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Inequality and the 2019 Presidential Election in Indonesia: Beyond Identity Politics

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Abstract

This study intends to understand vote based on economic evaluation at the 2019 presidential election in which Joko Widodo was incumbent, and Prabowo was the challenger. This paper argues that the presidential election in 2019 is a political arena where the voters assess the incumbent government's economic policies, one of which is redistributive. Redistributive policies are understood as government policies intended to reduce the gap between the rich and poor people or inequality. This empirical study uses merged data from BPS, Bappenas, and the KPU. By employing a unique dataset, the originality of this study is located on the relevance of redistributive policies in political contestation. This study estimates the outcome of the presidential election using the ordinary least square (OLS) method. It points out that reducing inequality at the district level influenced the presidential election result. This paper stresses that the capability of the government to reduce inequality determines the result of the election.

Keywords:

presidential election, inequality, redistributive policies, democracy

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INTRODUCTION

Two characteristics of the Indonesian economy have changed slowly over the last 20 years and lead us to question their relevance for presidential elections. First, there has been a stagnation in the average annual growth of the economy compared to the New Order administration. The average annual growth of the New Order was around 7.4 %. However, after the fall of the New Order administration, growth has been much slower, averaging around 5.4 % from 2009 to 2017 (Sato, 2019).

Second, a rise in inequality (in expenditure terms) in the last 20 years. Besides inequality in terms of expenditure, there is wage inequality in Indonesia, as Widyanti (2018) argued, but this paper focuses on inequality in expenditure. In this paper, inequality refers to the one in expenditure. In 2014, Indonesia experienced a record high in inequality which reached 0.41 as measured by the Gini coefficient. Less than two decades from 1996 to 2010, average growth annually in household consumption for the rich had grown three times faster compared to those of the poorest ones. The consumption level of the poorest 60 % of households grew below the mean, and growth for the poor was close to zero in real terms (World Bank, 2016). The trend of a more significant gap can be traced since 2010. By looking at the middle-income group, the country recorded an increase of middle class for 56.6% compared to that of in 2000 that reached 20% (Maipita & Wahyudi, 2017). The middle-income group has grown at 10 % annually since 2002 (World Bank 2016). This present paper has no space to discuss why inequality is increasing and how it is associated with the rise of the middle-class.¹

This paper argues that the presidential election in 2019, as a democratic procedure, is a political arena where the voters assess the incumbent government's economic policies, one of which is redistributive. Here, redistributive policies are understood as government policies intended to reduce the gap between the rich and poor people, such as assistance to the poor in the form of rice subsidy, access to education and healthcare, and various social assistance to help the poor people.² The Indonesian government introduced cash transfer, conditional cash transfer, and non-cash social-economic programs to move the poor from poverty. At this crucial point of the 2019 election, the voters judge whether the government meets their demand for redistribution of economic provision to reduce the gap between the rich and the poor people. This article explores that inequality, relative distribution expenditure, is still crucial in the election. The Joko Widodo (henceforth Jokowi) government, which was incumbent in the 2019 presidential election, adopted various redistributive policies to reduce rising inequality trends. Furthermore, this paper argues that the government adopted redistributive policies to respond to voters' demand for better access to basic provisions such as education and healthcare. The government adopted redistributive policies to

¹ World Bank. 2016. This report explains some sources of inequality, see p. 11

² Following discussion provided by Galasso, Vincenzo. 2017. *Political Economics: Redistributive Policies*. Milan: Bocconi University Press. Detailed discussion on redistributive policies is on chapter 5. He discusses progressive tax, but in this paper tax policies are not included

gain legitimacy from the voters. In addition to that, the government adopted these policies to mitigate potential conflict that would have been arisen if the poor people had less access to education, the healthcare system, and other provisions. While this paper underlines the relevance economy, especially the government redistributive policies to reduce inequality, it is intended to supplement the existing opinion that the presidential election in 2019 was marred by identity politics (Pepinsky, 2019). This paper proposes an argument by emphasizing economic variables.

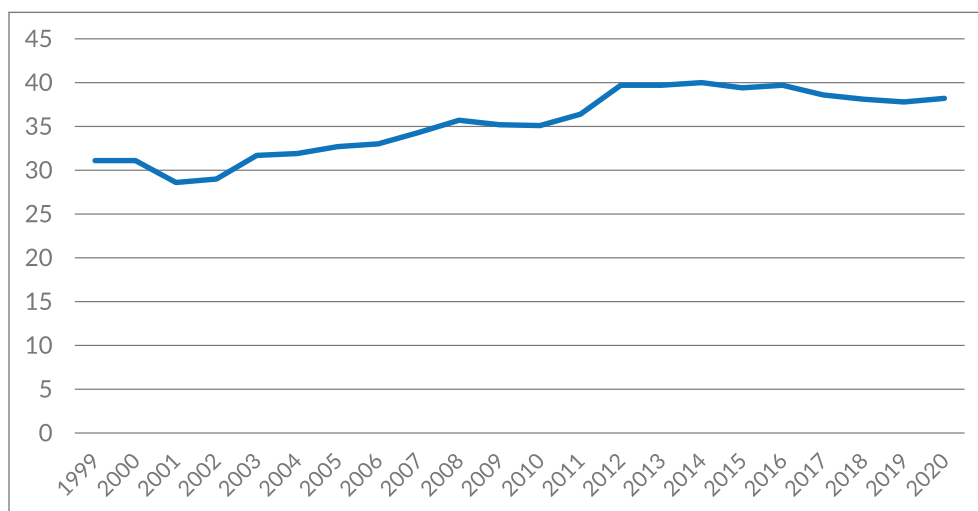
This study has three contributions to understanding inequality and democracy in Indonesia. First, democracy in Indonesia which had started after the fall of Suharto in 1997, ensued by the direct presidential election in 2004, gave way for contestation over policies. During the election in 2019, identity politics had been at play (Pepinsky, 2019). Therefore, the role of economic factors in 2019 presidential had been overlooked. While the argument about identity politics is valid, the 2019 election also revealed that economic issues, in this case, inequality, could serve as one of the determinants which decide the election outcome. Second, the government started to design and implement redistributive policies when it was aware that the gap between the rich and the poor people recorded a high point in 2014. Implementing a range of redistributive policies in Indonesia is not a new phenomenon as the New Order government had introduced them under Suharto. However, the economic and political situation after the economic crisis in 1997/98 had been somewhat different where the economic recovery process benefited the middle classes (Dartanto et al., 2020), which accounted for 20% (World Bank, 2018). This data means that the economic recovery process had put the majority in the poor category, and this situation would steer to increased inequality. Therefore, the government devised various redistributive policies which are intended to assist the poor people to move out from poverty. If the poor people fail to join the middle class, which means a high level of inequality, a more polarized society may result (World Bank, 2018) and lead to social conflict (Tadjoeddin et al., 2020). Third, this analysis demonstrates that higher levels of inequality may improve political demand from most voters, providing compelling evidence that greater economic inequality would function democracy as many voters could be categorized in the low-income level. Therefore, as one of democracy parameters, the presidential election is obviously an arena where the voters assess the incumbent government, including in the economic domain.

Why does inequality matters in the Indonesian political economy context? Aspinall (2015) argues that Indonesian society has a strong ethos of egalitarianism and is therefore hostile to the social gap. He mentions that this attitude has roots in the Indonesian anti-colonial struggle's economic nationalist and socialist themes. In addition to that, the democratic government of Post-Suharto's Indonesia is unable to give benefits to the poor (Kawamura 2019). As far as 2014, inequality was a political issue for two reasons. First, in 2014 President Susilo Bambang Yudhoyono's decade in office was about to end. There were feelings of dissatisfaction with his leadership (Aspinal et al., 2015). Second, the 2014 presidential election was a contestation year, and voters look at the candidates they believe could address inequality. Inequality was experiencing an increase in Susilo

Bambang Yudhoyono's decade rule. Prabowo employed a narrative that inequality in Indonesia results from a political system that benefits the rich. In 2017, two years before the presidential election, again Prabowo employed a similar strategy to use inequality as a central issue for the campaign (Muhtadi et al., 2019).

The discussion above reveals that inequalities have been a political issue in many elections that Prabowo used to gain votes. In his 2014 campaign, Prabowo claimed that the Indonesian government could not reduce the gap between the poor and the rich. He repeated this topic of inequality in the 2019 presidential election claimed that president Jokowi, the incumbent, failed to reduce the gap between the rich and the poor. Therefore, it is necessary to evaluate the inequality.

Figure 1. Inequality in Indonesia 2000-2020 as measured by Gini in terms of expenditure



Source: World Bank Indicators

Inequality in the period under study decreased and fell (Figure 1). From the data collected for this study, the mean for inequality in 2015 was 0.34, while in 2017 fell to 0.33. It means that, in general, the gap is decreasing, indicating that many districts experienced that gap becoming smaller. For example, Tanjung Balai, a district in North Sumatra province, had a Gini of 0.365 in 2015, falling to 0.278. This district experienced a fall in Gini for about -0.086, which is relatively large. Figure 2 reveal that many districts experienced a fall in inequality. The median value of this change is -0.02.

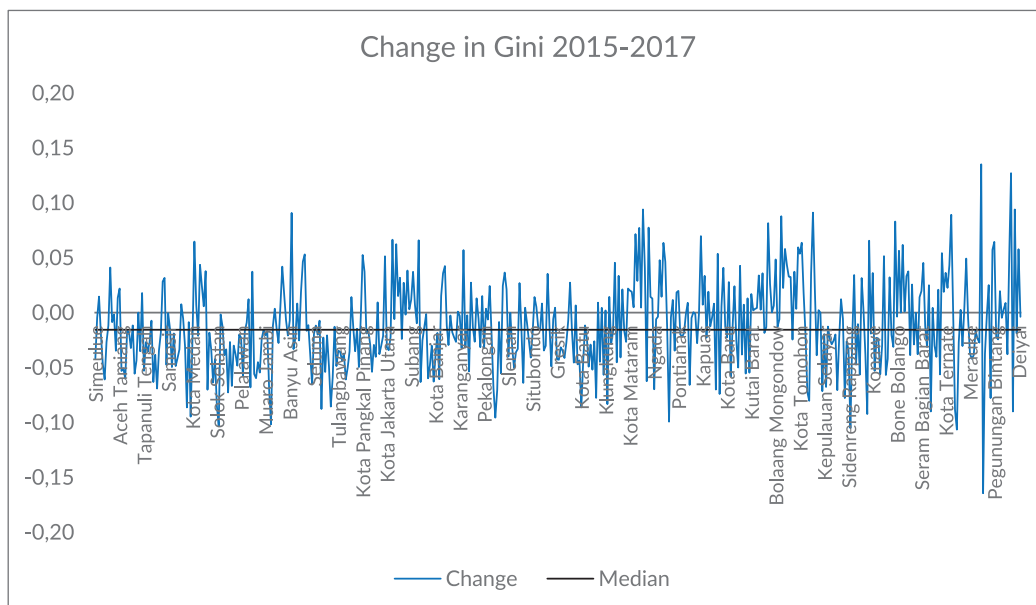
Inequality and political process

The basic assumption concerning narrowing down inequality is that income level forms individual preferences. In order to reduce inequality, the poor prefer to have deep government intervention. On the contrary, the rich favor less intervention in various policies. The logic to understand this situation is relatively simple. In a situation with no or less government intervention, the rich maintain their interests, whereas the poor may encounter problems gaining basic provisions. The rich can access these facilities

such as education and health services through the market mechanism in private hospitals or schools. On the contrary, the poor have limited access to these provisions.

Having mentioned differences in preferences between the elite and the people, a discussion on democracy and inequality can be grouped into two camps. One camp believes that democracy and inequality have positive associations, whereas another group believes there are no relationships. Bollen & Grandjean (1981) find that democracy has no effect of inequality. Sirowy & Inkeles (1990) state that democracy could not reduce inequality. Deininger & Squire (1996) find no significant correlation between democracy and inequality. Knutsen & Weggman (2016) argue that most citizens, either in rich or poor countries or egalitarian or inegalitarian societies, do not consider progressive redistribution among democracy's most important features. In the postcolonial states, including Indonesia, the problems of redistributions are closely associated with the state capability to implement the programs instead of democracy (Slater et al., 2014).

Figure 2. Change of the Gini Coefficient 2015 to 2017



Source: Bappenas from BPS

Contrary to the previous opinion, an argument proposed by Acemoglu & Robinson (2001; 2006) and Boix (2003) can be called a redistributive approach. Acemoglu and Robinson (2006) state that "democracy is usually not given by the elite because its values have changed. It is demanded by the disenfranchised as a way to obtain political power and thus secure a larger share of the economic benefits of the system." Boix (2003), Acemoglu & Robinson (2006) focus on how economic inequality, the relative distribution of income or assets, influenced voters' demand for reallocation. Boix (2003), Acemoglu and Robinson (2006) base their arguments on the supposition that a dictator and the rich, the elite, have similar preferences, while the middle class and the poor demand an end to manipulation by the elite. They see that democracy could occur

when the citizens can form a credible organization and present weight for opposition to the elite. Confronting credible pressure, the elite is pushed to allow democracy to run. Their arguments are not perfectly matching but suggest similar reasoning. Boix (2003) contends that a falling-off in inequality stimulates democracy. Acemoglu & Robinson (2006) argue that democracy augments a decline in inequality through redistribution. Nevertheless, low inequality or high redistribution is predicted under democracy. In a similar line of argument, Acemoglu et al. (2019) provide evidence that democracy positively affects GDP per capita. They believe that improved reallocation and the end of manipulation would be possible.

Other writers argue on similar lines to Boix and Acemoglu & Robinson's. Perotti (1993) finds an association between the political process and redistribution. Perotti (1993) contends, "the lower class will invest in education if the median voter has an incentive to enact enough redistribution." Scheve & Stasavage (2009) claim that the political process has a little causal effect on inequality in the long run. They mention that political factors do matter, but not in the often suggested way (Scheve & Stasavage, 2009). Gradstein & Milanovic (2004) proved that democracy supports redistribution. Milanovic (2016) argues that democracy and redistribution correlate because economic decisions have political implications.

Those arguments, as mentioned earlier, seem to follow and modify Meltzer & Richard (1981), who offer a foundational study of inequality and democracy. Meltzer & Richard formulated the alleged mismatch of democracy and property into a formal theory of rational expectations about electoral politics. A majority of voters receive less than average income. Therefore, there are more poor people than rich people. It would create a situation where under-average income prefers to raise taxes on that above-average income; therefore, democracy should consistently engender force for redistribution. The force for redistribution would enlarge with growing inequality. The logic is simple: as the rich grow richer than others, the poorer median voter would benefit more by prolonging to lift taxes. Therefore, outcomes of political struggle are a function of the preferences of the median voter, who prefer high taxes and substantial redistribution to poor people like themselves (Acemoglu & Robinson, 2006; Boix, 2003). On the contrary, the rich prefer no taxes and no redistribution. In high-income countries, these writes concentrate on tax policies as a vehicle for redistribution, while in a middle-income country such as Indonesia, redistributive policies take various forms of direct assistance to the poor people.

The argument, as mentioned earlier, for inequality and democracy mainly analyzes high-income countries in North America and Western Europe. Haggard & Kaufman (2008) provided one of the most comprehensive assessments of social policy in developing countries of Latin America, East Asia, and Eastern Europe. They underscore the affirmative consequences of democracy on social policy. Their finding is derived from the median voter theorem. They recognize the force of the lower-income groups that entered the electoral arena after democratization. This finding parallels the conclusion drawn by Meltzer & Richard (1981); therefore, they have a similar line argument to that of Acemoglu & Robinson (2006).

This paper contends that democracy provides an impetus for the incumbent government to address crucial issues such as a social policy to satisfy most voters. In order to earn legitimacy of both political and economical, the incumbent government had adopted social policies that could reduce or solve a range of pressing social issues, one of which is inequality. In essence, this paper mentions that the democratic process, such as the presidential election, would put critical pressure on the competing candidates to implement a range of social policies when they are elected, gain votes from the voters, and most of the voters are in the lower-income group. By looking at the composition of the voters who are mostly in the low-income category, the competing candidates are pressured to address social policies to reduce the gap between the rich and the poor people. In this sense, the incumbent has benefited as s/he already implemented a range of social policies to reduce inequality to avoid open conflict between the rich and the poor.

Furthermore, the redistributive social policies provide access to the poor people through various provisions such as healthcare and education. As a result, the incumbent would gain legitimacy from the voters. This paper is in line with the arguments proposed by Boix (2003), Acemoglu & Robinson (2006). In the context of the Indonesian economy, inequality, especially after the economic recovery process since 2000, tended to increase. The inequality reached its peak in 2014 and became an essential issue for the government.

Measuring the Gap: Gini coefficient

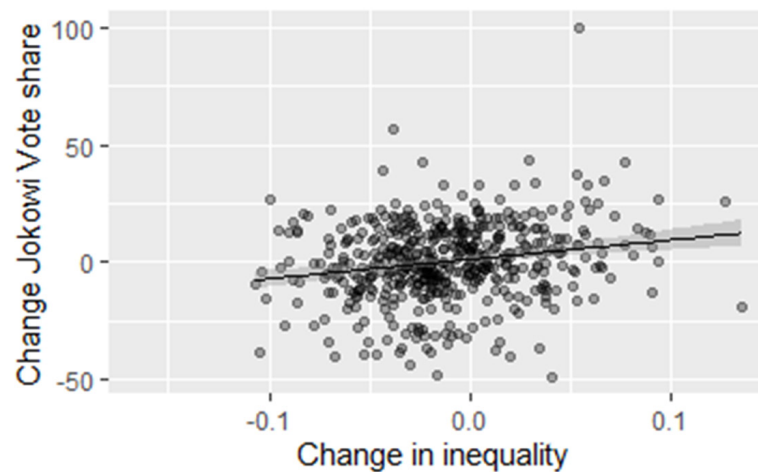
For three years in 1999, 2002, and 2003, the poorest 40 % share was more than 20 % (BPS 2003). BPS reported that in 2003, the level of inequality increased (expenditure distribution started to worsen). The report mentions the portion spent by the 40 % of the lowest income population declined from 21.66 % in 1999 to 20.92 % in 2002; and 20.57 % in 2003. The Gini coefficient for those years also improved from 0.31 in 1999 to 0.33 in 2002. After the Asian financial crisis in 1997 that also hit Indonesia, the poverty level increased dramatically, Gini coefficient also fell. Almost everyone was affected by the crisis, but the richest segment was hit hardest. When Indonesian economic recovery started to take form, aided by the commodity boom and the global financial crisis, the Gini rose.

However, the increase of the Gini at the beginning of the 2000s was not as big as that of in the 2010s. After the country recovered from the Asian financial crisis and the global crisis, Indonesia's real GDP per capita grew annually at an average of 5.4 % between 2000 and 2014 (World Bank, 2016). The World Bank's report revealed that this growth helped many to pull out from poverty, but at the same time, creating a strong middle class. The middle class mostly enjoyed this growth. Between 2003 and 2010, the richest 10 % consumption per capita grew more than 6 % per year, while the poorest of 40 % only grew at less than 2 % (World Bank, 2016). Therefore, it would not be a surprise when Gini increased dramatically from 0.30 in 2000 to 0.41 in 2014, recorded as the highest in Indonesian history. In order to tackle the inequality,

the central government aimed at reducing the gap between from 0.41 to 0.36 by year 2019 (Simangunson & Kuang-Hui, 2018).

After explaining inequality in the previous sub-section, this paper poses a question: Does it find that inequality is associated with the Jokowi's votes as the incumbent? This study shows that it does. This study presents the relationship between the 2015-2017 change of inequality and Jokowi's presidential vote shares in 2014-2019. This study looks at the change in inequality between 2015 and 2017 because Jokowi's first term as the president passed these periods. More importantly, as mentioned above, the country had experienced the highest record for inequality in 2014. Therefore it is necessary to evaluate Jokowi's government to address this gap as an economic and political issue. Figure 3 shows strong evidence that change in inequality benefited Jokowi. The districts that experienced a fall in inequality were considerably more likely to vote for Jokowi in the 2019 election.

Figure 3. Jokowi vote shares 2014-2019 and Gini change 2015-2017



METHODS

This study employs Jokowi's vote share in 2019 in each district as the dependent variable is. The estimation model is as follows:

$$\text{JKWVote}_{i2019} = \beta_0 + \beta_1 \text{JKWVote}_{i2014} + \beta_2 \Delta \text{Gap}_{i2015-2017} + \beta_3 \text{Javanese} + \beta_4 \text{Muslim} \\ + \gamma \text{Controls}_{i2014-2018} + \varepsilon$$

The estimation model includes Jokowi vote shares in the 2014 presidential election to look at the various tendencies of the districts to vote for Jokowi. By adding the vote shares in 2014, this study is calculating a flexible valuation model of change in Jokowi's vote share between 2014 and 2019 (Finkel, 1995). This study is interested in coefficient of β_2 . It captures the impact of inequality on the variation in Jokowi vote shares. The estimation model is following Healy & Lenz (2017) and Finkel (1995). Healy & Lenz (2017) employ panel data of two elections in the US: 2004 and 2008, and they place the election 2004 as one of the independent variables. They implemented the statistical method as explained by Finkel (1995).

