The VECM of Granger causality test

The results of Granger causality test within the vector error-correction model (VECM). The error correction term (ECT) contains information about the speed of change toward the long-run equilibrium. In Table 3, only coefficient on the lagged ECT for total

population is less than one and statistically significant level with a negative sign. This shows that LPOP is strongly endogenous. It solely endures short-run adjustment to bring about the long-run equilibrium. In the LGDP, LPPP and LUNEM caused long-run LPOP. The coefficient of ECT for LPOP is 0.04, indicates a speed adjustment of 0.04%, hence,

it requires longer time in order to go back to the long-run equilibrium which is 2500 years.

Figure 1 summarized the relationship among the GDP, PPP, population and unemployment rate in Indonesia. It also shows the direction of the Granger causality among the variables. From the results above, the entire variable is a one-way causality. The difference between the direction is it is direct or indirect relationship. The result implies that there are 5 uni-directional and 2 indirect causality. Since GDP will influence the purchasing power parity of people, purchasing power parity will influence population and population will bring impact to the unemployment rate, so government should take necessary action such as implement maximum wages to labors.
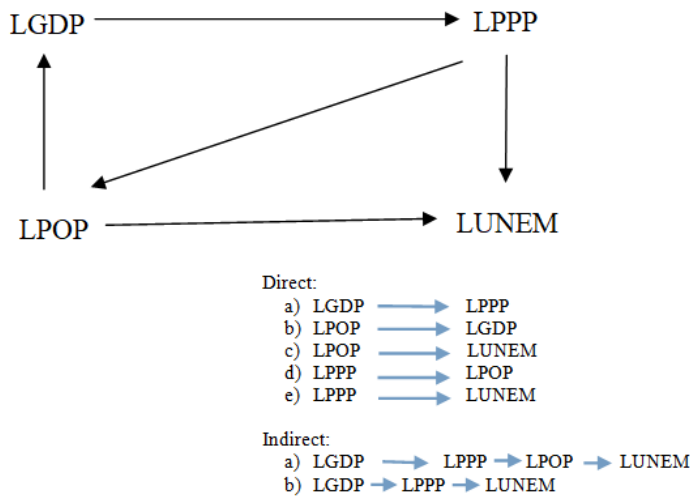

Figure 1. Short Run Causality Direction (Source: EViews output)

Discussion

Since GDP will influence the purchasing power parity of people, purchasing power parity will influence population and population will bring impact on the unemployment rate, so government should take the necessary action such as implement maximum wages to labors (Amalia et al., 2018).

When the wages are set up, the purchasing parity power can be under control and limited. This is logical because when the household's income is constrained, their expenses will be limited too. Apart from that, the households aware of the risk of an increasing number of people in the house could be a cost to the family. So, they by themselves practically implement the birth control to their family. As a result, unemployment could be reduced because less children are born. However, it will reduce the labor supply for the country in the future. The population might affect the country's economic activities.

There has been a growing concern in society on population and its impact on society since one decade (Roy et al., 2021). There have been some well-known researchers that study this issue. Some of them claim that population would negatively affect society and some of them suggest that population is a good way to generate economic growth.

Given that Indonesia is among the highly populated countries compared to many other countries in ASEAN, it is extremely important to establish an empirical study to investigate the impact of population on economic growth in this country. Studies into the determinants of economic growth are necessary to improve the effectiveness of the policies.

Both economic and demographic factors used in this study including total population, purchasing power parity, unemployment rate and gross domestic product are important in explaining total population and economic growth in Indonesia and in view of policy implication, the results from this study may allow the policymakers to come up with a new policy that helps to control the population growth in order to boost the economic growth in Indonesia.

High unemployment rate could be a cost to a country. As for Indonesia, there are many people living in that country (Rayhan et al., 2020). Unemployment rate could have to a negative effect such as the increase of crime. Thus, to avoid this from happening in Indonesia, the government should provide more employment opportunities to their citizens. Creating more jobs could be a better start for the government. Apart from that, job search agencies should help both new and experienced workers to find jobs suitable for their educational background, skills and experiences. The methods of accumulation and dissemination of information on jobs should be improved as well. When unemployment rate decreases, economic growth will become better because more people will be working. When people are working, then they have better income sources. People will purchase things and there are economic activities such as buying and selling. They will generate prosperity when there are economic activities.