This paper modified Healy & Lenz's (2017) estimation model. This paper adds social cleavages proportion of Muslim and Javanese as independent variables. This paper is considering that identity politics tainted the 2019 presidential election. Therefore, it is necessary to include social cleavages as variables that capture the phenomenon. Unlike Healy & Lenz (2017), who study loan delinquencies as their primary variable of interest to understand voting and local economics, this present study assesses inequality as the primary variable. This study uses control variables to see the consistency of inequality in three estimations. The estimations also look at another economic variable which relation to voting.

JKW votes 2019 and 2014 are voting share data for Jokowi and Jusuf Kalla in 2014 and Jokowi and Maruf Amin in 2019 at the district level. This paper uses two data points as Jokowi was the incumbent for the 2019 presidential election. Gap 2015-2017 is a change of inequality from 2015 to 2017 at the district level measured by the Gini coefficient. Javanese is a proportion of Javanese at the district level. Muslim is a proportion of Muslims at the district level. Some control variables are poverty, which measures the proportion of poor people at the district level; unemployment measures open at the district level in August each year. Poverty 2014-2018 measures change of poverty proportion in percentage at the district level. Unemployment 2014-2018 measures unemployment changes from 2014 to 2018 at the district level. This study employs two variables, poverty, and unemployment, to evaluate how voters respond to economic conditions. The strategy adopted by this paper is to look at the change in poverty and unemployment from 2014 to 2018. Data for this paper is collected from various sources. The data are at district level. Votes data for the presidential election are provided by the KPU. Some data are collected from the Bappenas site: adjusted per capita expenditure, unemployment and poverty. Bappenas data is collected from BPS. Javanese and Muslim data are from the census in 2000. Some control variables are also from the BPS as published by the Bappenas.

RESULT AND DISCUSSION

It is necessary to report the result of estimations in Table 1. Model 1 reports that Jokowi shares in 2014, change of Gini coefficient from 2015 to 2017, the proportion of Javanese are positive and significant, and only proportion of Muslims in the districts is negative and significant. Changes of Gini have a coefficient of 0.41, and it is relatively high in the real world. Jokowi vote shares in 2014 have a coefficient of 0.51, a proportion of Javanese 0.31, and a proportion of Muslim -0.46. His vote shares can explain the Jokowi vote shares increase in 2014, Gini, and proportion of Javanese at the district level.

Jokowi vote shares decreased were the proportion of Muslims in the district increased. In contrast, the proportion of Muslims can explain his decreased vote shares at the district level. This paper employs model 4, which adopted instrumental variables to check the possibility of endogeneity. The instrumental variable for model 4 is dummy Java were 1 for Java and 0 for other. The estimation result for model 4 is relatively similar to models 1, 2, and 3, with a very small change in the coefficient of independent

variables. The Muslim proportion in those models has relatively much bigger changed than other independent variables. In general, the estimation result from models 1, 2, and 3 are robust.

The concern variable of this paper is Gini, and its behavior is relatively consistent in models 1, 2, 3, and 4. The coefficient for Gini in model 1 is 0.41 and for model 2 is 0.41, model 3 is 0.42, and model 4 is 0.45, all at a significant level of 0.00. The coefficients of Gini tend to increase a little from model 1 to model 4. These changes result from the inclusion of control variables in models 2, 3, and model 4 because of the adoption of the instrumental variable. However, the most important findings from this paper are that Gini behave consistently to explain the Jokowi vote shares in 2019.

Table 1. Estimation Result by Ordinary Least Squares (OLS)

Dependent variable Jokowi vote shares in 2019.

Level of Analysis: districts	(Model 1)	(Model 2)	(Model 3)	Model 4 (Instrumental Variable)
Jokowi Votes 2014	0.51517*** (0.03452)	0.51373*** (0.03449)	0.50992*** (0.03460)	0.42320*** (0.04022)
Gini 2015-2017	0.41735*** (0.11817)	0.41859*** (0.11804)	0.42698*** (0.11815)	0.45230*** (0.12490)
Javanese	0.31346*** (0.01521)	0.31005*** (0.01537)	0.30972*** (0.01537)	0.42247*** (0.02721)
Muslim	-0.46999*** (0.01881)	-0.47415*** (0.01900)	-0.47307*** (0.01901)	-0.53088*** (0.02299)
Poverty 2014-2018		-0.47296 (0.32485)	-0.47652 (0.32495)	-0.11135 (0.35048)
Unemployment 2014-2018			0.25553 (0.21686)	0.26383 (0.22909)
Years of school 2014-2018			-1.74831 (1.85922)	-1.34660 (1.96557)
Constant	55.95781*** (2.87216)	56.06617*** (2.86969)	57.10717*** (2.99049)	63.69653*** (3.40699)
Observation	497	497	497	497
R square adjusted	0.8272	0.8276	0.8277	0.8078

Note: 0 (****) 0.001 (***) 0.01 (**) 0.05 (*) 0.1 (.) 1

Table 1 informs that economic variables such as changes in unemployment and poverty are insignificant and have positive signs. A study by other researchers found that unemployment in the long term positively affects income inequality (Agusalim & Pohan,

2018), and this study does not want to reject such a conclusion. Instead, this study takes a different path, and it evaluates the effect to vote shares in a presidential election as it is found in this study. Table 1 informs that education is also not significant with a positive sign. The behavior of changes in unemployment and poverty is consistent with a sense that they cannot explain vote shares for Jokowi in 2019, even though the positive signs are in line with the expectation. The changes in poverty and unemployment are expected to impact Jokowi vote shares in 2019, but the estimation results find they are not significant. The result of changes in unemployment and poverty in model 4 is also not significant with positive signs.

The estimations result in Table 1 exhibit that redistributive policies, as indicated by the change of Gini, fashioned the presidential election result. The relative robust effect of Gini, which is a product of various redistributive policies articulated and executed by both the central and local government, has exhibited that the district level voters hold the central government answerable for events outside its power (Healy & Malhotra, 2009). Indeed, in the Indonesian context, the local governments depend on the central government's transfer of various funds (Amalia, 2018). Therefore, it would not surprise voters if they believe that the central government plays a significant role in redistributive policy.

The finding of this paper puts relevance on the redistributive policy, but the 2019 presidential election result indicates that identity politics is also at play. This verdict is consistent with Thomas Pepinsky's (2019) conclusion. While acknowledging Pepinsky's finding, this paper underlines redistributive policy. This paper underlines voting based on economic calculation. In the broader context, this paper underlines the relevance of redistributive policies. The voters would evaluate the past performance of the incumbent's capacity to meet the voters' expectation on mitigating the widening gap between the rich and the poor people. The finding of this paper is in line with that of Meltzer & Richard (1981) Acemoglu & Robinson (2006) arguments' which connects the redistributive policies to the political rationale and particularly to electoral incentives. They mention that in democracy, office-seeking policy-makers make public policies to maximize their chance of securing the election. Politicians count the preferences of a majority of voters.

How to understand these differences in economic variables to explain Jokowi vote shares in 2019? Reducing poverty and unemployment have been the primary concern of the Indonesian government since the New Order regime. After the fall of the New Order regime, the following governments are also put serious attention to reducing poverty and unemployment. These are macroeconomics indicators which always be watched by the governments. Therefore, poverty and unemployment could be maintained at a low level. The economic recovery that has taken place since 2000 up to 2004 was able to reduce the number of poverty and unemployment due to the economic crisis that hit the country in 1997-1998. While economic recovery was able to reduce poverty and unemployment rates, the inequality tended to increase until 2014. During the 1997-98 financial crisis, poverty increased dramatically, but the ratio fell because everyone was affected. However, when the economic recovery started to take shape, and the economy grew, the gap between

the rich and the poor widened. The Gini has increased from 0.30 in 2000 to 0.41 in 2014, the highest Indonesian history (World Bank, 2018). One possible explanation for the increase in inequality may be the growth of the middle class.

The report mentions that several factors are responsible for the increasing gap between the rich and the poor. These factors are assets, income, consumption, and investment (World Bank, 2016). The report contends that high inequality may slow economic growth if poorer people cannot invest in their child development. It also argues that high-level inequality would increase the social cost, which provided an impetus for conflicts at the societal level. When people perceive that the gap between the rich and the poor is widening, income and wealth will open conflict. In short, a high level of inequality in Indonesia in income and wealth may hinder economic growth and potentially lead to open conflict in society. Facing this rising severe divide, both Yudhoyono and Jokowi governments adopted social policies to mitigate the widening gap. However, there were sentiments of discontent with the Yudhoyono administration because of the increase of inequality (Aspinal et al., 2015) as it was experiencing an increase in its decade rule. Therefore, the next 2014 and 2019 presidential elections were political competitions for a candidate that the voters believe could address the gap.

The first Jokowi administration addressed the widening gap by adopting several policy measures such as reducing stunting incidences, reducing the poverty rate, offering job opportunities, reducing the gap between the rich and poor, and strengthening industry for the SMEs.³ Relevant to the finding of this paper is Jokowi's government's effort to reduce the gap between the rich and poor. When Jokowi was installed as president in 2014, he adopted a vital policy that intended to reduce poverty and reduce the gap between the rich and poor: eliminated the subsidy for gasoline (TNP2K 2019). Jokowi argues that the subsidy for gasoline was mostly benefited the middle class instead of the poor people. Most importantly, he enlarged the social protection program for the poor.

This paper addresses the programs that are relevant to reducing inequality in Indonesia. The social protection programs have been targeted at children and low-income families. These programs were non-food assistance (Bansos Rastra); conditional cash transfer (Program Keluarga Harapan, PKH); educational cash transfer (Kartu Indonesia Pintar, KIP), food assistance (Sembako), and social insurance (Jaminan Kesehatan Nasional, Jaminan Kecelakaan Kerja). PKH aimed at 10 million poor households in 2017-2018 (TNP2K, 2019). Bansos Rastra was the biggest scheme for 15.6 million poor family with investment at around 0.18 % of GDP (TNP2K 2019, 49). Other schemes implemented by Jokowi were family welfare deposit program (program simpanan keluarga sejahtera, PSKS) as compensation for elimination of the gasoline subsidy; family hope program (program keluarga sejahtera, PKH); Indonesian health card (Kartu Indonesia Sehat, KIS); and Indonesian Smart Card (Kartu Indonesia Pintar, KIS). PSKS was targeted at 1 million beneficiaries who received 200,000 IDR for 5 months. Perhaps, these policies work to

³ <https://indonesiabaik.id/infografis/uapaya-atasi-ketidakmerataan>

reduce inequality. Therefore, the government pursued policies that work to bridge the gap, as Przeworski (2012) and Landa & Kapstein (2001) discussed.

During his first term as president, Jokowi enlarged the social protection program, which mainly targeted the poor, and as a result, inequality, as indicated by the Gini, started to decrease. Improvement of social protection programs has contributed to the decrease of the Gini from 39.2 to 38.0 in 2019 (TNP2K 2019, 78). The change indicates that even very small there was a positive sign that implementing various redistributive policies could reduce the Gini. As mentioned above, the government's efforts for a substantial redistributive policy is a political process to reduce inequality. Scheve & Stasavage (2009) contended that political factors do matter. They believe that political decisions for redistribution would require a long-time process. Their conclusion is accurate, and this paper does not intend to reject it. However, in a presidential contestation environment, as this study claims, the voters tend to vote for a candidate that can reduce the gap. The finding of this study is closer to those of Gradstein & Milanovic (2004), who proved that democracy supports redistribution, and Milanovic (2016) contends that democracy and redistribution are associated because economic decisiveness has political insinuations.

The government efforts to reduce inequality benefited Jokowi's administration. It indicates that various social protection programs devised under the Jokowi administration worked and benefited the poor people most importantly. The poor people had access to social insurance, education, and health facilities. It is important to note that these social protection programs have weaknesses such as inclusion and exclusion errors or simply mistargeting. However, these weaknesses are beyond the scope of the present study. The Jokowi administration in 2014-2019 tried to improve the provision of the social protection program through various policies, and one of them should be the improvement of the database for poor people. The voters seemed to perceive that the government under Jokowi was responsive to the widening inequality gap. Most importantly, the voters saw that the Gini declined in 2019 compared to that of 2014. The decline of Gini might not be very big, but there was a tendency to decline.

The regions that reduced the gap between the rich and the poor people tended to vote for Jokowi. It means that the economic policy that Jokowi implemented in the first term to reduce inequality worked for him. This finding is very different from those of Iversen & Soskice (2006) as they study democracy and redistributive policies in developed nations. While the finding of this paper underlines that the government policies to reduce inequality could determine the outcome of the election, it is relevant to note here that the gap between the rich and the poor people is still relatively high. In 2014 the richest 10 % of Indonesian consumed as much as the poorest 54 % (World Bank, 2016).

CONCLUSION

This study finds that inequality has relevant implications for the democratic process. Indonesia's 2019 presidential election highlighted the relevance of redistributive policies to gain votes. This study aims at understanding vote based on economic consideration

at the district level. In the 2019 election in which Jokowi was incumbent, the voters at the district level assessed his capacity to reduce the widening gap between the rich and the poor people. This study unveils that social policies could also explain the result of the presidential election that the incumbent government has introduced. Jokowi's victory can be elucidated to redistributive policies, highlighting the relevance of the government efforts to reduce inequality. Thus, the district-level voters as a group were happy with Jokowi's performance in his first term to address inequality.

The finding of this paper implies that the government policies to reduce inequality resonate with the voters, and the government has incentives to continue these policies. This study shows that the voters can assess government policies, which signifies that these policies impact the voters. This finding in voters' response to redistributive policies reveals a good prospect for the future of democracy in Indonesia. Identity politics also drove the presidential election. Therefore, politicians would have a huge incentive to mobilize primordial sentiments such as religious or ethnic identity. The outcome of the elections, which operated on primordial sentiments, would direct deep societal division. On the contrary, if the voters base their judgment on economic factors, in this case, inequality, the competing candidates would likely consider the economic policies that satisfy the voters. An attractive puzzle for the future democracy in this country is whether the voters choose the presidential candidate that offers better economic policies to improve their welfare.

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Digital Finance For Improving Financial Inclusion Indonesians' Banking

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Abstract

A digital finance service breakthrough is essential to get better financial assistance to optimize financial inclusion, and the effectiveness requires technological support in banking financial services. The study investigates the effect of digital finance on financial inclusion in Indonesians' banking industry. We develop the new measurement, namely average digital finance (ADF), and use loan transactions to proxy financial inclusion. The samples are six banking during 2013-2019, and we use panel data regression to test the hypothesis and do a robustness check. Our result confirms that ADF positively impacts financial inclusion and finds evidence of bank size's role in digital finance and financial inclusion. It implicates banks' strategy for optimizing financial inclusion based on its characteristics such as age, profitability, and efficiency. It contributes to digital finance's government policy for using explored internet banking and mobile banking stimulatingly.

Keywords:

financial services, digital finance, mobile banking, internet banking, financial inclusion

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INTRODUCTION

The issue of financial inclusion globally is essentially a worldwide government concern. The lack of opportunities to access financial services by vulnerable and needy groups is a global policy problem. Finding an innovative financial service model for the poor is an urgent challenge. It is based on the argument that poverty is a money gap and a gap in access to financial instruments that can improve lives. This financial limitation can slow economic growth and exacerbate economic inequality (Demirguc-Kunt et al., 2008). Therefore, the G-20 and the World Bank are trying to reduce poverty levels in developing countries through increased financial inclusion (GPFI, 2011; Ozili, 2018).

Financial inclusion has been a central policy government of many developing and emerging countries. Sahay et al. (2015) state that financial inclusion as the use of, and access to, legal, financial services will bring the excluded population access to formal financial products and services. Financial inclusion is expected to alleviate poverty and minimize a country's economic gap. Financial inclusion engenders aggregate Gross Domestic Product (Dabla-Norris et al., 2015). The unequal access to public finance due to the distribution of residences far from financial service centers has encouraged the importance of banks' role in strengthening financial inclusion strategies. The well-managed, efficient and inclusive financial system will improve an individual's financial state, provide facilities for goods and services exchange, integrate between society and economy, and protect economic shocks. There are many successes of financial inclusion stores such as India (Chavan et al., 2009), Zimbabwe (Mago & Chitokwindo, 2014), Nigeria (David-West et al., 2018), also Somalia and Kenya (Gas, 2019).

Financial inclusion is still a relevant issue for many countries that drive some innovation of financial institutions. Technological development leads to a fundamental re-imagining process and business capital in the financial services industry (World Bank Group, 2016). The increase in the internet-based economy using digital, especially mobile media, has led to financial transaction development structure changes. Digital Financial Services (DFS) have become a fundamental part of everyday life for every individual. Digital Financial Services provides the means to meet these needs and can give an excellent contribution to national economies' growth. Digital finance leads to digitalization, including all electronic products and financial sector services such as credit, electronic exchange systems, and home banking.

Furthermore, digital finance provides access to banks and their services, such as payment systems and credit that otherwise could hardly be reached (Gomber et al., 2017). The financial inclusion of digital finance has been internationally regarded as a means of adequate to provide opportunities to promote financial inclusion by reducing financial services costs (Asian Development Bank, 2016). Bank directs services into the banking network through various bank products accessible and affordable to the low-income earners as one of the financial institutions.

Financial inclusion becomes a significant driver of poverty because low-income people can now enjoy financial service through increased economic growth (Mago

& Chitokwindo, 2014). Some countries show significant progress in their banking management. Raj (2015) explains that some African States have progressed rapidly in monetary consideration by utilizing computerized financial control over the past few years. In Kenya, digital financial services have become a solution for addressing economic difficulties. It is reflected by the growing amount of credit in Kenya banking. David-West et al. (2018) describe financial technology in Nigeria to impact sustainable economic growth positively and have great potential for financial inclusion.

In Indonesia, the financial inclusion trend began to emerge after the monetary crisis in 2008, based primarily on crisis impact to the groups of bottom pyramids such as labor, low-income earners, and nonpermanent residents who have not accessed banking services (Bank Indonesia, 2016). Maverick's Indonesia reported that the banking industry increasingly adopted the newly emerging digital trend in 2018. Banking is actively launching digital services products, either independently or collaborating with financial technology (fintech) companies. Digital Financial Services (DFS) that have evolved in Indonesia are internet banking, mobile banking, and e-Money. According to Bank Indonesia (2016), the principles in DFS emphasize the right balance between innovation and risk in achieving greater financial inclusion and utilization of legal and regulatory frameworks for using digital technology to improve financial inclusion. It involves establishing a digital financial practice responsible for protecting consumers and improving financial literacy and awareness to understand digital financial products better.

Implementation of inclusive financial policy in Indonesia is very relevant to support Bank Indonesia's effectiveness and monetary function, payment system, and financial system stability. Inclusive finance helps lower liquidity pressure and credit risk in the banking sector. Furthermore, inclusive finance enables opening new retail markets, especially micro and small credit, diversifying portfolios, and minimizing credit risk. The inclusive economic program can also improve community capabilities and responsible finance through financial education and consumer protection. Generally, an inclusive financial policy can increase the effectiveness of existing monetary policy to touch all life walks (Bank Indonesia, 2016).

Banks have a significant role as financial service providers to encourage financial inclusion in Indonesia. Financial services of digital technology have become a new alternative in providing financial access services to the community. Banking financial services technology will help reach the community, especially rural communities that are generally not affordable by banks. The fact of Indonesia shows that the financial access conditions are assessed still low that reflected in the financial inclusion index Peruta (2015) finds that Indonesia is rank 9 (nine) of Index of Financial Inclusion (IFI). Moreover, part of cluster 2 (two) is defined as the group of countries that have been implemented for a short time (just below two years). Indonesia's financial inclusion experienced a growth of 12.8% compared to the survey results in 2014, which amounted to 36.1%. It means that the account growth amounted to 4.2% per year. The last survey conducted by the World Bank in 2017 showed that Indonesia's financial inclusion was 48,9% of the adult population already had an account. It can interpret that from 100 Indonesian adult residents, only 49

people have accounts with formal financial institutions. Although Bank Indonesia's data for 2020 shows that the trend of financial and digital economic transactions is growing positively, the volume of digital banking transactions has increased from 2017 to 2019, with an average growth of 21.13% (Warjiyo, 2021). However, general solid preferences and acceptance are needed for the successful Bank's role in facilitating access to financial services. This fact is in line with banks' role in Kenya, ensuring sustainability reaching people who do not have a bank account and driving inclusive financial growth (Kithinji, 2017). A similar thing is stated in Ozili (2018) found that digital finance through financial technology services affects financial inclusion in developing and advanced countries and digital finance convenience for low-income individuals.

However, the effectiveness of financial inclusion requires technological support in the application of banking financial services. A breakthrough in digital finance service is essential for better financial services to optimize financial inclusion. The innovation of financial institutions needed in many ways includes mobile banking concepts reached by 'unbanked' low-income earners and the unemployed as long as they have access to a cell phone (Mago & Chitokwindo, 2014). It is made possible through digitization, which can essentially turn a smartphone into a wallet, cheque book, bank branch, and accounting ledger, all in just one service. Digital finance refers to financial services providers who use portable or mobile technologies and web technologies, and network agents to conduct processing and supervision of their financial services.

Access to financial services brings so many benefits to society through digital financial innovations that affect banking institutions' performance and improve access to financial services. Theoretically, financial innovations show that digital financial innovations enhance financial inclusion, while the technology acceptance model indicates that acceptance of DFS improves financial services accessibility by various users. Mobile banking has benefited multiple stakeholders, such as increasing the flow of money, spreading entrepreneurship, and increasing Gross Domestic Product (Singh et al., 2014). The finding of Salam (2018) in Indonesia stated that digital banking is beneficial and helps Sharia bank services. Kithinji's research (2017) in Kenya also finds the significant impact of digital banking strategy in improving the Bank's financial inclusion.

The importance of mobile technology in expanding financial services at an affordable cost is due to the initial investment and other fixed expenses, so the marginal cost is very low for every transaction or every new customer (Honohan & Beck, 2007). It has rapidly led to mobile money expansion and helped infrastructure constraints and inclusive finance (Son et al., 2020). The development of mobile financial service in emerging and developing countries are primarily equipped with a mobile phone that provides an advantage in terms of access to financial assistance. Hopefully, through internet banking and mobile banking, financial services will encourage the public to easily make financial transactions and improve banking services quality (Peruta, 2015). Furthermore, the community is more accessible in conducting banking services through mobile money such as credit submission that can improve productivity by increasing efficiency, lowering the transaction cost, and creating a platform for other businesses (Donovan, 2011).

Providers of digital finance services are profit-seeking corporations that use digital finance to maximize their profitability or maximize the profitable opportunities of businesses affiliated with digital finance providers, namely banks' financial and non-financial institutions. However, on the other side, there are obstacles to implementing digital services, such as costly costs and risks, unavailability of extensive infrastructure, and banking crimes committed by the user. The expected benefit of digital finance for improving financial inclusion can only be fully realized if the cost of providing digital financial services is negligible or zero (Ozili, 2017). The failure of digital finance can be triggered by the inaccuracy of the applied digital finance technology such as mobile finance (credit, insurance, and savings), mobile banking (transactional and informational), and mobile payment (P2P, G2P, and B2B). Because it also depends on the level of financial literacy in the community (Donovan, 2011). Mobile banking is a mobile technology to access banking services run by banks or other financial institutions and allows customers access to their bank accounts using mobile technology (Ahmad et al., 2020). The number of mobile banking transactions can raise costs and risk of crime in the community's low financial literacy and decrease financial inclusion. Therefore, it needed to study the process of mobile banking by banks and customers (Singh et al., 2014).

The number of studies examining digital finance's financial inclusion effect from a banking perspective is still relatively small and limited. That makes us look for banks' role in digital finance and their impact on financial inclusion, especially in Indonesia. Some previous research such as Chavan et al. (2009), Mago & Chitokwindo (2014), (Peruta, 2015), and Son et al. (2020), tend to analyze digital finance and financial inclusion from the users perspective and explore the advantage of digital finance in improving users welfare by increasing financial services access. As part of the financial system, we argue that banks urgently provide digital financial services through mobile money for various users. It is expected to increase poverty and become a solution to overall economic improvement for the country.

The form of fintech innovation enables financial transactions through mobile devices (Donovan, 2011). Mobile money shares other technical design characteristics, such as mobile payments and online banking (Senyo & Osabutey, 2020). Then we use bank transactions through mobile technology as a proxy of digital finance because it reflects account ownership by users, transaction costs of the Bank, and financial transactions that led to the level of competition of digital services. Precisely, we capture the digital finance of the Bank through internet banking and mobile banking transactions based on the argument. The high and low commerce of the two shows that individual customers' perceptions and attitudes are either positive or negative on banks' digital financial services (Singh et al., 2014). Analysis bank as economic digitalization services intermediary is essential for deciding the level of trust. In mobile money services through the story of mobile transactions.

Internet banking and mobile banking are part of digital finance, namely digital finance business function, relevant technologies, technological concepts, and institutions providing digital finance solutions, i.e., Bank (Gomber et al., 2017). This study develops the new digital finance measurement, namely Average Digital Finance (ADF), consisting

of the average sum of internet and mobile banking. This ADF measurement developed from previous research of Kithinji (2017) that uses the internet and mobile banking as two separated proxies of digital finance. We argue that combining mobile money types in one measurement will better reflect digital finance's function. Singh et al. (2014) state that product usage-controlled by individuals' thinking and perception about digital financial services, leading to the perception that is increasing various mobile transactions will reflect users' positive perception in adopting digital finance.

Furthermore, our study uses the number of loans as a proxy of financial inclusion based on financial inclusion arguments that reduce poverty by creating productivity due to easy access to users' formal financial services. Being an owner of mobile money accounts such as the internet and mobile banking increases the probability of saving and loan-taking behavior (Gas, 2019). The high loans reflect users' capability to improve their well-being by providing education, medical, farm or business, and others.

Therefore, this study analyzes digital finance's impact on the banking industry's financial inclusion in Indonesia during 2013-2019. The research formulates problems related to digital finance's influence on financial inclusion. It is expected to have the practical implication that the banking industry can consider digital finance aspects as a strategic decision for designing financial service through financial inclusion policy based on bank characteristics. Furthermore, this research is also expected to reference the government's consideration of financial inclusion strategy through digitalization banking services according to the community's features.

METHODS

This study investigates the impact of digital finance and financial inclusion in Indonesia. We hypothesize that digital finance has a positive effect on increasing financial inclusion. We explore yearly data from the banking industry from the Indonesia Stock Exchange (IDX) and Authority Financial Services (OJK) from 2013 to 2019. Analyzed data by assessing and deepening the literature relating to research, online searching, and other websites linked to data needs. Our sample based on internet banking and mobile banking transactions is 6 (six) Bank Central Asia, Bank Rakyat Indonesia, Bank Tabungan Negara, Bank Mandiri, Bank Nasional Indonesia, and Bank CIMB Niaga. We exclude bank mergers or acquisitions and incomplete data for variables.

Our study focuses on analyzing the role of banks in digital finance and financial inclusion, so we select the relevant measurement of bank financial reports' variables. This research's dependent variables are financial inclusion proxied by the loans, and the independent variable are internet banking and mobile banking as digital finance proxies. We developed a new digital finance measurement, namely Average Digital Finance (ADF), measured by the average of internet and mobile banking transactions. It is based on the argument that merging it more reflects all value of digital finance, according to Singh et al. (2014). We also use control variables in this study bank: bank profitability measured by net income margin, bank efficiency ratio based on operating cost to operating income, and bank age.

This study tested the hypotheses that examine the impact of digital finance on financial inclusion, and we built the empirical model are formulated as follows: According to this, the model estimate in this study is as follows:

$$LOAN_{it} = \beta_0 + \beta_1 ADF_{it} + \beta_2 PROF_{it} + \beta_3 EFR_{it} + \beta_4 AGE_{it} + e_{it}$$

Where: it represents Bank and time; respectively, LOAN is financial inclusion proxied by loans. ADF is the Average of Digital Finance proxied by the average sum of internet and mobile banking transactions. PROF is bank profitability measured by Net Interest Margin, EFR is bank efficiency ratio measured by Operating Cost to Operating Income, and AGE is bank age.

Furthermore, the study used panel data regression to estimate cross-section and time-series data parameter estimation. The regression method data panel will give the estimation result, which is Best Linear Unbiased Estimation (BLUE). Estimating the regression model using panel data can be done through three approaches: standard effect model, fixed-effect model, and random effect model. In this study, we use the random effect model based on the argument it can describe a random character of the i-th unit observation and remains at all times. We also did the robustness check by replacing the independent variable following Kithinji (2017) that uses the internet and mobile banking as two independent digital finance measurements.

RESULT AND DISCUSSION

Descriptive Statistical Analysis

Digital finance requires extensive infrastructure, which can be done more freely by giant Bank's assets. Descriptive data shows that the highest average of mobile banking transactions is 1318 million transactions, BCA Bank, while the lowest trade value is 14,35 million is BTN bank. The highest value of Internet banking transactions is 1711 million is also a BCA bank, whereas the most inadequate marketing is BTN Bank is 1,1 million. Furthermore, the highest is BRI Bank for the credit value found, and the lowest is BTN Bank. The highest efficiency ratio of Bank measured by Operating Cost to Operating Income is BTN bank, and the highest profitability of Bank proxied by Net Interest Income (NIM) is BRI bank. Furthermore, Table 1 shows more extensive Banks having more mobile and internet banking transactions than smaller ones.

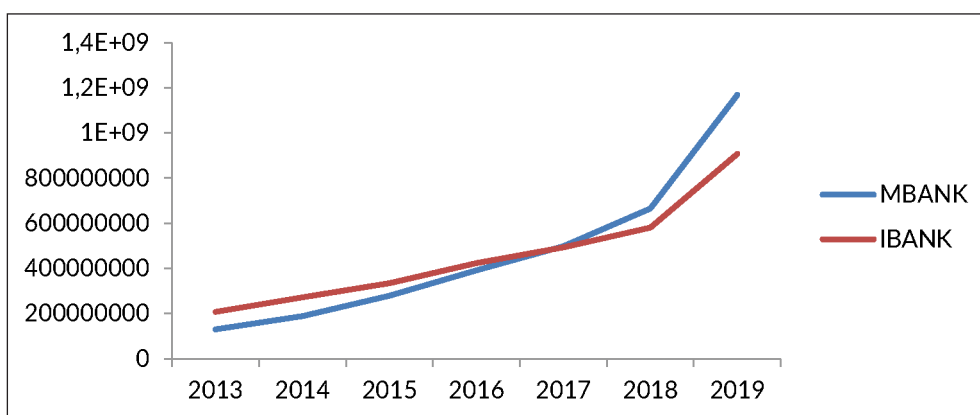
Table 1. The Descriptive Statistical Analysis

	LOANS (in a million Rp)	MBANK (in a million transaction)	IBANK (in a million transaction)	ASSETS (in a million Rp)	PROFITABILITY (Net Interest Margin)	EFFICIENCY (Operating Cost to Operating Income)	AGE
Mean	418000	457	449	636000000	0,060	0,719	75
Median	405000	257	30	615000000	0,058	0,702	66
Maximum	970000	3850	2510	1420000000	0,086	0,981	124
Minimum	92400	2,1	0,2	131000000	0,033	0,062	15
Std. Dev.	235000	694	677	366000000	0,011	0,148	36
Skewness	0,491	3,20	1,684	0,365	0,483	-1,822	-0,01

Source: Authors' data (2020)

As reflected in the number of mobile and internet banking transactions, digital banking development increased during 2013-2019. It is in line with Bank Indonesia data (2020), which states that digital banking transactions have grown significantly since 2016-2019 due to the positive attitude of public acceptance of digital financial services. Figure 1 shows that the growth of internet banking is higher than mobile banking, which leads to an increase in financial literacy, especially digital finance among Indonesians, which provides a better understanding of the benefits of mobile money in supporting their activities. Good knowledge of digital financial services encourages increased public trust as digital technology users in banking products improve the quality of life and economic welfare.

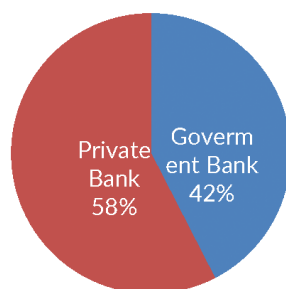
Figure 1. Development of Digital Banking Transactions in Indonesia 2013-2019



Source: Authors' data (2020)

Overall, the proportion of the number of digital financial service transactions was dominated by private banks, which reached 58%, while the accumulation of digital banking transactions by state banks was only 42% (see Figure 2). The flexibility of the digital finance strategy by private banks greater than government banks is possible because the ownership structure determines the Bank's strategic decisions and capacity. In line with Honohan & Beck's (2007) findings, the influence of ownership structure depends on the strategies and capabilities of the resulting bank management. The Bank has unique characteristics, such as age, size, ownership, and boards. Then it may be linked to the decisions making.

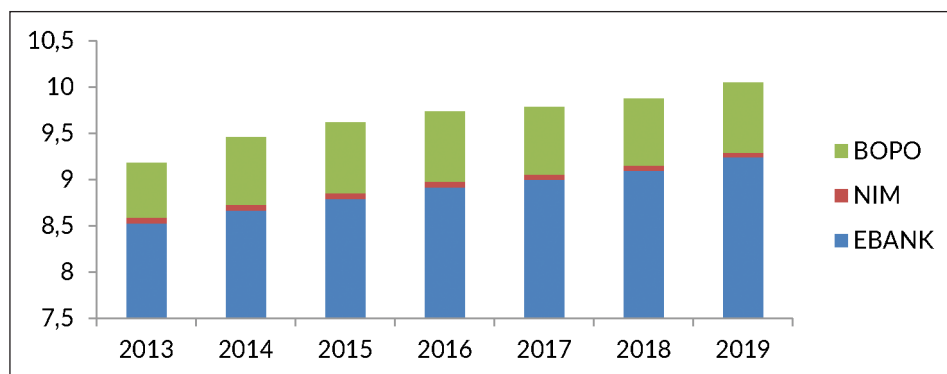
Figure 2. The Proportion of the number of Digital Banking transactions in Indonesia 2013-2019



Source: Authors' data (2020)

Private banks have independent capital management to develop digital finance strategies for improving market share and applied technology financial inclusion. For handling bank characteristics gap, certain functions can be divided so that each Bank can achieve economies of scale. The collaboration between state and private banks needs to be improved. There is a unity of perception regarding digital financial services standards with each function's division based on the coverage area of digital financial services, both urban and rural. It is intended to achieve economies of scale from each of its digital banking strategies.

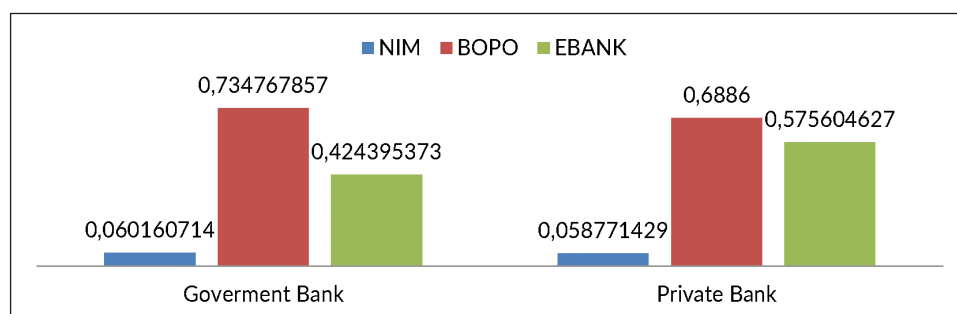
Figure 3. Effectiveness of Digital Banking in Indonesia 2013-2019



Source: Authors' data (2020)

Furthermore, digital finance's effectiveness in Indonesian banking in Figure 3 appears to be not optimal based on the size of the Net Interest Margin (NIM) and Operational Cost to Operating Income (BOPO). The increase in the number of digital banking transactions (mobile and internet banking) has boosted banking income margins, but this has not been followed by a decrease in operating costs, as shown in Figure 3.

Figure 4. Digital Finance Performance in Indonesian Banking 2013-2019



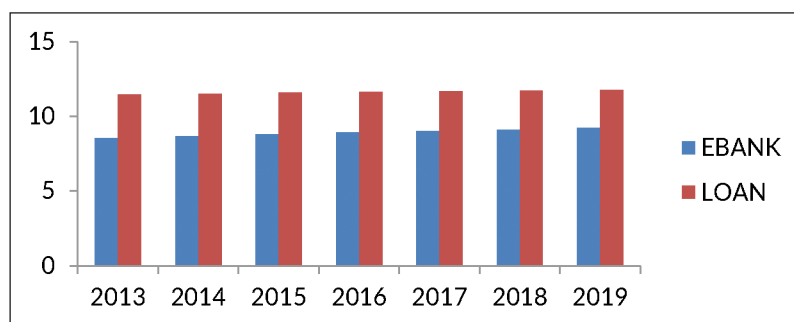
Source: Authors' data (2020)

The comparison of private and government banks' digital finance performance in Figure 4 shows that the average private bank is more efficient in providing internet and mobile banking. However, digital finance strategies for improving financial inclusion need to consider increasing profits at low prices. Although state banks have a higher average NIM than private banks, the value of government bank operational costs as

reflected in BOPO is still high. It requires evaluation by the banking sector in Indonesia, considering that financial services technology procurement should be linked with relatively low marginal unit costs (Honohan & Beck, 2007).

Furthermore, this study's findings show an overview of Indonesian banks' role in financial inclusion through digital finance, as shown in Figure 5. The increase in the number of digital banking transactions from 2013 to 2019 is in line with the number of loans. It can be interpreted as increasing informal access to financial services obtained by the public. Digital finance improves financial services that are more practical and easier and provides access for the unbanked community. It can also offer financial services in real-time, facilitating payments, savings, credit, insurance, and other financial facilities in banking. The number of mobile transactions shows that individual customers' perceptions and attitudes are positive or negative on banks' digital financial services (Singh et al., 2014). The positive financial experiences lead to the trust level of digital financial transactions.

Figure 5. Development of Digital Finance and Financial Inclusion in Indonesia 2013-2019



Source: Authors' data (2020)

The growth in banking financial inclusion achievements shows digital financial services' success for easy access to formal finance for the public. The increase in loans as an indicator of banking finance encourages other digital products that require anticipation from banks and the government. Banks and the government's role is also crucial because it needs to create a safe environment for these digital financial service facilities (Gabor & Brooks, 2017). The increase of loans can lead to higher risks for the bank, namely lousy credit that will trigger distressed banks if not appropriately managed.

Gas (2019) states that financial inclusion determinants are individual characteristics such as gender, age, education, and behavior (saving and loan). The determinant of financial inclusion is the quality of digital banking implementation by financial services institutions and the user side, in this case, the community. On the bank side, financial inclusion's effectiveness through technological support should preferably be efficient risk management and financial literacy for the community. When people understand that digital finance makes access to formal financial services more manageable, their opportunities to improve their economy are open, such as school loans and medical treatment. Owning a mobile financial service account will direct their behavior to facilitate digital finance. The education process is essential for digital financial literacy for the

community. It is the key to accelerating digital finance applications' understanding of easy access to users' financial services.

We analyze digital finance's impact on financial inclusion using panel data regression, especially cross-section random effect. As our expectation, the study results show a significant impact of digital finance on financial inclusion. Implementing a new measurement, which combines average mobile banking and internet banking, namely Average Digital Finance (ADF), has a positive coefficient in increasing loans. Our findings support Mago & Chitokwindo's (2014) previous research that digital financial services have an urgent role in financial inclusion for increasing financial activity and boosting economic growth.

Table 2. Regression Result

Dependent Variable <i>Financial Inclusion</i> Log of loans	Research Model	Robust Model
Independent Variable		
Digital Finance (ADF)		
Log of Average of digital banking transactions	0,2892* (0,0159)	-
MBANK	-	0,1991* (18,916)
Log of mobile transaction banking		
IBANK	-	0,0757* (0,0116)
Log of transaction internet banking		
Control Variables		
Profitability (PROF)	-2,6042**	6,0347*
Net Interest Margin	(1,2791)	(0,8297)
Efficiency Ratio		
Operating cost to Operating Income	0,0708 (0,0602)	0,4175* (0,0524)
Bank Age		
	0,0012*** (0,0006)	0,0003 (0,0002)
Year dummies	Not Included	Not Included
Constant	Included	Included
Method	RE	RE
Adjusted R-squared	0.8149	0.8284

This table presents the results of random effect panel data both of research model and robust model. The dependent variable is financial inclusion provide by credit loans (LOANS); the independent variable is digital finance proxied by the average transaction of mobile banking and internet banking (ADF). In contrast, for the robust model using separated mobile banking transaction (MBANK) and internet banking transaction (IBANK). The control variables are bank profitability measured by Net Interest Margin, bank efficiency ratio in Operating Cost to Operating Income and bank age. The values in parentheses are standard errors. *significant 1% **significant 5%***significant 10%

In contrast, banks' increase in financial inclusion through access to loans has not always resulted in profits. Table 2 shows the finding of a negative coefficient of Net Interest Margin (NIM), which means that the increase in loans reduces the bank's income margin, which is possible due to the erosion of high bank operational costs. It is supported by the descriptive data in Graph 3, which shows that Indonesian banks' efficiency in the digital banking program has not yet been optimal, which has increased bank operational costs.

It seems to contradict the original goal of developing digital finance to improve financial services' quality, diversity, and efficiency (Li et al., 2020). The mobile banking system is ideal for remote areas, given that it is an easily accessible, cheaper, more convenient, and faster means of sending and receiving money. However, this should apply both from the perspective of users and banks as financial service intermediaries, and when banks experience inefficiency, the purpose of digital finance becomes doubtful. It is based on the statement of Sahay et al. (2015) and Dabla-Norris et al. (2015) that financial inclusion should consist of a combination of market depth (size and liquidity), efficiency (sustainable, low-cost financial services), and access (the ability of individuals to access financial services).

Furthermore, this study found evidence that age banks control the influence of digital finance on financial inclusion. It means that banks that have been engaged in the banking industry for a long time will be better able to implement digital financial services to increase financial inclusion. It is based on the logical argument that the longer a bank lasts in its industry, the better it will carry out various strategies and explore multiple digital financial services. Younger banks need more priority for determining the accuracy of digital banking due to limited experience and market share.

Furthermore, we conducted a robustness check to follow Kithinji (2017) by replacing the digital finance proxy by separating internet banking and mobile banking. As expected, mobile banking's coefficient as a measurement of digital banking is still positive for financial inclusion. Contrastly, profitability and efficiency banks proved significant control variables in digital banking and financial inclusion. This finding supports graph three's descriptive data that show increased digital finance will increase net interest margin and bank cost.