Besides that, the government should help unemployed citizens by providing them with short-term support through skills training and living expenses. If necessary, the government could send some of the unemployed youth to work abroad as long as they are willing and able to work. The government will still benefit from that. Another way for increasing employment is through the improvements in education and training. This is because people should have the required capability, including skill and knowledge, for doing the work and performing well. Apprenticeship training programs and entrepreneurship skills training programs also help to reduce the unemployment rate. The government should strengthen and expand internship opportunities since many apprenticeship positions will turn into permanent jobs.

As the empirical evidence in this study has shown that total population will influence economic growth, government should be more concerned with birth control (Furuoka & Munir, 2010). As mentioned before, having more people that are jobless is not a good way to perform the economy of a country. In addition, more people reduce the quality of the environment. This is because more people lead to more usage of vehicles, more carbon dioxide and more human activities that damage the environment. In addition, air pollution becomes more serious when there are more people in the towns. It may be a good sign for the country that there are people living in their country, but the government should know that population influences economic growth as well. They could be a burden to the country and there is more concern about the negative externalities rather than positive externalities. Thus, the government should enhance birth control policy to control population growth.

By effectively controlling the fertility rate in Indonesia, parents will have more time to work and earn money. Thus they can increase their purchasing power parity, have more spending power and create demand which stimulates production and jobs. However, declining fertility rates will reduce labor supply. But, with Indonesia, declining fertility rates could give opportunities to those unemployed. Less birth means fewer people and less job hunting competition.

Besides, the government could always have the authority to change the policy according to the country's condition. If the situation demands more population than it would be, then the government can dismiss the current policy, evaluate it, then change based on a unified and more humane design (Lam, 2011). Taking as example the case in China over the last years, devoted to the relevant polemics, China is one of the countries that ever implemented birth control policy which which suggests one child per family. However, when China analysed that the birth control policy was no longer effective, the government dropped the current policy and enhanced a new policy that enable the citizens to have more than one child in the family. Thus, Indonesia could do the same thing. However, the decision and action must suit the economic condition of the country. At the very least, technocrats need to collectively control regulations that consider the burden of living including: standard of living costs, inflation, per capita income, wages and household consumption.

Conclusion, Implication, and Future Studies

The main purpose of this study is to examine the relationships between population and economic growth in Indonesia for the period of 1987-2020. We constructed the

empirical model adopted in this study based on the theoretical framework used by Simon (1987). The economic factors used include unemployment rate and gross domestic product whereas total population represents the demographic variables and purchasing power parity. We analysed each of the variables in this study.

The time series analyses are performed by applying co-integration and causality analyses. The first step leading to a co-integration test is conducting a unit root test for each variable and determining their order of integration. We have summarized the main findings as follows. The result of ADF, DFGLS and KPSS show that all the variables are stationary at first difference level whereas other variables are non-stationary at significant level. As for the Johansen co-integration test, the results reveal that GDP, population, purchasing power parity and unemployment rate are co-integrated in the long run because there only exists one co-integrating vector between the variables used.

Furthermore, Granger causality test within the VECM framework is used to determine the long-run and short-run causality between the variables used for GDP, population, purchasing power parity and unemployment in which the variables are co-integrated in the long run. From the coefficient on the lagged ECT for total population, the negative sign shows that LPOP is short-run change to bring about the long-run equilibrium. It also indicates that in the long run, LPOP is affected by LGDP, LPPP and LUNEM.

In conclusion, the analysis in this study is better uses for population and its impact on purchasing power parity, unemployment and GDP. Those variables seem to influence each other and will impact the population in the future. As one has to know that population is

a much complex phenomenon than can be captured by the simplistic model presented here. This study has at least shown that the population has a significant impact on the purchasing power parity, unemployment and GDP which means that there are indirect impacts of population on the economic growth in Indonesia.

The empirical evidence in this study suggests that the long-term management and reduction in the total population is associated with the economic environment within the country since these variables will influence economic growth. Further analysis of total population and economic growth in Indonesia should be made and we need more attention to the economic influences to extract more reliable results to be used as policies for their best combating. There are few limitations that confined this study and will be presented. First, the results in this study may not thoroughly capture that the population and economic condition in Indonesia has only a few variables, including unemployment rate, gross domestic product and purchasing power parity, and are used in this study. By refining the variables and data used, further studies will deepen the understanding of the causes of crime and methods of how to boost economic growth. Second, the extent of time series data for this study is limited, especially for unemployment rate that are incomplete for the last five years and serve as a constraint for an analysis of this nature. Thus, the study can be extended by examining the affects of economic on different demographic factors.

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