CONCLUSION

A country's economic growth achievement and financial inclusion are a solution to improving poverty by providing affordable financial services by all circles and providing good quality financial services, effective and efficient. The research results prove that digital finance positively impacts financial inclusion through digital financial services, facilitating access to financial services. The bank functions as an intermediary financial offer digital financial assistance for the public. Such as mobile banking, internet banking, and other products. The growth of digital banking transactions will trigger an increase in the financial inclusion index, which can boost banking financial stability.

Furthermore, the study results show that increasing or decreasing internet banking and mobile banking transactions can simultaneously influence credit penetration (loans). It is supported by positive public acceptance and understanding of banking digital financial literacy. It has implications for Indonesia's banking strategy to improve further the education and socialization of digital banking financial services. Banks should explore digital technology in financial assistance based on characteristics such as costs, benefits, and age. Thus, increasing financial inclusion through digital finance will be optimal and not reduce bank revenues, reducing the operational cost of digital banking. In the long term, it will optimize bank income margins. It can expand bank cooperation with economic agents regarding fees and transaction fees for digital banking services.

The other side of this research is the findings that have implications for the government regarding the banking industry's mobile technology strategy to optimize its future performance. The government and banks cannot ignore the fact that there is a difference in the acceptance of understanding and behavior of digital financial services in urban and rural areas. The government can consider digital financial assistance based on a society's specific characteristics, such as age, income and education, and sites' distribution. It is intended so that the digital finance strategy's effectiveness is right on target to increase the ease of financial and economic access. Continuous digital financial literacy and risk management by banks and governments are needed to accelerate public understanding of the application of sound, precise, and safe digital banking. However, community economic growth is thrust through inclusive financial services. Complete and affordable digital financial services that facilitate financial services will undoubtedly encourage people to use them.

For further research, we can simultaneously compare digital finance performance through financial inclusion from three perspectives: banks, non-bank financial services, and the user community. Using a mixed method that juxtaposes banking data with digital finance user response data is a promising opportunity for better mapping digital finance's role in financial inclusion and economic growth. It provides a complete picture of digital finance's influence on financial inclusion in urban and rural areas.

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Non-Interest Income and Deposit Money Banks (DMBs) Performance in Nigeria

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Abstract

The review of the regulations guiding the activities of Deposit Money Banks (DMBs) in Nigeria affected the revenue generated by DMBs, forcing most banks to diversify their sources of revenue to non-interest income. Panel data technique was employed to examine the impact of non-interest income on DMBs performance in Nigeria from 2012 through 2019. The empirical finding revealed that non-interest income, capital adequacy ratio, and bank loan positively and significantly impact DMBs' performance in Nigeria. The study recommends that DMBs delve into non-interest income activities as it appeared to improve the performance of DMBs in Nigeria, and the monetary authority should review the policy guiding the non-interest income activities of the DMBs at regular intervals.

Keywords:

non-interest income, Return on Asset, Panel regression, Bank Performance

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INTRODUCTION

Deposit Money Banks (DMBs) are mainly expected to accept deposits from the surplus unit and make it available as credit to the deficit unit, known as financial intermediation. The main function of banks in a financial system is the intermediation role of indirect financing. This traditional function is anticipated to be the primary source of revenue to the bank, a component of bank income, referred to as the interest income. The bank's interest income is from credit extended to their clients and the income from investments. It represents margin arising from interest on loans & investments and the interest paid by the bank to depositors or other banks.

The deregulation of the Nigerian financial system in 1986 ushered in stiff competition that necessitated the restructuring and recapitalization of banks, which made Nigerian banks opt for diversification of their revenue from interest income (traditional source) to non-interest income (non-traditional source). Diversifying into non-interest income does not affect the interest income; banks also earn additional income from non-interest income by charging their customer a fee for every financial service rendered other than intermediation service (DeYoung & Rice, 2004). Non-interest income is not expected to affect the interest income but to serve as an additional source of income to DMBs.

Nigerian banks were faced with frequent reviews of regulations that affected the revenue generated by these banks. The Central Bank of Nigeria (CBN) in 2016 announced the eradication of commission on turnover (COT), which is a component of the non-interest income charged by banks on debit transactions initiated by the customer for the benefit of the third party because it contributes over 60% of the bank's revenue in Nigeria. The abolished COT replaced the current account maintenance fee and reduced the bank revenue by 20%. This change of policy by CBN has reduced the DMBs' non-interest income, which is likely to affect the bank performance in Nigeria adversely. DeYoung & Rice (2004) show that non-interest income forms 40% of the operating income of commercial banks in the United States (U.S.).

The import of non-interest income has been advanced by Bian et al. (2015), but Nigerian DMBs have been seriously affected as global crude oil price instability has a far-reaching effect on banks' non-performing loans. More so, the 2016 full implementation of Treasury Single Account (TSA) in Nigeria leading to the withdrawal of all government accounts from banks has deprived DMBs of over N1 trillion (Ndubuaku et al., 2016), thus reducing bank capital and their loanable capacity, thereby leading to more dependence on non-interest income to augmenting the reduced interest income for survival. This condition has necessitated an investigation into the relationship between non-interest income and DMBs' performance in Nigeria.

Another crucial factor influencing investors' behavior is inflation, as it allows them to switch to more favorable investment opportunities that pay higher returns; this process is known as disintermediation (Edward & Mishkin, 1995). This process could force banks to venture into non-traditional services. Some banks' average interest rate on demand deposit in Nigeria is 4.2%, while the prime and maximum lending rate on general commerce

is 15% and 30%, respectively. Investors have various windows in which they can invest their funds. For instance, the Treasury bill pays a guaranteed average interest of 11%, and the mutual fund pays 10%. Also, the FinTech companies PiggyVest and Cowrywise offer the least interest rate of 10% on savings per annum that are all legitimate investments. Withdrawal of customer funds from DMBs into other investment windows reduced the capital base, liquidity level, the credits advanced to customers, and increased the cost incurred (Edward & Mishkin, 1995). This situation is likened to Allen & Santomero's (2001) submission on U.S. banks when they believed that, for banks in the USA to regain their lost position due to competition, they need to reduce the interest on the loan and increase the interest paid on deposit. This condition has further shown the damaging effect of inflation on non-interest income, thereby affecting DMB performance in Nigeria (see Prabha et al., 2016).

Previous studies have documented the importance of bank size in the profitability drive of any DMBs. This study is hinged on the submission of Rogers & Sinkey (1999) that bank size is one of the determinants of bank involvement in non-traditional activities. Although, previous studies provides a different results about the relationship between bank size and bank performance. For instance, Flamini et al. (2009), Karakaya & Er (2013), Al-Tarawneh et al. (2017) are in line with Rogers & Sinkey's assertion that bank size has a positive and significant relationship with bank performance. On the contrary, Athanasoglou et al. (2008) found no significant relationship between bank size and banks performance. Baek et al. (2018) affirmed that money incurred by banks in carrying out non-traditional activities is higher than what is incurred on traditional activities, which made the non-interest income to be more volatile.

Also, Karakaya & Er (2013); Al-Tarawneh et al. (2017) showed a positive linkage between credit creation of DMBs to the size of its profitability despite the extent of banks' exposure to non-performing loans. Although, high non-performing loans in the bank's portfolio could reduce the banks' profitability, resulting in non-recovery of loans (bad debt). Other factors influencing bank performance as identified by literature include management expense (Guru et al., 2002; Al-Tarawneh et al., 2017); labor and capital productivity (Naceur & Goaied, 2001).

Several studies have established a linkage between non-interest income and the performance of banks, but the extent of the relationship between the duo remained unresolved in the Nigerian context. Despite extensive studies in this area, there is no consensus about the exact relationship between non-interest income and bank performance as different reasons were advanced for the mixed findings. The relationship is more complicated as it depends on the circumstances and the prevailing state of the economy. It is worth mentioning that most previous studies on non-interest income and bank performance nexus found positive impact (DeYoung & Rice, 2004; Craigwell & Maxwell, 2006; Demirgüçç-Kunt & Huizinga, 2010; Karakaya & Er, 2013; Lee et al., 2014; Sun et al., 2017; Al-Tarawneh et al., 2017; Adedeji & Adedeji, 2018; Baek et al., 2018; Al-Slehat & Altameemi, 2021). In contrast, Mndeme (2015) found a negative impact.

However, this study contributes to the literature on non-interest income and bank performance in the following ways: First, studies on non-interest income concerning bank performance in Nigeria remain scarce as Adedeji & Adedeji (2018) study spanned through 2006 and 2015, which did not cover 2016 full implementation of Treasury Single Account (TSA) and its impact on bank performance. Second, the improvement on the number of sampled banks by this study to 13 DMBs representing about 93% quoted DMBs in Nigeria, excluding Jaiz Bank because it was quoted in 2017, as any sample below this may give a misleading result for policy recommendation. Third, this study considers only bank-specific variables, which the previous study on Nigeria did not give adequate attention to. Therefore, this study examines the impact of non-interest income on the performance of DMBs in Nigeria. The remaining part of this paper focuses on the methodology, followed by the empirical results and interpretation, and lastly, the conclusion and policy recommendation.

METHODS

This study employed an ex-post facto research design based on a quantitative description of historical financial data. In estimating the impact of non-interest income on DMBs' performance in Nigeria, we adopted the model of Al-Tarawneh et al. (2017), which is expressed in a functional form equation 1.

$$ROA = f(NonInt, CapRatio, Overhead, Loan, Size) \quad (1)$$

Where *ROA* is return on asset that is a proxy for bank performance, *NonInt* represents non-interest income, *CapRatio* represents capital adequacy ratio, *Overhead* represents overhead expenses, *Loan* represents bank loan and *Size* represents bank size.

More so, equation 1 is therefore restated in a linear form in equation 2:

$$ROA_{i,t} = a_0 + a_1 NonInt_{i,t} + a_2 CapRatio_{i,t} + a_3 Overhead_{i,t} + a_4 Loan_{i,t} + a_5 Size_{i,t} + \varepsilon_{i,t} \quad (2)$$

Where ε represents error term and a_1 , a_2 , a_3 , a_4 and a_5 are coefficients of the of the explanatory variables in the model.

The statistical technique employed was panel data analysis comprising of pooled regression, fixed effect regression and random effect regression model. We conducted the Hausman-test, Breusch-pagan LM test, Pesaran Cross-Section Dependence test, and Wald test to guide our decision on the model that best fit this study.

he Hausman test is a diagnostic test only for the REM estimates and not a diagnostic test for FEM. This condition is because the REM considers all time-invariant differences between variables/heterogeneity bias problems in its estimation. In contrast, FEM only considers time-invariant difference within a variable in its estimates, making it inappropriate for scholars to use only the Hausman test as the only diagnostic test (Clark & Linzer, 2012). This condition makes it imperative for scholars to carry out other diagnostic tests like the Breusch-pagan LM test, Pesaran Cross-Section Dependence test, and Wald test.

The REM believes that the difference among variables is uncorrelated and random among the explanatory variables in a model and assumes that the error terms in a model are uncorrelated with the estimates, which permits the usage of time-invariant variables an independent variable in the model. It is to be noted that the FEM helps to ascertain the time-invariant causes within a variable while the REM takes care of the time-invariant causes between variables in a model.

The REM is therefore specified for the purpose of this study as in equation 3:

$$ROA_{i,t} = a_0 + a_1 NonInt_{i,t} + a_2 CapRatio_{i,t} + a_3 Overhead_{i,t} + a_4 Loan_{i,t} + a_5 Size_{i,t} + U_{i,t} + \varepsilon_{i,t} \quad (3)$$

We estimated the Wald test to identify the presence of heteroskedasticity among the variables in the model. The study also conducted the Breusch-Pagan LM test of independence and Pasaran Cross-sectional Dependence test in order to identify whether there is a presence of cross-sectional dependence in the residuals or not. The null hypothesis of this test is that the residuals are uncorrelated (Baltagi, 2008).

We extracted data from the financial statements of 13 quoted deposit money banks that charge interest in Nigeria out of the fourteen (14) listed DMBs on the Nigerian Stock Exchange (NSE) as of 31st December 2019, covering the period of 2012 to 2019. The remaining one (1) DMB, which is Jaiz bank, was excluded due to the unavailability of data because it was quoted on NSE in 2017. More so, the justification for choosing the year 2012 as the beginning period was since the TSA was introduced in the year 2012, which led to the withdrawal of government funds from accounts of DMBs in Nigeria and forced many of the DMBs to venture more into the non-interest income activities. Data extracted were analyzed with panel data involving thirteen (13) cross-sectional observations with a period of six (8) years.

RESULT AND DISCUSSION

Result

Table 1 presents the descriptive statistics of each variable used in this study. Findings revealed that Return on Asset (ROA) has an average mean value of 0.018952, which implies that the average return of DMBs is 1.8952% within the period while the median value of 1.5742%. The highest value of ROA is 19.8515%, with a minimum value of -0.09532, which has its standard deviation of 0.026118. Non-interest income has an average mean of 0.293822, which implies that an average bank in Nigeria generates ₦29.38 (29.38 Nigerian nairas) for every ₦ 100 asset of the bank used that is expected to improve the bank revenue. Capital Adequacy Ratio (Capratio) has an average mean of 0.153376, which implies that an average bank in Nigeria has a capital adequacy ratio of 15.33%, which is higher than the minimum requirement set by the Central Bank of Nigeria, which was 15% for banks with international subsidiaries and 10% for banks without international subsidiaries. The loan has an average mean of 0.412917, which implies that an average bank in Nigeria gives out a loan of ₦ 41.29 out of every ₦ 100 of the bank's asset. This data also signifies that the depositor's funds are protected and ensure stability in the Nigerian banking system.

Table 1. Descriptive Statistics

Variables	Mean	Median	Maximum	Minimum	Std Dev.	Obs
ROA	0.018952	0.015742	0.198515	-0.09532	0.026118	104
NONINT	0.293822	0.257860	0.987750	0.000512	0.178492	104
CAPRATIO	0.153376	0.137215	0.973031	-1.5475	0.292371	104
LOAN	0.412917	0.430417	0.571904	0.000244	0.126680	104
OVERHEAD	0.641609	0.644741	1.063525	2.09E-05	0.215464	104
SIZE	12.14124	12.13963	12.91508	11.19453	0.395403	104

Source: Author Computation, 2020
NB: ₦ represents Nigerian Naira

This result is evidence that Nigerian banks given loans below the minimum requirement set by the Central Bank of Nigeria, which is 60%, i.e., banks must give ₦60 out of every ₦100 held with the bank. Overhead has an average mean of 64.16% which implies that an average bank in Nigeria expend ₦64.16 for every ₦100 generated by the banks. Size has an average mean value of 12.14124 that implies that an average bank in Nigeria has assets worth of ₦1, 307,585,211,014. Table 3 explains the level of correlation among the variables in this study.

Table 2. Correlation Matrix of relationship among specified variables

Variables	ROA	NONINT	CAPRATIO	LOAN	OVERHEAD	SIZE
ROA	1.00000					
NONINT	0.45758	1.00000				
CAPRATIO	0.55446	0.54178	1.00000			
LOAN	-0.17759	-0.51734	-0.13401	1.00000		
OVERHEAD	-0.09938	-0.41031	-0.04221	0.90316	1.00000	
SIZE	0.14872	-0.08565	0.045387	0.34439	0.33991	1.00000

Source: Author Computation, 2020

Table 2 shows the correlation among the variables. It shows that non-interest income, capital adequacy ratio, and bank size have a positive relationship with return on the asset, which means when these three variables increase, return on asset increases by these proportion. In comparison, loan and Overhead have a negative relationship with return on the asset, which means when these two variables reduce, return on asset increases by these proportion. The capital adequacy ratio is positively related to non-interest income, which means capital adequacy moves in the same direction as non-interest income. At the same time, loan, Overhead, and size negatively correlate with non-interest income, which means an increase in these variables, will reduce non-interest income by their respective proportion. Capital adequacy ratio is negatively related to loan and Overhead but positively related to bank size. The loan is positively related to Overhead and bank

size. Overhead expenses are positively related to bank size, implying that an increase in the size of a bank increases the expenses incurred in the banking business.

Table 3 explains the pooled, random and fixed effect regression result. The pooled result shows that non-interest income has a positive effect on return on assets, implying that a unit increase in non-interest income will bring about 0.029246 increases in bank performance, which is significant. The capital adequacy ratio positively impacts return on assets, which means that a unit increase in capital adequacy ratio will bring about 0.037817 increases in bank performance, which is significant. Next, overhead does not impact the return on the asset. A loan does not affect the return on assets. Bank size positively impacts the return on an asset, implying that a unit increase in size will bring about a 0.011307 increase in bank performance.

Table 3. Regression Results

Variable	Pooled Result	Fixed Effect	Random Effect
NONINT	0.029246*** (0.016596)	0.002782 (0.027986)	0.030675* (0.020290)
CAPRATIO	0.037817* (0.008780)	0.036502* (0.012033)	0.035683* (0.010061)
OVERHEAD	0.007451 (0.023133)	-0.009857 (0.036774)	-0.001886 (0.027251)
LOAN	-0.027199 (0.041905)	0.048017 (0.064016)	0.018368** (0.048258)
SIZE	0.011307** (0.005696)	-0.029332 (0.019534)	0.009714 (0.008931)
R-squared	0.368954	0.610118	0.279543
Adjusted R-squared	0.336758	0.491673	0.242785
F-statistic	11.45956	5.151064	7.604969
Prob(F-statistic)	0.000000	0.000000	0.000005
Durbin-Watson stat	1.315552	1.955927	1.799159
Hausman Chi-Sq. Statistic (p-value)			0.561866 (0.9897)
Wald Test (p-value)	7.604969 (0.0000)		
Breusch-Pagan LM (p-value)	84.55172 (0.2865)		
Pesaran CD (p-value)	0.317646 (0.7508)		

Source: Author Computation, 2020

Note: *, ** and ***: significant at 1%, 5% and 10% respectively

The F-statistics of 11.45956 with Prob (F-statistic) of 0.000000 at a 5% level of significance indicates that the linear relationship between the independent and dependent

variable is statistically significant (i.e., the overall model), which means that the regression equation coefficients are not equal to zero and that the model is fit. The Durbin-Watson statistics of 1.315552 shows the presence of autocorrelation in the model.

The FEM result shows that non-interest income does not affect the return on assets. The capital adequacy ratio has a significant positive impact on return on assets, which means that a unit increase in capital adequacy ratio will bring about 0.036502 increases in significant bank performance. Overhead has no impact on the return on assets. The loan does not affect the return on assets. Besides that, bank size has no impact on return on assets.

The F-statistics of 5.151064 with Prob (F-statistic) of 0.000000 at a 5% level of significance indicates that the linear relationship between the independent and dependent variable is statistically significant (i.e., the overall model), which means that the regression equation coefficients are not equal to zero and that the model is fit. The Durbin-Watson statistics of 1.955927 show no autocorrelation in the model.

The REM result shows that non-interest income has a significant positive effect on return on assets, implying that a unit increase in non-interest income will bring about a 0.030675 increase in bank performance. The capital adequacy ratio has a significant positive impact on return on assets, which means that a unit increase in capital adequacy ratio will bring about a significant 0.035683 increase bank performance. Overhead has no impact on return on asset. A loan has a significant positive effect on the return on assets, which means that a unit increases in the loan will lead to a 0.018368 increase in bank performance. Bank size has no impact on the return on assets.

The F-statistics of 7.604969 with Prob(F-statistic) of 0.000005 at a 5% level of significance indicates that the linear relationship between the independent and dependent variable is statistically significant (i.e., the overall model), which means that the regression equation coefficients are not equal to zero and that the model is fit. The Durbin-Watson statistics of 1.799159 show no autocorrelation in the model.

The Wald test result shows that there is a presence of heteroskedasticity among the variance in the model, making it necessary to conduct both the FEM and REM. The Breusch-Pagan LM test for cross-sectional dependence and Pesaran cross-sectional dependence results show that the residuals across the entities are uncorrelated, which is one of the conditions to be satisfied before running FEM and REM. The Hausman test determines whether the errors (ui) are correlated or not with the null hypothesis that random effect is the preferred model and alternate hypothesis that fixed effect is the suitable model preferred the REM, which depicts that the errors (ui) are not correlated based on the chi-square statistics of 0.561866 that is not significant at 5%. This result implies that the REM is the suitable model to be used because it can illustrate more consistent and unbiased estimates as opposed fixed-effect model.

Discussion

The random effect regression result depicts that non-interest income has a significant positive impact on the return on assets, which implies that the higher the income generated

from the non-traditional activities of banks, the better the performance of the banks. This result revealed that an increase in the non-interest income of DMBs attracts additional income to the DMBs, eventually increasing the performance of the DMBs. This result conforms to the a priori expectation of and lends credence to Al-Tarawneh et al. (2017); Craigwell & Maxwell (2006); Adedeji & Adedeji (2018); Sun et al. (2017) but contradicts the findings of Mndeme (2015).

The capital adequacy ratio has a significant positive impact on bank performance which implies that the higher the capital adequacy ratio of banks, the higher the performance of the banks. This result shows that the increase in the bank is the capital base increases the liquidity level, the volume of credits advanced to customers, and improved the performance of the DMBs at large. This result is inconsistent with the a priori expectation and the findings of Al-Tarawneh et al. (2017) and Karayaka & Er (2013).

Overhead has an insignificant negative impact on bank performance, which signifies that the more money banks spend on their daily operation, the lower their performance. Banks are better off if they take caution and reduce the amount expended in running the banking business. This result is in line with the a priori expectation and prior study of Al-Tarawneh et al. (2017), Karayaka & Er (2013) but contrary to the findings of Naceur & Goaied (2001). However, non-interest income and revenue concentration affect bank risk (Williams, 2016; Hunjra et al., 2020). Cost-efficiency is key to generating and profiting from non-interest income (Isshaq et al., 2019).

The positive and significant impact of bank loans on bank performance implies that the higher the ratio of loan to total asset given to the deficit unit, the better the bank's performance as this is expected to boost economic output due to the availability of credit to the productive sectors. This result aligns with a priori expectation and prior studies of Al-Tarawneh et al. (2017); Karayaka and Er (2013). Bank size was found to have an insignificant positive effect on return on assets, which means the higher the assets acquired by the bank, the better the bank's performance. Acquisition of necessary assets essential for the banking business will improve the performance of the banks. This result aligns with the a priori expectation and the study of (Flamini et al., 2009; Al-Tarawneh et al., 2017; Karakaya & Er, 2013; Rogers & Sinkey, 1999), but contrary to the empirical finding of Athanasoglou et al. (2008).

Because of the above, our study found a significant impact of non-interest income on bank performance from 2012 – to 2019. It can be empirically established that the essential role of non-interest income on Nigerian bank performance cannot be denied. It has improved the earnings of DMBs and restored their confidence in the banking business without jeopardizing the growth and development of the Nigerian economy.

CONCLUSION

This study aims to investigate the impact of non-interest income on Deposit Money Banks (DMBs) performance in Nigeria using data from Nigeria covering the period 2012-2019. Panel regression estimation technique was used to determine the effect of

non-interest income on DMBs performance in Nigeria. Hausman test and other diagnostic tests preferred the random effect model as the suitable model for this study because it can illustrate more consistent estimates as opposed fixed effect model and ordinary least square technique.

Our study found that non-interest income significantly impacts deposit money banks' performance in Nigeria. The empirical result shows that non-interest income plays an imperative role in the performance of DMBs in Nigeria due to its significant positive impact on the performance of DMBs. It is noted that capital adequacy ratio and bank loan are also crucial determinants of DMBs' performance in Nigeria. Thus, increasing non-interest income, capital adequacy ratio, and bank loan activities will induce bank performance. Therefore, we recommend that Nigerian monetary authorities propose a policy to encourage DMBs to engage in non-traditional activities subject to periodic review to prevent the exploitation of the bank customers and the banking sector distress in the economy.

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The Demographic and Behavior Determinant of Credit Card Default in Indonesia

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Abstract

The purpose of this paper is to analyze the demographic and behavioral factors that significantly affect the credit card Non-Performing Loan (NPL). This study is carried out to provide managerial recommendations for controlling credit card NPL. This study uses secondary data from Indonesia's most significant private bank with 100,000 samples of cardholder data. Demographic factors and cardholder behavior that significantly influence credit card NPL can be used to improve the credit scoring system for new cardholders and as indicators for a behavior scoring system for existing cardholders. This research uses a probability stratified random sampling technique. Logistic regression uses demographic factors and cardholder behavior significantly affected credit card NPL. According to the logistic regression model, cardholder behavior was more likely to NPL than demographic characteristics. The number of credit cards showed the highest credit card NPL probability.

Keywords:

credit card, behavior, demographic, logistic regression model, non-performing loan

How to Cite:

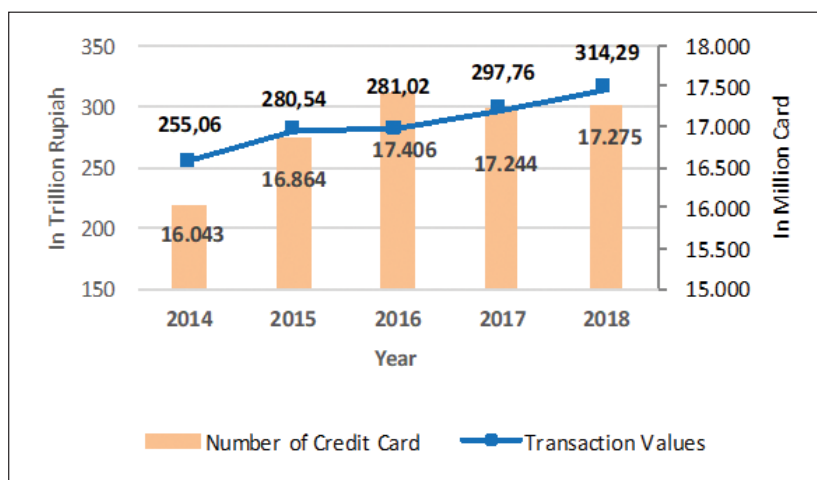
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INTRODUCTION

Indonesia is a developing country with the fourth largest population in the world (2,642 million in December 2018). Indonesia has a demographic bonus where the economic productive population is 68% of the total population. Indonesia will experience a demographic bonus up to 2045. Furthermore, in December 2018, household consumption was still the main pillar of national economic growth. The composition of household consumption in 2018 was 55.7% of Gross Domestic Product (GDP). Household consumption expenditure in the fourth quarter of 2018 grew 5.08% compared to 2017. Thus, the dominance of the productive age population will push household consumption even higher in the coming years. This condition strengthens Indonesia as a potential emerging market economy and a place for investment.

One of the prospective businesses in Indonesia is credit cards, as indicated by the number of credit cardholders, which is low compared to the productive age population in Indonesia (9,53% in December 2018). In addition, the number of cards and credit card transaction values from 2014-2018 experienced growth (Figure 1). In 2019 there were 25 credit card issuers, consisting of banks and non-bank financial institutions (Central Bank of Indonesia, 2019). The number of credit card issuers has increased compared to 2005 (17 issuers).

Figure 1. Number of Credit Card and Transaction Values



Credit cards make it easy for cardholders to make payments for purchases made. Cardholders do not need cash, and the credit card issuer makes payment transaction purchases first. Cardholders are obliged to pay off the issuer at the agreed time, either immediately or in installments. Credit cards also make it easy for cardholders to withdraw cash from an ATM (Automated Teller Machine). In addition, according to the Central Bank of Indonesia (BI) regulation No. 18/33/DKSP reduced the maximum limit on credit card interest rates from 2.95% to 2.25% per month since 2 December 2016. This will ease the burden on cardholders when bill payments are not made in full. Credit cards are unsecured consumer loans offered by banks (Wilson, 2007). This indicates the bank

will have a greater percentage of losses than other types of credit if a borrower defaults. Therefore, growth of credit card business must be balanced with good credit quality.

According to Central Bank of Indonesia (BI) regulation No. 14/15/PBI/2012, bank credit quality is grouped into five areas, consisting of current (L), special attention (DPK), substandard (KL), doubtful (D), and bad (M). Credit quality can be measured using a Non-Performing Loan (NPL), which is the ratio of outstanding loans that are substandard, doubtful, and bad to a total loan. Therefore, NPL can reflect credit default risk. According to the description above, it is important for banks to understand the factors that affect credit card NPL. By understanding the factors that influence the level of NPL, credit quality and bank soundness can be maintained, so that the growth of the credit card business can provide long-term benefits for banks.

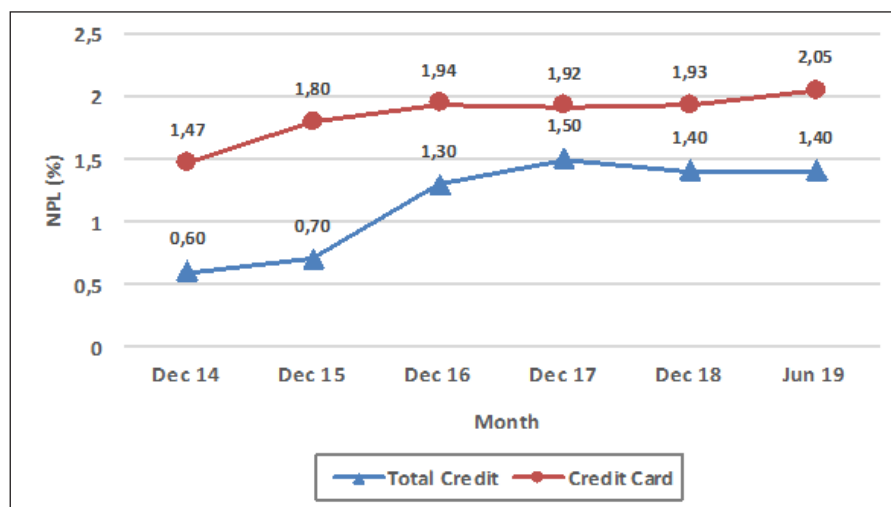
Wang et al. (2011) showed that only three factors significantly influenced credit card quality (demographics, behavior, and cardholder personality). According to Agarwal et al. (2011), the factors that significantly influence credit card quality are marital status, homeownership, and urbanization. Furthermore, Bellotti and Crook (2013) showed that these three factors had a significant effect on the credit card quality of cardholders through variables of occupation, age, income, the number of credit cards, the ratio of payment to bills, transaction frequency, and credit limit. Kiarie (2015) showed that homeownership and age significantly affected credit card quality. In addition, Porto et al. (2017) showed that cardholders who live in rural areas have a greater probability of delaying payment/ not full payment than cardholders who live in urban areas. Li et al. (2019) studied factors that affect the quality of credit cardholders by using demographics and cardholder behavior. The results showed that factors that significantly influenced the credit quality of cardholders were gender, age, marital status, type of transaction, transaction frequency, and nominal per transaction. One study on factors affecting credit card defaults in Indonesia has been conducted by Sayono et al. (2009) and showed variables like gender, marital status, and income increased the probability of credit card defaults.

Table 1. Growth of Card Number, Transaction Value, and Outstanding Credit Card (2014 – 2018)

	Growth (%)					Average (%)
	2014	2015	2016	2017	2018	
Number of Card						
National	6.31	5.11	3.22	-0.93	0.18	2.78
Bank	5.09	6.39	8.55	10.49	9.50	8.00
Transaction Value						
National	14.19	9.99	0.17	5.96	5.55	7.17
Bank	17.90	9.76	6.13	13.41	14.45	12.33
Outstanding						
National	22.57	12.0	7.16	4.63	1.38	9.55
Bank	18.35	8.10	13.71	6.96	11.80	11.78

Some previous studies have been conducted to examine the factors that significantly affect the credit quality of credit cards. This study uses secondary data obtained from the biggest private bank in Indonesia with average card growth, transaction value, and outstanding credit cards above the national average (Table 1). Various diverse emerged, but several commonalities were found, such as the demography and behavior of cardholders. The difference between this study and previous studies lies in the variables, data collection, and analysis methods. This study uses a complete variable by combining demographics and cardholder behavior so that it is expected to get more comprehensive results.

Figure 2: NPL Credit Card and Total Credit Bank



The purpose of this study is to analyze the demographic and behavioral factors that significantly affect the credit card Non-Performing Loan (NPL). Furthermore, from 2014 to June 2019, the trend of credit card NPL has increased and is always higher than the NPL of total credit banks (Figure 2). This study is carried out to provide managerial recommendations for controlling credit card NPL. Our results are also expected to enrich the existing literature on credit card products.

METHODS

Analyses of demographic factors and cardholder behavior were conducted by taking a sample of the cardholder data population as of June 2019. The sampling method used probability sampling with a stratified random sampling technique. The total sample used was 100,000 cardholders spread over each island in Indonesia. Variables were grouped into two categories that describe demographic factors and cardholder behavior. Types and definitions of variables are shown in Table 2.

This research is using logistic regression to determine demographic factors, social status, and cardholder behavior that significantly influenced cardholder NPL. Logistic Regression was chosen to examine the effect of independent variables on dependent variables that consists of two or more categories (Firdaus et. al., 2011). Press and Wilson

(1978) state that the advantages of logistic regression is that it does not require the assumption of normality of the independent variable, meaning the independent variable must not have a normal distribution. Categorical independent variables tend not to be normally distributed (Halperin et al., 1971). Logistic regression can be used to analyze independent variables that are continuous, discrete, and dichotomous (Kuncoro, 2005). Firdaus et al. (2011) added that logistic regression is not required to fulfil the non-multicollinearity and the size of each group does not have to be the same.

Table 2. Type and Definition Variables

Factors	Type of Variables	Variables	Variables Definition
Demographic	Independent	• Age • Gender • Education • Occupation • Income • Residential Area	Year Male; Female Under/Graduate/Post; Non-Under/Graduate/Post Self Employed; Non-Self Employed ≤ 10 million; > 10 million (Rupiah) Java; Non-Java
		• Marital Status • Home Ownership Status	Married; Single/Widow/Widower Own; Not Own
Behavior	Independent	• Bill to Income Ratio • Bill to Credit Limit Ratio • Payment to Bill Ratio • Credit Limit to Income Ratio • Cash Advance Frequency • Number of Card • Credit Limit	Percent Percent Percent Percent Average per Month Card < 20 Million; ≥ 20 Million (Rupiah)
		Dependent	Non-Performing Loan NPL; Non-NPL

The logistic regression model for demographic factors, social status, and cardholder behavior that affect cardholder NPL was as follows:

$$\text{Logit}(Y_i) = \alpha + \beta_1 X_{1i} + \dots + \beta_n X_{ni} + \varepsilon_i \quad (1)$$

Where:

Y = Independent Variable

X = Dependent Variable

α = Constant

β = Dependent Variable Coefficient

ε = Error

i = Cardholder

RESULT AND DISCUSSION

The estimation results of the logistic regression model consist of 12 independent variables (Table 3). An omnibus test of model coefficient shows Chi square statistics with a significance level ≤ 0.05 , meaning there is a significant influence of the independent variables simultaneously on the dependent variable. A Nagelkerke R square of 65.5%, meaning that the ability of independent variables to explain the dependent variable is 65.5%. The percentage correct classification value is 98% and above Cpro (93.84%), which shows that the model has good predictive accuracy.

The independent variable that partially affects the credit card NPL can be seen from the Wald Test results with a significance level ≤ 0.05 . Based on the Wald Test results, demographic factors that significantly affect the credit card NPL consist of age, gender, education, occupation, and residential area. Cardholder behavior factors that have a significant influence on credit card NPL are Payment to Bill (RP) Ratio, Ratio of Bill to Limit Credit (RL), Cash Advance Frequency (CA), Number of Credit Cards, and Credit Card Limit. Exp (B) of each variable on the cardholder behavior factor is greater than the demographic factor. This shows that cardholder behavior factors have a higher probability of influencing credit card NPL than demographic factors.

Table 3. Logistic Regression Estimation Result

Variables	Coefficient	Wald Test		Exp (B)
		Values	Sig.	
Gender (Male)	0.383	54.837	0.000	1.466
Marital Status (Single/Widow/ Widower)	0.016	0.065	0.798	1.016
Education (Non-Undergraduate)	0.442	73.717	0.000	1.556
Occupation (Self Employed)	0.269	18.472	0.000	1.309
Residential Area (Java)	0.405	23.968	0.000	1.499
Income (≤ 10 million)	-0.098	2.525	0.112	0.907
Credit Limit (≥ 20 million)	-0.415	18.571	0.000	0.661
Age	-0.032	83.385	0.000	0.969
Number of Card	-4.879	3,471.649	0.000	0.008
Payment to Bill Ratio	-4.233	1,148.232	0.000	0.015
Cash Advance Frequency	-0.555	95.109	0.000	0.574
Bill to Credit Limit Ratio	1.122	158.076	0.000	3.071
Constant	5.656	593.204	0.000	285.951
Model Goodness Test				
Omnibus Test of Model Coefficient (Chi-square Statistic = 1,7519.937; Sig. = 0.000)				
Nagelkerke R Square = 65.5%				
Percentage Correct Classification = 98%; Cpro = 93.84%				

Age has a negative coefficient, meaning that young cardholders tend to have a higher probability of NPL. This condition is in line with the results from Kim (2000), Stavins (2000), Muthomi (2005), Nyamongo (2011), Bellotti and Crook (2013), Wang et al. (2014), Kiarie et al. (2015), Huang (2018), Kim et al. (2018), and Li et al. (2019). Based on Figure 3, the percentage of the number of NPL cardholders compared to the total cardholders continues to increase with the younger age group. Conversely, the percentage of non-NPL cardholders continued to decline compared to total cardholders by age category.

Figure 3. Percentage of Non-NPL and NPL Cardholders by age category

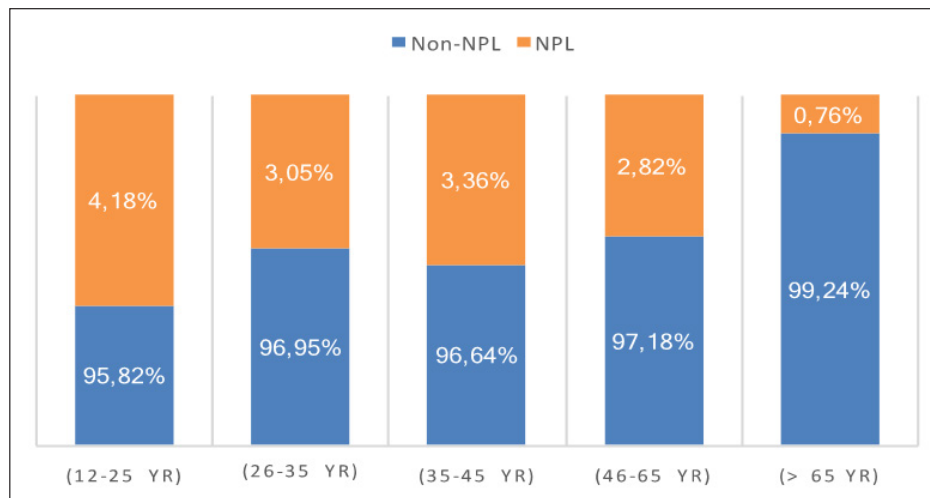
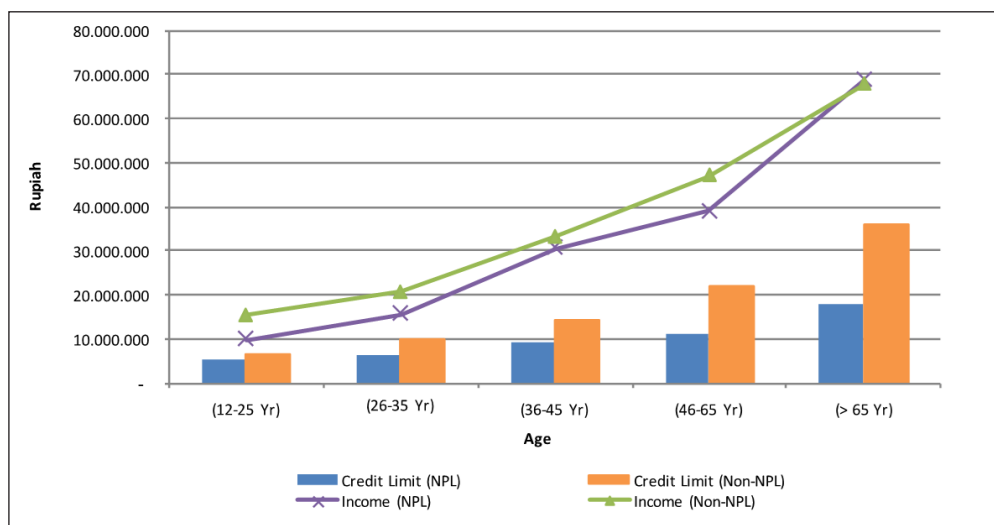


Figure 4 shows the relationship between age categories and cardholder income. The figure shows that the younger age category has a lower income than the older age category. Young cardholders have a higher probability of NPL because their cardholder income is still low, while the desire of young cardholders to try new things is very high.

Figure 4. Credit Limit and Income of Non-NPL and NPL Cardholders by Age Category



Male has a positive coefficient, so males tend to show a higher probability of NPL than females. This condition is in line with the results from Muhmin and Umar (2007), Muchiru (2008), Sayono (2009), Wang et al. (2014), Chin et al. (2017), Huang (2018), Kim et al. (2018), Li et al. (2019). Based on the sample, 60.09% of the NPL cardholders are male. Table 4 shows that the male NPL cardholders are not yet financially secure (61.29% income $\leq$ 10 million) and must provide family support (61.45% are married). The level of education of most non/under/postgraduates (54.79%) makes it difficult to pursue a career at a higher level (70.30% of cardholders with non-self-employed). Cardholders mostly live in Java (90.52%), especially in the regions of DKI Jakarta, West Java, and Banten, so they have a higher expenditure level than other regions.

Table 4. Characteristics of Male NPL Cardholders

Male	NPL	
	Number of Cardholder	%
Age		
12-25	181	9.48
26-35	818	42.85
36-45	557	29.18
46-65	349	18.28
> 65	4	0.21
Education		
Under/Graduate/Post	863	45.21
Non Under/Graduated/Post	1,046	54.79
Occupation		
Self Employed	567	29.70
Non-Self Employed	1,342	70.30
Income (Rupiah)		
$\leq$ 10 Million	1,170	61.29
3 - 5 Million	713	60.94
> 5 - 10 Million	457	39.06
> 10 Million	739	38.71
Residential Area		
Java	1728	90.52
Non-Java	181	9.48
Marital Status		
Married	1,173	61.45
Single/Widow/Widower	736	38.55
Home Ownership Status		
Own	734	38.45
Not Own	1,175	61.55
TOTAL	1.909	

Non-under/graduate/post education has a positive coefficient. This shows that cardholders with a non-under/graduate/post level of education have a higher probability of NPL than a cardholder with a level of under/graduate/post education. This condition is in line with the results of study by Stavins (2000), Norvilitis & Maria (2002), Muhmin & Umar (2007). Based on Table 5, non-under/graduate/post education NPL cardholder are mostly non-self-employed (70.44%), married (59.92%), living in Java (92.72%), and do not yet have their own home (64.81%). The level of non-under/graduate/post education makes it difficult for cardholders with non-self-employed status to pursue a career at a higher level, give their married status, cost of living in Java, and not yet owning a home, which causes higher cardholder spending, while most of the income is between IDR 3-5 million (68.02% of income $\leq$ 10 million).

Self-employed status is a positive coefficient. This shows that self-employed individuals have a higher NPL probability than cardholders with non-self-employed status. This condition is in line with results from Muthomi (2005), Muchiru (2008), Bellotti and Crook (2013), Leow & Crook (2014), and Warnakulasuriya (2016). Living in Java has a positive coefficient value. This shows that cardholders who live in Java have a higher NPL probability than cardholders who live in other areas. This condition is in line with the results from Porto et al. (2017) and Kim et al. (2018), which state that the area of residence affects the probability of NPL.

Table 5. Characteristics of Non-Under/Graduate/Post NPL Cardholders

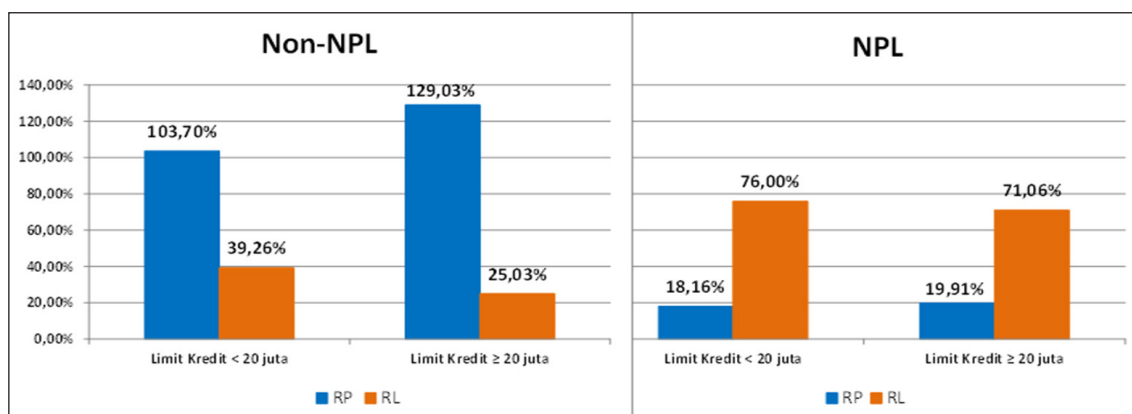
Non-Under/Graduate/Post	NPL	
	Number of Cardholder	%
Occupation		
- Self Employed	520	29.56
- Non-Self Employed	1,239	70.44
Income (Rupiah)		
$\leq$ 10 million	1,229	69.87
3 - 5 million	836	68.02
> 5 - 10 million	393	31.98
> 10 million	530	30.13
Residential Area		
Java	1,631	92.72
Non-Java	128	7.28
Marital Status		
Married	1,054	59.92
Single/Widow/Widower	705	40.08
Home Ownership Status		
Own	619	35.19
Not Own	1,140	64.81
TOTAL	1,759	

The payment to bill ratio (RP) is a negative coefficient, meaning low RP will increase the probability of NPL cardholders. This condition is in line with the results from Stavins (2000), Muthomi (2005), Muchiru (2008), Zhao et al. (2009), Bellotti & Crook (2013), and Warnakulasuriya (2016). Bill to credit limit ratio (RL) has a positive coefficient, meaning high RL will increase the probability of NPL cardholders. This condition is in line with the results from Kim (2000), Muthomi (2005), Muchiru (2008), Zhao et al. (2009), Nyamongo (2011), and Wang et al. (2014).

Cash Advance (CA) frequency has a negative coefficient, so low CA will increase the probability of NPL cardholders. This condition differs from Muthomi (2005), Muchiru (2008), and Zhao et al. (2009), who all showed that a high CA frequency would increase the probability of NPL. This condition can occur because of differences in cardholder behavior, regulator policies in each country, and credit card provisions in each bank. According to BI regulation No. 17/51/DKSP/2015, the maximum CA limit per day through an ATM is IDR 10 million (magnetic stripe card) and IDR 15 million (chip card). Banks apply a maximum CA limit of 40% of the credit limit with a minimum nominal limit per CA of IDR 100,000. The maximum percentage of the credit limit related to cash withdrawal transactions means that cardholders who do not pay off their credit card bills will not be able to perform CA if they have reached the maximum limit. Thus, cardholders who pay bills tend to have higher cash advance transaction frequencies than cardholders who do not pay credit card bills.

The number of credit cards has a negative coefficient, so a low number of credit cards will increase the probability of NPL cardholders. This condition is consistent with a study by Bellotti & Crook (2013). Banks tend not to approve the addition of credit cards to cardholders who make partial payments or have a history of late payments. Therefore, cardholders have a slight chance of getting more credit cards than cardholders who always make total payments.

Figure 5. RP and RL of Non-NPL and NPL Cardholder based on Limit Credit Categories



Credit card limit has a negative coefficient, so cardholders with a credit card limit greater than IDR 20 million have a higher NPL probability than cardholders with a lower limit. This result is supported by previous work from Muchiru (2008), Bellotti and

Crook (2013), and Gui (2019). Banks tend not to approve the addition of a credit limit to cardholders with a low payment to bill (RP) ratio and a high bill to credit limit (RL) ratio. Figure 5 shows that both Non-NPL and NPL cardholders with credit limits less than IDR 20 million have low RP and high RL compared to credit limits over IDR 20 million.

Based on the study result above, there are managerial implications that can be used by banks when making decisions. Banks can use demographic characteristics to increase credit card NPL probabilities to improve current credit card feasibility analysis indicators. In addition, banks need to consider using cardholder behavior indicators in credit scoring. This indicator is necessary because cardholder behavior factors have a higher probability of influencing credit card NPL than demographic factors. The behavior can be identified by several questions added to the credit card application form. Banks can validate the answers of prospective cardholders by confirming with other banks (bank checking) where the prospective cardholder has an existing or prior credit card.

Banks can also control NPL by selecting credit cards to customers (depositors) who do not have credit cards. The criteria for selecting potential customers can use demographic characteristics that significantly affect the credit card NPL based on the results of this study. Specifically, banks can use indicators that increase the probability for non-NPL cardholders. Banks can use SMS, email, or push notifications on Internet banking sites and mobile banking apps to inform selected customers. Interested customers can immediately confirm without filling out a credit card application form because the bank already has the customer's data. This condition will improve customer experiences and satisfaction with the bank. In addition, this mechanism will provide efficiencies (reduce bank operational costs) such as telemarketing fees, telephone costs, and printing costs for credit card application forms.

Behavior scoring reflects each cardholder's risk level based on indicators of demographic characteristics and behavior used. Bank can use demographic characteristics and cardholder behavior that significantly influences the credit card NPL as an indicator of behavior scoring for cardholders. Behavior scoring can be used as an early warning indicator of NPL opportunities from each cardholder so that banks can anticipate activity before the unpaid bills increase. Anticipatory actions that can be taken include reducing the use of credit card limits below 100%. In addition, banks can also offer installment features to cardholders with low behavior scoring (risk of default) to ease the payment process and maintain good credit cardholder quality.

Furthermore, banks can use behavior scoring to increase credit card portfolios and customer engagement by automatically increasing credit limits for cardholders with high (good) scoring. Behavior scoring can also be used as a reference to approve requests for temporary or permanent credit limit increases and credit card additions. This scoring will speed up the decision on the cardholder's request. In the current era of digitalization, banks can maximize behavior scoring to make decisions on requests for temporary or permanent credit limit increases and the addition of credit cards through mobile banking or internet banking. This action can speed up the process and reduce labor and other operational costs compared to the current credit card processing methods.

Banks can control credit card NPL through credit card promotions offered to cardholders. Currently, a bank's promotion program is based on the type of credit card and the need of the cardholder to increase the volume of the credit card transaction. Identification of needs can analyze previous cardholder transactions (event-based marketing). However, this promotion process does not consider the demographic characteristics and behavior of cardholders who have a probability of NPL. Therefore, a bank can use both factors when choosing the correct cardholder as a credit card promotion target. Thus, business targets can be achieved, and credit card NPL can also be controlled.

CONCLUSION

According to the logistic regression model, young cardholders, male, non-under/graduate/post-education, self-employed, and living in Java all increase probability of cardholder NPL. Cardholder behavior provides a higher likelihood of NPL than demographic characteristics. Cardholder behaviors that increase the likelihood of NPL are a low payment to bill (RP) ratio, high bill to credit limit (RL) ratio, low frequency of cash advance, low number of credit cards, and credit card limits < IDR 20 million. The number of credit cards shows the highest NPL probability.

Based on the results of this study, there are managerial implications that banks can use when making decisions. Demographic characteristics and cardholder behavior that significantly influence credit card NPL can improve the feasibility analysis tools for new cardholders (credit scoring system) and as indicators of behavior scoring systems for existing cardholders. Banks can maximize behavior-scoring systems to automatically increase credit limits for selected cardholders and provide automatic approval of requests to increase credit limits temporarily or permanently. Banks can also control NPL by offering credit cards selectively to existing customers who do not have credit cards and offering selective promotion programs based on demographic characteristics and behavior that significantly affect credit card NPL based on the results of this study. The consumer can add Credit cards through mobile banking and Internet banking.

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Road Quality in Indonesia: Is It Linked to Special Allocation Funds and Political Competition?

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Abstract

This study aims to determine the relationship between decentralization, viewed from a fiscal and political perspective, and the quality of road infrastructure in Indonesian regions. This study uses panel data of 32 provinces in Indonesia in the 2011–2018 and applied pooled ordinary least square (OLS) estimation with individual fixed-effects to capture time-variable estimation. The results show that special allocation funds (DAK) did not significantly improve the quality of damaged roads, although the correlation was negative. The apparent improvement in the damaged-road ratio is presumed to be because the government is currently more focused on the physical construction of roads than on maintenance, so the level/quality of road maintenance is still not optimal. The political competition was found to be negatively related to the improvement of the damaged-road ratio, indicating that political competition improved the quality of budget execution in road infrastructure provision.

Keywords:

special allocation funds; political competition; road quality

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INTRODUCTION

The decentralized political system formally implemented in Indonesia in January 2001 continues to develop. At present, the delegation of authority and regional funding is regulated by Law Number 23 of 2014 concerning regional government, and Law Number 33 of 2004 concerning the financial balance between the central government and regional governments. Various interacting phenomena related to the implementation of decentralization reflect the different political, fiscal, and administrative dimensions present at each government level (Martinez-Vazquez et al., 2017). Through the decentralization scheme, local governments are expected to develop their respective regions, provide access to services for the community, and open up wider employment opportunities to improve the welfare of the community in the long run.

Road infrastructure development is one of the government's priority programs for accelerating development. District roads represent 80% of total roads and are the primary connectivity mechanism for regional economies. One of the sources of funds for road construction comes from the transfer of funds from the central government through the Special Allocation Fund (DAK). There are two types of DAK, namely physical and non-physical. In terms of objectives, physical DAK has three aspects: regular physical DAK is the fulfillment of basic services and economic equality to improve community welfare quality; assigned physical DAK supports national priorities that are devolved to regional authorities related to predetermined priority activities and locations; finally, affirmative physical DAK accelerates infrastructure and basic services in priority locations but specifically for underdeveloped and border areas.

Regulation of the Minister of Public Works and Public Housing Number 21 of 2017 states that DAK implementation aims to improve the function of the road network as integrated access for potential development areas, especially those in remote, isolated, underdeveloped, and border areas. DAK is prioritized for building activities and maintaining roads regularly. During the period 2010 to 2019, the total realized DAK reached Rp23 trillion. The increase in the number of DAK realizations is also in line with the increasing total length of district roads, which reached 440 thousand km in 2018 (up from 384 thousand km in 2009). However, almost 50 percent of total roads are in a non-optimal condition, comprising 16.07% lightly damaged roads and 24.70% heavily damaged roads. This is much worse than the situation at national and provincial levels of 3% and 19%, respectively. At the same time, regional roads have a greater multiplier effect on economic growth than non-regional roads (Fan & Chan-Kang, 2008). Thus, the relationship between DAK and road quality needs to be investigated further.

Martinez-Vazquez et al., (2017) state that empirical research related to the impact of decentralization on infrastructure services, specifically in terms of the amount of fund allocation and infrastructure-quality outcomes, is still very limited. Research related to the implementation and development of decentralization initially focused more on expenditure and financing mechanisms operating from the center to the fiscal and economic sectors. The implementation of decentralization can strengthen fiscal balance (Eyraud & Lusinyan,

2013; Neyapti, 2010) and improve the quality of education (del Granado et al., 2018) and people's access to health services (Apriliani & Khoirunurrofik, 2020; Bracco et al., 2019; Channa & Faguet, 2016; Habibi et al., 2003; Jiménez-Rubio, 2011). However, there are indications that if regional capacity is not yet able to manage the budget properly, the impact of decentralization will not be optimal (Ghozali & Khoirunurrofik, 2020; Lewis, 2017; Neyapti, 2006). A stable fiscal balance is a foundation for local governments to be able to meet community needs. Areas that initially have minimal access to infrastructure seem increasingly focused on increasing investment, especially in the health sector and physical infrastructure (Kis-Katos & Sjahrir, 2017). However, there is a tendency for regions to use their revenue for other activities rather than for investments whose financing has been regulated by the central government. The direct impact of total local revenue will be lower if the use of transfer funds increases (Kappeler et al., 2013).

Other research is increasingly examining the impact of the amount of investment and the quality of the available public services. Fiscal decentralization can positively impact infrastructure quality (Escaleras & Calcagno, 2018; Kis-Katos & Sjahrir, 2017). However, several studies have shown that budget decentralization has not positively impacted the Indonesian context (Lewis, 2017). Budget decentralization can be measured in terms of the scale of its use, and of its outcomes as measured through service quality. A decrease in marginal return will appear when an investment is carried out continuously, although it still positively impacts the economy (S. Fan & Chan-Kang, 2008).

In fiscal decentralization schemes in Indonesia, physical DAK is one of the sources of financing for road construction and maintenance. An increase in the number of DAKs will support the achievement of priority programs intended to provide adequate infrastructure in the regions. Initially, DAK allocation used a top-down formulation, in which the central government determined the amount of budget allocated to each area (known as a "formula-based" process). In practice, such a concept delivered ineffective and inefficient results. The mismatch of information received by the central government resulted in imprecise allocation both in terms of budget amount and location. In such conditions, the budget is absorbed more slowly and is not even absorbed to the full extent. Therefore, since 2016, DAK allocations have been compiled on a bottom-up basis, in which local governments submit proposals regarding the necessary funding requirements (known as a "proposal-based" process). With this approach, budget absorption will be more effective and efficient. Local governments are assumed to have more information about their regions' needs and so to be better able to adjust budget planning to optimize the provision of infrastructure access.

Apart from budget execution, it should be noted that a conducive political process is also an influencing factor in decentralization success. The political process was formed to meet the needs of a political decentralization scheme that aims to increase local governments' responsiveness to their communities' needs. The top-down accountability mechanism is expected to create better conditions because of the bond between elected leaders and the community, and it is hoped that this concept can improve public services. However, suppose the regional government is more strongly controlled by the political elite

than the central government, due to weak political accountability mechanisms. In that case, the quality and quantity of public services will not improve (World Bank, 2017). Thus it is clear that the better the political process, the more effective and efficient fiscal implementation will be.

The planning, stipulating, and implementing of budgets is closely related to the political processes formed as a result of political decentralization, processes heavily influenced by centrifugal pressure and separatist movements and socio-political tensions among the regions (Martinez-Vazquez et al., 2017). The delegation of authority from central government to local officials who are directly elected by the community impacts increasing on the number of parties and candidates contending for leadership roles. The chances of being selected depend on the degree to which the community believes in the performance of local government. As a result, political competition will be tighter, and local governments will always strive to improve their performance to ensure re-election in the next period. Increasingly strong political competition can increase the efficiency of budget execution (Bracco et al., 2019) and positively impact the economy (Rezki, 2018).

Political decentralization gives rise to political competition in which direct election by the community opens up opportunities for many political parties and increases the available choices for people at a more local level. This increasing political competition will encourage local governments to be more responsive (and vice versa). Thus, it is assumed that with the existence of political competition, local government performance will improve and so will service to the community. However, there are indications that there is interference in the political process in the planning and budget-execution processes, which indirectly impacts the quality of public services (Rahmawati & Khoirunurrofik, 2021). The number of parties involved in the political process will lead to more preferences that must be included in decision-making if the results of existing processes are to achieve the best utility for many parties. This indicates that the stronger the political competition that is formed, the better the quality of government performance will be (Albornoz & Cabrales, 2013). However, if the political process is weakly competitive, loopholes will be created for budget distortion (Skoufias et al., 2011; Wiguna & Khoirunurrofik, 2021). In addition, even if local government involvement increases, if accountability is still not solid, the may hamper the system of nationalizing political parties (Dell'Anno & Teobaldelli, 2015; Fan et al., 2009).

Political decentralization has a vital role to play in the quality of infrastructure through the degree of political competition, which can also be illustrated by the extent to which the public trusts the government and political elites. The existence of an electoral system directly results in the expansion of opportunities for various parties to compete. Greater openness and availability of facilities for the public to convey their aspirations is one factor that has influenced the success of political decentralization, leading to the strengthening of the democratic system. The better the economic growth in a country, the greater the chances of implementing democracy. Also, improving economic conditions can increase public confidence in the government (Ligthart & Van Oudheusden, 2015).

Research on decentralization generally focuses on the education and health sectors. This study, therefore, seeks to develop a theme related to the infrastructure sector, because this is also one of the essential services that should be considered. Given the close relationship between fiscal and political aspects of decentralization, this study is to examine the association between DAK (fiscal decentralization) and political competition (political decentralization) relate to Indonesia's quality of road infrastructure in the 2011–2018 period.

This study will contribute to the literature in two folds. First, by measuring the quality of infrastructure using heavily damaged roads, the study provides evidence on how effective DAK for road maintenance is to improve the quality of district roads. Second, the study also observed how political decentralization that measures in terms of the political competition that plays a role in the quality of infrastructure development through the political process of local budgeting decisions.

METHODS

This study uses panel data with a sample of 32 provinces in Indonesia (all provinces except DKI Jakarta and North Kalimantan due to the limited data available) in the 2011–2018 timeframe and with a fixed-effects approach. This study collects data from the Central Bureau of Statistics (BPS), the CEIC Database, the General Election Commissions (KPU), and the Directorate General of Financial Balance, Ministry of Finance (DJPK). To examine the hypotheses, we specify in equation 1. Detailed measurement variables and data sources are explained in Table 1.

$$\text{ROAD}_{it} = \alpha_0 + \alpha_1 \text{DAK}_{it} + \beta_1 \text{Polcomp}_{it} + \alpha_2 \text{Percap}_{it} + \alpha_3 \text{Population}_{it} + \alpha_4 \text{Policy}_{it} + \alpha_5 \text{DAKPol}_{it} + \alpha_6 \text{LagRoad}_{it} + \beta_2 \text{IDI}_{it} + \beta_3 \text{PEXP}_{it} + \beta_4 \text{MEXP}_{it} + \lambda_{it} + u_i \quad (1)$$

As with the market mechanism, an increase in political parties will result in competition between parties to increase the probability of obtaining seats in parliament. Political competition can be measured by calculating the concentration of political party votes in legislative elections using the Herfindahl Hirschman Index (HHI) and has been used to calculate political competition in several recent studies (Alfano & Baraldi, 2015; Rezki, 2018). The HHI shows the extent of each party's strength in the district-level legislative elections or political concentration in the district parliament. HHI is in the range of 0 to 1, where 0 indicates that political concentration is deficient (i.e., political competition is intense) and one indicates that political concentration is high (i.e., political competition is weak). The HHI is obtained by summing the squares of each party's share of votes with the majority vote using the following formula:

$$\text{Political Concentration Index}_{d, t} = \sum \text{Sh Vote}_{p, d, t}^2 \quad (2)$$

Political Concentration Index_{d, t} is an index of the concentration of political parties in district d year t obtained from the accumulated squared share of each party's votes p in district d year t, equal to the value of HHI. An HHI value of 1 indicates that the competition that occurs in the selection process is perfect. The competition value is

subtracted from the HHI index using the following formula to obtain political competition figures:

$$\text{Political Competition}_{d,t} = 1 - \text{Political Concentration Index}_{d,t} \quad (3)$$

Political Competition_{d,t} is the political competition figure in regency d year t, indicating how strong/weak the competition is between political parties in the legislative elections. The presence of political parties with a high concentration in a district indicates that the community's degree of political competition is low and vice versa. Political competition figures in 2009 are used for 2011–2013 data and 2014 for 2014–2018 data. This figure used is the average figure of the political competition of all districts in one province.

Table 1. Variable definition and data sources

Variables	Variable definition, data sources	Expected sign
Road Ratio (ROAD)	The ratio between the length of district damaged roads to the total length of district roads, CEIC Database.	
Special Allocation Fund (DAK)	The ratio between DAK realization in the road sector and the length of district roads to adjust for variations in DAK allocation and road lengths in each district; the potential for reverse causality is anticipated using a lag time of 1 year earlier, Directorate General of Financial Balance, Ministry of Finance (DJPK).	(-)
Political competition (Polcomp)	Illustrate the extent of political competition between parties based on the number of valid votes during the 2009 and 2014 DPRD representative elections, General Election Commissions (KPU).	(-)
Income per capita (Percap)	Reflects perceptions of the higher the income per capita, the more road use will increase, indirectly due to greater economic activity, Central Bureau of Statistics (BPS).	(+)
Population ratio (Population)	As the direct subject using the roads, as population actively moves around, the economic life of roads decreases more; with adjustment necessary to the length of district roads in each province, because areas with longer routes may have a smaller population than those with shorter routes, Central Bureau of Statistics (BPS).	(+)
DAK allocation policy (Policy)	Dummy variable for formula-based (2010-2015 period) as 0 and proposal-based (2016-2018 period) as 1; reflects a perception of the extent to which policy could impact the size of the allocation and the absorption of budgets in the regions.	(-)
Policy * DAK (DAKpol)	Reflects interaction between DAK allocation policy and DAK realization to identify the behavior of each policy.	(-)
A portion of damaged roads in the previous year (LagRoad)	Reflects the perception of the extent to which length of damaged roads in the current year increases with the extent of damaged roads in the previous year, CEIC Databased.	(+)
Indonesia Democracy Index (IDI)	Indicates the level of democracy identified through three aspects: civil liberty, political rights, and institutions of democracy; provides an overview of government/ bureaucracy performance, legislative institutions (DPRD), political parties, judiciary, law enforcement agencies, Central Bureau of Statistics (BPS).	(+)
Physical spending (PEXP)	Reflects a link between political competition and public services; uses a share of the previous year's regional infrastructure spending as one road construction financing source.	(-)
Maintenance spending (MEXP)	Reflects a link between political competition and public services; uses a share of the current year's regional infrastructure spending as one road maintenance financing source.	(-)

RESULT AND DISCUSSION

Fiscal Decentralization and Road Quality

Table 2 shows that DAK used in the road sector does not statistically impact the quality of district roads (especially model 4). However, the correlation between the DAK and the damaged-road ratios is negative, following previous expectations. The change in DAK allocation policy causes the ratio of damaged roads to increase at a significance level of 10%. When the allocation policy changed to being proposal-based, the ratio of damaged roads increased by 4.6%. In addition, the portion of damaged roads in the previous year significantly affected the addition of damaged roads in the current year by 0.4%.

Table 2. The Estimation Model Using The Fixed-Effect Model (FEM)

Variables	Model 1	Model 2	Model 3	Model 4
DAK	-3.45e-09 (2.00e-08)	-9.73e-09 (1.41e-08)		-9.19e-09 (1.42e-08)
Percap		0.000136 (0.000118)		0.000126 (0.000112)
Population		4.48e-07 (5.10e-07)		4.83e-07 (4.91e-07)
Policy		4.980* (2.662)		4.612* (2.566)
DAKPol		2.61e-06 (2.13e-06)		2.53e-06 (2.09e-06)
LagRoad		0.436*** (0.112)		0.416*** (0.115)
Polcomp	-28.67*** (7.483)		-29.66*** (8.421)	-20.92*** (7.389)
PEXP			0.0120 (0.0185)	-0.00476 (0.0166)
MEXP			0.0216 (0.0200)	0.00857 (0.0154)
IDI			0.0541 (0.0916)	0.0718 (0.0862)
Constant	42.89*** (6.790)	5.317 (3.682)	39.67*** (8.084)	19.47* (10.47)
Observations	256	256	256	256
R-squared	0.285	0.369	0.288	0.380
Number of i	32	32	32	32

Notes: Robust standard errors in parentheses, *** p < 0.01, ** p < 0.05, * p < 0.1

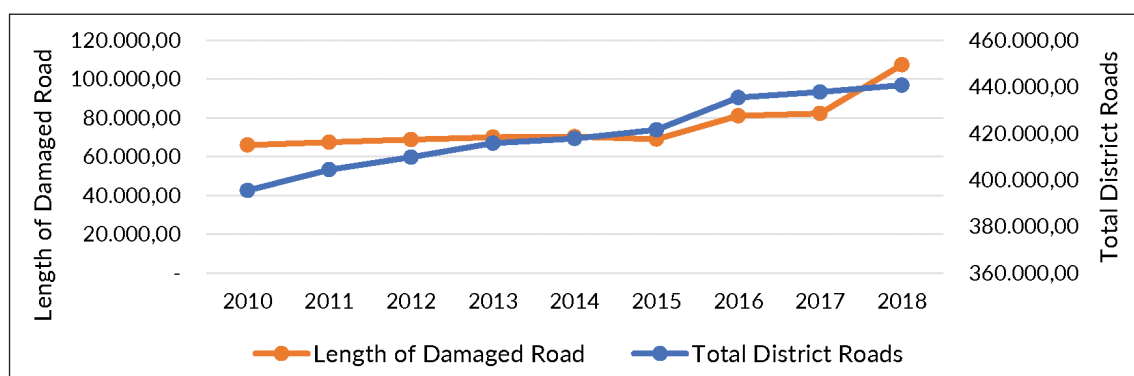
This study's results are consistent with previous empirical studies that in fiscal decentralization, increased spending on infrastructure is expanding and developing toward

improving its quality (Kis-Katos & Sjahrir, 2017). Regions that initially lacked infrastructure access began building public facilities with financial support from the central government. However, the context in the problem described earlier is that implementing the DAK budget increases is accompanied by an increase in damage to roads.

Other factors indicating to influence this condition are the trade-off between road construction and maintenance resulting from differences in development priorities and changes in the scheme for determining DAK allocations. This case is similar to the program in Spain. According to research by Albalade et al. (2013), the existence of budget allocations to maintain road quality empirically proven to be safer for road users. But in reality, the program maintenance of the quality of roads in Spain was considered relatively low. This finding implies that the utilization of the infrastructure budget has not been optimal to maintain roads remain conducive and safe for road users. Moreover, Mehari, Z. (2013) also stated that during 1974-2010, the Ethiopian government's budget allocation continued to increase but only impacted the development of road access. Meanwhile, the improvement of road access in rural areas is still not in line with expectations. Both of these conditions indicate that the government should expand the use of the budget to maintain road quality rather than just building new roads.

Furthermore, Figure 1 shows that in 2010–2014, the length of heavily damaged roads tended to be constant, with an average share of 16 percent of total district roads. This finding indicates that road-condition constancy is one of the impacts of road maintenance, even though such roads are still categorized as severely damaged. However, in 2018, damaged roads drastically increased to 24.5 percent. This increase may have happened because, during the 2015–2019 government, one of the priority programs was providing physical road infrastructure, including district roads. District-road development showed a significant increase, reaching 5% in 2018.

Figure 1. Comparison of The Length of Damaged Roads and Total District Roads



Source: CEIC, 2020 (processed data)

The lack of road infrastructure, especially in the regions, has led to neglect of maintenance activities. The reason behind the budget's neglect for maintaining road quality is often because of the trade-off between new road construction and road maintenance.

Even though DAK has a positive relationship with road-quality improvement, differences in priorities increase heavily damaged roads. The increasing need for road access in line with economic activity development does not guarantee that the focus is on increasing road length but also on maintaining/improving road quality. The OECD states that ensuring that infrastructure maintenance is carried out regularly and obtaining an adequate budget is crucial and is the easiest way to ensure that the existence and quality of such infrastructure remain conducive to development (OECD, 2016).

In comparing the DAK ratio and the portion of damaged roads, Java and Bali have smaller DAK ratios than other regions; however, the share of damaged roads in these areas is much smaller. Since Java and Bali already have much more adequate infrastructure facilities, the allocation of DAK can focus on road maintenance. Sumatra is also one of the regions with a smaller DAK ratio than the eastern area. However, the share of damaged roads in Sumatra is quite large when compared to Java and Bali. Likewise, the eastern region suggests a dire need for infrastructure development more significantly than other regions. The government focused on allocating much larger DAK for the eastern region and increasing it in 2014. The increasing share of damaged roads in this area is also an indication of the trade-offs described earlier.

The next factor is related to the change in policy for determining DAK allocation from formula-based (top-down) to proposal-based (bottom-up). In 2010–2015 (formula-based), the length of roads in damaged conditions tended to be stable. However, in 2016–2018 (proposal-based), the length of damaged roads increased sharply, indicating that when DAK allocations are prepared based on a proposal-based policy, the portion of district roads that are severely damaged increases. The revised scheme for determining allocations based on local government proposals attempts to improve the effectiveness and efficiency of budget execution. However, from this study's results, the proposed scheme has not yet had the impact expected. The reason is maybe that local governments do not have complete information on the technical guidelines for implementing submissions, resulting in apathy. There is uncertainty from the central government regarding the number of applications received, causing the regions to become skeptical and hesitant to plan developments.

Political Competition and Road Quality

Table 2 also shows that political competition is consistently negatively and significantly related to the ratio of heavily damaged district roads. Each one-point increase in political competition is related to a decrease in the proportion of district roads in severely damaged conditions by 21% at the 1% significance level. Although research has not been found regarding competition and road quality in the Indonesian context, political competition can generally increase expenditure on infrastructure services and increase per-capita income (Rezki, 2018). Increasingly healthy political competition improves the quality of government governance. The elected leader will strive to provide the best performance results to be re-elected in the following period (Wiguna & Khoirunurrofik, 2021). This robust political

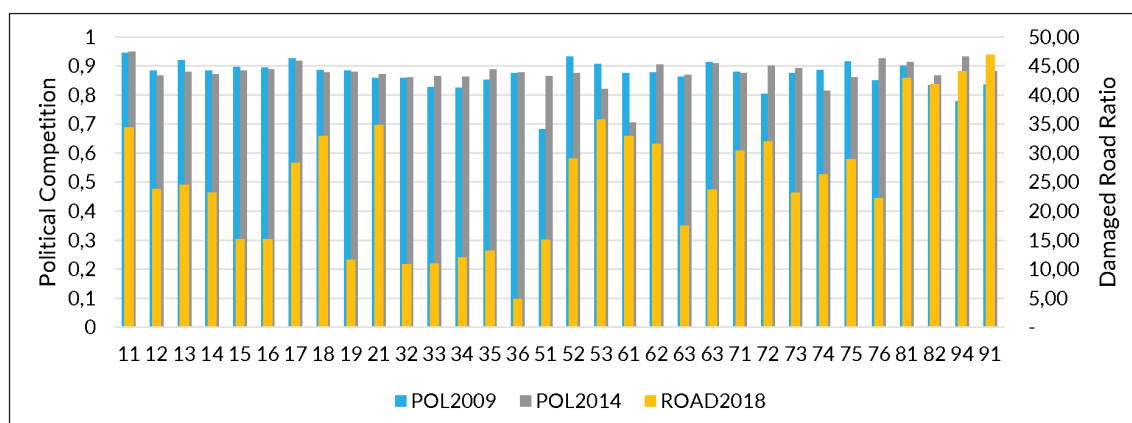
competition indicates that the degree of decentralization is also increasing and can be a way to mitigate the risk of fraud (Dell'Anno & Teobaldelli, 2015).

The more excellent support has implications for improving the incumbent's performance and will undoubtedly be observable in the services provided (Wiguna & Khoirunurrofik, 2021). As Burnett & Kogan (2017) show that the high variation in the number of complaints that arise for local road damage in San Diego is strongly influenced by the extent of local community support for political incumbents. In addition, cities in Colombia, which have high political competition, tend to perform better. This situation is noticeable from the increase in fiscal performance in Colombian cities due to robust political competition (Marín et al., 2021).

Figure 2 shows that each province has a high level of competition and that this level of competition is almost evenly equal across all provinces. This finding suggests a low concentration of political parties in the regions and an evenly distributed concentration of political parties in various areas. Some areas that experienced a strengthening of competition, in general, had fewer damaged roads than other areas in the same region, such as Java, West Kalimantan, East Kalimantan, West Sulawesi, and Central Sulawesi. Regions outside Java also have a high political competition level and are not much different from the Java region itself, such as Kalimantan, Sulawesi, and Papua. However, the share of heavily damaged district roads is still relatively high. This situation may be because local government development outside Java still focuses on developing inadequate road access.

Hayat & Amaratunga (2014) conducted a study on the maintenance of road infrastructure after the tsunami in Aceh. The result shows that political pressure had an impact on the effectiveness of infrastructure development. However, the project's preference is to prioritize investment in new roads rather than repairing damaged roads. In this case, political stability needs to be reconsidered rather than optimizing the amount of investment to construct new roads. The finding shows that local government performance depends on political power stability and needs support from conducive institutional factors such as political processes.

Figure 2. Political Competition and Damaged-road Ratio



Source: KPU and CEIC, 2020 (processed data)

The development of political decentralization is also closely related to the strength of democracy. IDI is assumed to show the level of democratic development in Indonesia, which is closely related to the political-system variable. The achievement level is measured based on the implementation and development of three aspects of democracy: civil liberty, political rights, and the institutions of democracy. Overall, the value of the IDI is still classified as moderate, indicating that further improvements to the democratic system are needed. If achieved, such improvements will increasingly reflect the achievement of public satisfaction with available public services. Political rights are an indicator of political democracy that includes participation and competition. There are five main components related to political rights, namely the right to vote, the right to compete for public office, the right to compete for votes, free and fair elections, and the making of government policies based on public votes (United Nations Development Programme, 2009).

The direction of the political-rights aspect seems to be improving. It suggests that citizens' rights to vote and be elected are increasingly open, voters are free to make choices, and the level and impact of public complaints about government administration are also getting better. It also indicates that access to services for the community as related to the political process is getting better. However, the level of political rights is still in the medium category and is the lowest of the aspects measured. The improved level of public trust in the government indirectly impacts improving economic conditions, although this has not been seen optimally in all aspects (Ligthart & Van Oudheusden, 2015). Therefore, the strengthening of political decentralization must be supported by strengthening the various elements of the democracy index.

Robustness Check

To ensure that this study's results are robust, the authors involved another independent variable, namely the ratio of the length of a regency's roads to the length of regency roads as a whole. Based on the estimation results in Table 3, the DAK ratio for roads is significantly positively related to the road-length ratio. It suggests that DAK realization is currently focusing on the physical construction of roads. In other words, although the DAK realization has a positive relationship with road-quality improvement, the impact is still not optimal due to differences in the priority scales in budget execution.

It also indicates that the DAK ratio is robust concerning improvement in the quality of district roads but is statistically insignificant. Furthermore, this check found that political competition was negatively related, but the direction changed to positive after using the road-quantity variable. In conclusion, DAK and political competition positively affect the quality and quantity of roads. Moreover, a robust check also considers the ratio measurement of district roads in good condition. Based on the estimation results in Table 4, it is found that DAK and political competition are negatively related to good-quality district roads. This finding indicates that the use

of DAK and political competition are related to infrastructure problems that are not in good condition. In addition, a road being in good condition indicates that it is newly constructed and therefore does not require maintenance. In conclusion, among the robustness checks, DAK and political competition positively correlate with the improvement of the quality of damaged roads.

CONCLUSION

The study results indicate that the implementation of DAK was not optimal for improving road quality. It is observable that the absorption ratio of DAK has no impact on advancing the quality of district roads, although the result suggests that the DAK ratio has a negative relationship with the damaged-road ratio. Nevertheless, the differences in priorities of each region have increased districts' damaged-road ratios since the budget for maintaining road quality is often neglected due to the trade-off between new roads construction and road maintenance. In addition, the change in DAK allocation policy, which was initially determined by the central government, to becoming proposal-based has resulted in changes in the behavior of local governments toward DAK requirements.

This study's results, unfortunately, observed that the proposed scheme has not had the optimal impact expected as we observed that the portion of district roads that were severely damaged increased. With a strong relationship between DAK policy and road quality, it is best if regional governments increase socialization about the proposal-based process to encourage small regions to propose the required funds. Additionally, strengthening political competition can positively improve the quality of budget execution and positively impact district roads' quality. Generally, regions outside Java also had high political competition levels and were not much different from the Java region itself.

However, the share of heavily damaged district roads is still relatively high, perhaps because local development outside Java focuses on increasing inadequate road access rather than improving or maintaining existing roads. This study advocates that the central government must set up a better DAK management system to ensure that the planning and budgeting process of local infrastructures development, particularly on road development and its maintenance. Furthermore, the political process in the local budget agreement should rely on the accurate information required and the quality status of local roads.

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Table 3. Robustness check: Dependent Variable = QUANTITY RATIO (total length of district roads)

VARIABLES	QUANTITY RATIO				ROAD			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
DAK	2.48e-09* (1.25e-09)	2.30e-09* (1.24e-09)		2.12e-09* (1.22e-09)	-3.45e-09 (2.00e-08)	-1.09e-08 (2.12e-08)		-1.07e-08 (2.09e-08)
Percap		-2.14e-06 (9.79e-06)		-0.0244 (0.0165)		0.0640 (0.272)		0.0302 (0.282)
Population		-2.70e-10 (1.20e-08)		-0.0445 (0.0264)		0.548 (0.450)		0.411 (0.493)
Policy		0.0307		-2.27e-06		9.76e-05		8.34e-05
DAKPol		(0.177)		(8.70e-06)		(0.000140)		(0.000131)
		-1.30e-07 (9.62e-08)		7.47e-09 (1.04e-08)		5.05e-07 (5.68e-07)		5.37e-07 (5.70e-07)
LagRoad		0.0107 (0.00647)		-1.55e-06 (9.38e-07)		-2.36e-05** (9.98e-06)		-2.43e-05** (9.82e-06)
Polcomp	0.0212 (1.304)		0.141 (1.256)	-0.215 (1.001)	-28.67*** (7.483)		-29.66*** (8.421)	-25.13* (13.57)
PEXP			-0.00226 (0.00146)	-0.00110 (0.00119)			0.0120 (0.0185)	0.0151 (0.0258)
MEXP			-0.00212 (0.00157)	-0.000999 (0.00120)			0.0216 (0.0200)	0.0190 (0.0247)
IDI			-0.00617 (0.00561)	-0.00690 (0.00528)			0.0541 (0.0916)	0.0594 (0.0783)
Constant	3.101*** (1.129)	2.997*** (0.369)	3.473*** (1.037)	6.100*** (1.264)	42.89*** (6.790)	2.945 (18.57)	39.67*** (8.084)	25.59 (26.38)
Observations	256	256	256	256	256	256	256	256

Notes: Robust standard errors in parentheses *** p < 0.01, ** p < 0.05, * p < 0.1. Includes year dummy

Table 4. Robustness check. Dependent Variable: Good Roads Ratio

Variables	Good roads ratio				Damaged roads ratio (ROAD)			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
DAK	-3.22e-08 (2.56e-08)	-2.21e-08 (2.25e-08)		-2.32e-08 (2.47e-08)	-3.45e-09 (2.00e-08)	-9.73e-09 (1.41e-08)		-9.19e-09 (1.42e-08)
Percap		-0.000130 (0.000210)		-0.000224 (0.000228)		0.000136 (0.000118)		0.000126 (0.000112)
Population		-1.18e-06*** (4.11e-07)		-1.07e-06** (4.29e-07)		4.48e-07 (5.10e-07)		4.83e-07 (4.91e-07)
Policy		5.411 (5.806)		7.894 (6.138)		4.980* (2.662)		4.612* (2.566)
DAKPol		-2.15e-06 (3.04e-06)		-2.90e-06 (2.99e-06)		2.61e-06 (2.13e-06)		2.53e-06 (2.09e-06)
LagRoad		-0.169 (0.222)		-0.220 (0.219)		0.436*** (0.112)		0.416*** (0.115)
Polcomp	-42.98* (24.01)		-42.16* (24.37)	-47.66* (25.11)	-28.67*** (7.483)		-29.66*** (8.421)	-20.92*** (7.389)
PEXP			-0.00537 (0.0284)	0.0164 (0.0339)			0.0120 (0.0185)	-0.00476 (0.0166)
MEXP			-0.0617* (0.0310)	-0.0356 (0.0289)			0.0216 (0.0200)	0.00857 (0.0154)
IDI			-0.0600 (0.147)	-0.111 (0.142)			0.0541 (0.0916)	0.0718 (0.0862)
Constant	80.18*** (20.88)	50.69*** (8.583)	84.43*** (23.63)	103.9*** (31.10)	42.89*** (6.790)	5.317 (3.682)	39.67*** (8.084)	19.47* (10.47)

Notes: Robust standard errors in parentheses *** p < 0.01, ** p < 0.05, * p < 0.1 Includes year dummies

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The Effect of the Operational Exit Tolls on the Welfare of the Local Community

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Abstract

Infrastructure is a part of accelerating economic growth. The construction of toll roads can provide positive and negative impacts. The existence of toll roads can reduce transportation and production costs, which will increase domestic and international market efficiency. However, the construction of toll roads is feared can kill small businesses. Studies of the effect of operational exit tolls on welfare are still limited in Indonesia. This study was conducted to identify the impact of toll roads on community welfare in the Pandaan-Malang exit tolls area. Using paired t-test and the cluster analysis method showed that the positive and negative impacts of toll roads construction on the community in the exit tolls area are varied for each cluster. This study can be used as the basis for formulating policies for communities affected by operational exit tolls, in particular. Creating new economic centers in the exit tolls based on local uniqueness can minimize the negative impacts on communities.

Keywords:

cluster, infrastructure, economic growth, exit toll

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INTRODUCTION

The Indonesian government continues to develop its national priority projects, one of which is toll roads. Within five years (2020 - 2024), toll roads built throughout Indonesia are targeted to reach 2,513 km (Kementerian PUPR, 2020). To improve the community's welfare of Malang and its surroundings, the government intensively increases the quantity and quality of infrastructure. The construction of toll roads is done to facilitate the access of Malang to several districts and cities nearby. This infrastructure development was followed up with the construction of the Malang-Surabaya access toll road in East Java. That access will pass through four gates, namely the exit toll in Region Lawang, Pakis, Karanglo, and Madyopuro.

Infrastructure development is an effort to increase investment in an economy and face the international markets. According to the existing economic growth theory (Acemoglu, 2009; Barro & Sala-I-Martin, 2004; Mankiw, 2013; Solow, 1956; Swan, 1956), investment is one of the robust variables in providing a positive impact on economic growth. It indicates that more investment will trigger an increase in the economic growth level. Infrastructure development can also increase efficiency by reducing goods distribution costs significantly. Therefore, infrastructure development can contribute to increasing exports, which in turn can boost economic growth. The researchers found that export positively affects economic growth (Hessels & van Stel, 2011; Jarreau & Poncet, 2012; Lazarov, 2019; Tekin, 2012).

The construction of toll roads will greatly support various governmental, economic, industrial, and community activities that can increase economic growth, primarily through trade in the international market. Additionally, the development of infrastructure can decrease income inequality (Chatterjee & Turnovsky, 2012; Dwiputri et al., 2018). Therefore, this study was conducted to determine the impacts of opening four exit tolls access on the local community's welfare, which some of them had worked in small and medium enterprises (SMEs). Other researchers said that the role of SMEs is one aspect that encourages economic growth and development (Gherghina et al., 2020; Kostini & Raharja, 2019). Identification of the impact will help the government and community in their efforts to achieve public welfare and the success of trade in the international market.

This research will map the impact of policies in several clusters so that the follow-up policies that will be applied can align with the government's target in facing the international market. This research identifies the public welfare difference between before and after infrastructure development. This study identified the changes in the addition of infrastructure, income, and consumption of local communities after opening and the use of access to the four exit tolls.

The construction of toll roads is considered one of the investments of government that can create new jobs, reduce transportation and production costs, develop community social activities, and increase economic growth and living standards. The results of several studies show that there is a positive relationship between infrastructure development and economic productivity (Annala et al., 2008; Aschauer, 1989; Esfahani & Ramírez, 2003; Laique et al., 2019). Infrastructure development can be a means of community economic

activities. Therefore, infrastructure can increase the quantity and quality of economic activity which will eventually provide increased income and prosperity of the community. Other researcher also reveals that infrastructure development as a part of capital is able to improve the economic performance of a country (Dwiputri et al., 2019; Pradhan & Bagchi, 2013).

Road infrastructure also can support the logistic service. So far, the distribution of goods, especially in Indonesia, mainly uses road infrastructure. Therefore, the construction of road infrastructure can facilitate the distribution of goods and services. Additionally, that logistic services are at the heart of the development of competitiveness and economy of the country (Bunrueang et al., 2019).

A favorable urban environment is the most crucial aspect of city competitiveness and urban development goals directly related to the public interest, quality of life of the population, and the sustainable development of urban society and economy (Khalil, 2012; Li et al., 2013). Growing population density results in hectic transportation (Hartono & Hapsari, 2019). To create an urban environment that supports sustainable development, the Government of Indonesia has been carrying out intensive infrastructure development. Therefore, the impact of infrastructure on sustainable development is one of the recent research topics in Indonesia. Other researchers found that Indonesia's infrastructure development could increase economic growth, government revenue, and reduce poverty (Aswicahyono & Friawan, 2008; Irawan et al., 2012).

The results of previous studies indicate that the impact of toll road construction on community welfare can be positive or negative. However, there is limited research that specifically looks at the impact on the welfare of the local community around exit tolls. This research uses microdata and focuses more on the impact of infrastructure development, especially the follow-up policy applied to the local community, particularly those living around the Pandaan-Malang exit toll area. However, this research wants to identify the impact of infrastructure construction on public welfare.

METHODS

Development programs such as infrastructure and government policies are designed to change existing conditions for the better (Gertler et al., 2016). The research method often used for impact analysis is the Randomized Control Trial (RCT) method. The RCT method is usually implemented before the policy program is implemented. Policy makers divide the group into two parts which both have the same characteristics. The first group that gets the program is called the treatment group. Furthermore, the second group did not get the program, called the control group. The RCT method compares outputs before and after program implementation (Khandker et al., 2010). RCT is a method often used in research experiments. The purpose of RCT is to evaluate the impact of the existence of a program or policy intervention. The RCT method divides the two groups into a treatment group and a control or treatment group seen in the two periods. But, the RCT method could not be applied to this study because the program had implemented.

To reduce bias in estimation of impact of the program, this study compares the output variables before and after the exit tolls opened. By applying the Paired T-test, this study can identify the impact of program by comparing before and after implementation of program. Then, the deeply analysis is carried out with cluster analysis method to see the impact of the program based on clusters. Henceforth this study uses the Paired T-test and applies the Cluster Analysis methods in formulating the follow-up policy and find out the impact of infrastructure development is divided into several clusters. Paired T-test called dependent samples T-test is a statistical procedure used to determine whether the average difference between the two sets of observations is zero. In a Paired T-test, each subject was measured twice, producing paired observations. This study uses primary data obtained from a survey of local communities as respondents. The survey was conducted at four exit toll points: Lawang, Pakis, Karanglo, and Madyopuro.

RESULT AND DISCUSSION

The results showed that the construction of the toll road did not always have a positive impact on the entire community. Of 101 respondents, as many as 52 respondents stated that they got a change in income; the remaining 49 respondents stated no change in their income. 30 respondents had decreased income, and 22 respondents had increased income after the construction of Malang city toll road. Those who have benefited from the toll road have small and medium enterprises (SME's) that are directly related to the economic activity of the toll road, for example, food and beverage vendors, souvenir sellers, grocery stores, and toll road employees.

The welfare measure often used is the consumption expenditure. From the interview, ten respondents stated that their total consumption increased, including food and non-food consumption. The rest of the respondents' total consumption of both food and non-food did not change. Four respondents got to change their jobs, while 17 respondents argued that there were better facilities before and after exit toll construction. Furthermore, all respondents stated no change in their assets between before and after the exit toll construction. Using a paired t-test, some of the respondents' characteristics before and after toll road construction did not show any significant difference. It is because the use of the new toll road is still only for one year.

Table 1 concluded that income before toll construction was higher with a significance level of 10% than income after toll construction. However, total consumption before toll construction was significantly lower than after toll construction by 5%. This result is in line with research conducted on the construction of toll Salatiga (Marpaung et al., 2021), Texas (Kalmanje & Kockelman, 2009), and southern Staffordshire (Pugh & Fairburn, 2008), where there is an increase in the welfare of society. However, social welfare as measured by income showed the opposite result where income significantly declining. People who use toll roads tend to be more efficient in distance and time, so that they would prefer to get to the destination right away instead of resting first at the exit toll gate. Although there is a decline in income, in the long term, the existence of toll roads is expected to have a positive impact on income, for example, from the increase in land prices (Rohman et al.,

2017). Overall, Table 1 showed that toll road construction negatively impacts the local community, significantly reducing revenue but increasing consumption. Furthermore, the type of consumption that has a significant increase would be identified further.

Table 1. Table of Paired T-Test Before and After Exit Toll Construction in Malang

Variable	Time	N	Mean (in IDR)	P-value
Income	Before	101	949,505	mean(diff) < 0 Pr(T < t) = 0.0868
	After	101	829,505	
Total Consumption	Before	101	1,322,733	mean(diff) > 0 Pr(T > t) = 0.0487
	After	101	1,348,277	
Stapled Consumption	Before	100	252,330	mean(diff) > 0 Pr(T > t) = 0.0813
	After	100	262,830	
Vegetables Consumption	Before	97	271,804	mean(diff) > 0 Pr(T > t) = 0.0638
	After	97	281,598	
Side-dish Consumption	Before	96	396,354	mean(diff) > 0 Pr(T > t) = 0.3610
	After	96	399,375	

Note: diff= $X_{\text{after}} - X_{\text{before}}$

Using the paired t-test method showed that carbohydrate consumption (staple food) after the exit tolls construction was significantly higher than before the exit toll construction by 10%. Likewise, after exit tolls construction, vegetable consumption was also significantly higher than before by 10%. However, consumption of side dishes before and after exit tolls construction does not have a significant difference. Other consumption and asset ownership indicate that there is no significant difference too. It showed that exit tolls still do not have much economic impact, especially on the surrounding community. The impact given even tends to be negative.

For a deeper analysis, this study identified the division of clusters related to the impact received by the community on the use of exit tolls. The division of clusters can provide policy formulation to the government to increase the positive impact of exit tolls on local communities. The cluster analysis used in this study was a non-hierarchical cluster because the divided cluster has been identified based on the impact obtained by the community on the use of toll exits. The results of cluster analysis were as follows.

Table 2 concluded that local people who got the exit tolls construction effect are divided into two main clusters: *the more educated cluster* (Cluster 1) and *the less educated cluster* (Cluster 2). Cluster 1 has the characteristics of having a business in the field of food, has a relatively large number of family members, has increased income after the use of exit tolls, tends not to change job after the use of exit tolls, has increased consumption after the use of exit tolls, tends to have higher education compared to Cluster 2. Furthermore, Cluster 2 has the characteristics of having a business in the field of food, the family members were relatively less than Cluster 1, tends to get decreased income after the use of exit tolls, tends not to change job after the use of exit tolls, tends to decrease consumption after the use of exit tolls, and tends to have lower education compared to Cluster 1. The

results of this analysis show that those who can take advantage of opportunities from infrastructure development are those with higher education. The construction of toll roads will create new jobs for the surrounding community by providing materials and equipment (Almahmoud & Doloi, 2015). In addition, the construction of toll roads also has the potential to reduce poverty through employment (Lee & Chan, 2010).

Table 2. Cluster Analysis

Variable	Cluster 1	Cluster 2
Zscore_food	0.84074	0.84074
Zscore_transportation	-0.62228	-0.62228
Zscore_hhsize	0.40654	-1.45984
Zscore_income_change	0.30678	-2.13608
Zscore_job_change	-0.20206	-0.20206
Zscore_facility_change	-0.44764	-0.20206
Zscore_consumption_change	3.00165	-0.32985
Zscore_totalconsumption_change	8.63457	-2.12233
Zscore_education	-0.07451	-1.14963

Cluster 2 has a more positive perception related to an increase in facilities after exit tolls construction. Based on the in-depth interview, several things that have changed are the increase of quality and width of the road. Respondents agreed that an increase in infrastructure had smoothed traffic flow, and they are more satisfied when using the road because of the better road quality. This research result is in line with research conducted in southern Staffordshire, which indicates that the presence of the toll road provides an indirect impact on road infrastructure improvements (Pugh & Fairburn, 2008). These results are consistent with studies that showed people's access to an activity center can be faster because of congestion avoidance on non-toll roads that divert vehicles to the motorway at peak traffic times (Doloi, 2012; Rohman et al., 2017).

From the different characteristics of the two clusters, the government can improve the community's welfare by providing policy formulations for each cluster divided into *more educated* and *less educated* clusters. The cluster analysis can conclude that the key in improving the welfare of local communities, especially around the exit toll, would be through improving their education and/or upgrading their knowledge. The government should upgrade the knowledge by providing an understanding related to several ways to increase income, such as opening new businesses and business expansion, financial and saving literacy, and understanding related to consumption behavior. The main target for upgrading knowledge is the community included in Cluster 2, namely, the *less educated* cluster.

The construction of toll roads, especially at exit tolls, will create opportunities for the emergence of new small and medium enterprises (Rohman et al., 2017). Communities can use it to improve their welfare in the long term. The public needs to understand the business potential that can increase income by utilizing public facilities around the

exit tolls. Potential businesses that would have good prospects were the businesses in the food and transportation sector. From the interview, it is known that several people have side jobs as an online motorcycle or taxi drivers. In addition to understanding the business potential, the public also needs to understand how to run a business to be profitable with the concept of “low cost, optimal benefit.” That is because many people in Indonesia still traditionally run their businesses without involving cost-benefit analysis.

Financial literacy also needs to be given to Cluster 2 because in opening new businesses or expanding their businesses, the community often needs additional funds. So, the un-bankable community needs to be given upgraded knowledge in order to be bankable. In addition to providing knowledge in financial literacy, the community also needs knowledge related to saving and investment so that the public can know how to save from the income of their business and invest profitably. Furthermore, the community also needs to understand consumption behavior so that they can allocate consumption optimally to improve the quality of life when income increases.

Indonesian people tend to use their transitory income for investment and reduce consumption of non-essential goods such as cigarettes to increase their investment (Dwiputri, 2017). It showed that Indonesian people tend to save and invest when there is an increase in income. Therefore, a knowledge upgrade that related to investment and consumption behavior also needs to be given. The further analysis is to create clusters based on the income group shown in Table 3 below.

Table 3. Cluster Analysis (Case by Income Group)

Variable	Cluster 1	Cluster 2
Zscore_food	0.84074	-0.00885
Zscore_transportation	-0.62228	0.00655
Zscore_hhsize	0.40654	-0.02568
Zscore_income_change	0.30678	-0.01041
Zscore_job_change	-0.20206	0.01276
Zscore_facility_change	-0.44764	0.02827
Zscore_consumption_change	3.00165	-0.01424
Zscore_totalconsumption_change	8.63457	-0.08213
Zscore_education	-0.07451	-0.00661

Table 3 shows the same results as Table 2 that Cluster 2 remains categorized as “less educated” than Cluster 1. The characteristics of the cluster in both tables do not show significant differences. Several studies reveal that infrastructure development influences economic productivity (Annala et al., 2008; Aschauer, 1989; Esfahani & Ramírez, 2003). Study of the impact of construction of Malang toll road (Indonesia) to the community around the exit toll, showed that there was a decrease in income with a significance level of 10% and an increase in total consumption with a significance level of 5%. It showed that toll road construction significantly decreases revenue by 10% but increases consumption significantly by 5%.

The paired t-test method analysis showed that carbohydrates (staple food) and vegetable consumption experienced a significant increase by 10%. However, the consumption of side dishes does not significantly differ between before and after the toll road construction. The study found no significant difference in consumption of other types of goods and asset ownership. It showed that exit tolls yet to have a positive economic impact, especially on the surrounding community. To increase the positive impact, it needs a more strategic formulation of government policy.

Cluster analysis results showed that there were two clusters in the community around the exit toll. The difference between cluster 1 and cluster 2 is that people in cluster 1 relatively have more family members, have a higher level of education, and have increased income and consumption than cluster 2 after exit tolls construction. With the striking difference, cluster 1 is called the “more educated” cluster and cluster 2 is the “less educated” cluster.

CONCLUSION

Infrastructure is one of the transitions to boost economic growth. The construction of toll roads is expected to increase the people's welfare, especially those in the exit toll area. This research focuses on the community who live around the Pandaan-Malang exit toll areas. The analysis results show that people living around the Pandaan-Malang exit tolls experience an increase in welfare as measured by expenditure. However, it has no impact on other welfare measures such as assets but has a negative impact on income. From the cluster analysis results, it can be seen that the improvement in the community's welfare around the exit toll can be achieved through increasing the education rate and/or upgrading knowledge. Upgrading knowledge that the government can do is provide understanding related to several ways to increase income through opening new businesses and business expansion, financial literacy, saving, and understanding related to consumption behavior. The main target for this knowledge upgrade is the community included in cluster 2, namely the “less educated.”

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Direct Cash Transfer Effect on Children Quality in Women's Household in Indonesia

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Abstract

Many studies confirm the importance of the role of women in the effectiveness of government programs, especially the programs aimed at improving family welfare. This study aims to examine the effect of the government program of direct cash transfers (BLT) on the human capital of children in households headed by women in Indonesia. Data for the study was obtained from IFLS (wave 5) and analyzed with multiple linear regression. The analysis results show that there is a negative effect of BLT on the education of children. Previous studies state this is due to the changing behavior of the recipient households or the spillover effects on the non-recipient households. This research proposes a different reason, such as social discrimination against households headed by women. The solid patriarchal culture in Indonesia often ignores female-headed households, so the number of households receiving social protection programs is relatively very limited.

Keywords:

cash transfer policy, the human capital of children, gender, household welfare

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INTRODUCTION

Increasing human resources can be regarded as a non-physical investment related to the number of funds spent and the opportunity to earn income during the investment process. The investment process is expected to provide a higher level of income to achieve a higher level of consumption. Such an investment is called human capital investment. The term 'human capital' has been known since Gary S. Becker wrote *Human Capital* in 1964. Becker's human capital theory states that a person can increase their income through increased education (Psacharopoulos & Patrinos, 2018). The concept of the rate of return to investment in education is similar to that in any other sector. There are two conventional methods to measure the rate of return to investment in education from an individual perspective: the entire discounting method and the Mincer earnings function method (Yubilianto, 2020).

The most strategic targets in developing quality human resources are children. Children as family members and the next generation become very important in national development. Education is one of society's most powerful instruments to reduce poverty and vulnerability. The direct role of education is to provide knowledge and skills, thereby increasing productivity and creating access to employment. The indirect roles of education cover many areas of life, including economic activities, gender equality, maternal health, and skills development. Education is believed to have an essential role in strengthening the ability of humans and countries to absorb and create modern technology and developing their capacity to create sustainable growth and development.

As is known, gender issues emerge as a deconstruction of patriarchal culture. Gender is more emphasized on the different roles and functions that exist and is made by the community. Differences in the roles and functions of women and men are normal as long as they do not cause gender inequality. However, in reality, gender differences often lead to inequalities and injustices for women. These forms of gender injustice are incompatible with human rights. Therefore, in 1993 the United Nations made the Declaration on the Elimination of Violence Against Women. The Government of Indonesia seeks to achieve gender equality through Presidential Instruction No. 9 of 2000 concerning Gender Mainstreaming in National Development.

There is a paradigm shift in which women no longer only work in the domestic sphere but also in the public sphere. Working women have a very dominant function in the household. Women's education is critical, especially in the current era when gender emancipation and equality are essential things and are being continuously fought for by women. Therefore, education is no longer the monopoly of men. Women must receive education from the lowest level to an adequate level. Many women have the same level of education as that men have, and some women even have a higher level of education than men. Engida (2021) states that women with a high level of education will certainly have a relatively strong power to make decisions in their household, including decisions on their children's education. Setyari (2013) states that measuring "power" in studies of household decision-making has proven to be complicated. Household members may

obtain power from various sources, some of which are from outside the household. The most prominent source of power is their control over household welfare. Power indicators may vary with social, economic, and cultural contexts. An indicator of power that is commonly used is the income of the wife and husband as a measure of relative power. Another indicator of power that is also commonly used is the parents' level of education or the head of the household.

Many studies include measures that are considered indicators of women's power, including asset ownership (Beegle et al., 2001; Quisumbing & Maluccio, 2003). The studies provide empirical evidence of some factors that influence household resource allocation. The assets owned by a woman before marriage may strengthen her position in the household after marriage. (Doss, 2006, 2013) uses the measurement of farmland and broader assets, including savings and businesses, to show that women's asset ownership is associated with a positive impact on the outcome, for example, a higher share of the budget for food and education in Ghana. (Johnson et al., 2016) considers a broader set of assets, moving beyond physical assets to include social networks to examine their impacts on household outcomes and women's well-being. A wife who has more assets in the marriage may have more power to "force" her choices in decision-making by controlling the husband's assets brought into the marriage (Setyari et al., 2018).

Several empirical studies within the framework of intrahousehold resource allocation that have been conducted in Indonesia focused on education as an indicator of welfare. Among them is the study conducted by Quisumbing & Maluccio (2003), which took place in Bangladesh, Ethiopia, Indonesia, and South Africa. The study focused on the patterns of household spending, especially the one on education, and concluded that the share of assets owned by women would increase education spending for their children. However, the framework has not been used much to see the impact of resource allocation in the household on children's education levels, especially in Indonesia. This condition becomes very important because many decisions that affect economic development results and the development of human capital are taken at the household level.

The level of child welfare cannot be separated from the role of the mother because of using her abilities. A mother can allocate resources owned by the household. This condition depends on the mother's amount of power to carry out her preferences (Doss, 2013). Therefore, the measurement of power is very important to understand how the parents, especially the mother, allocate resources in the household that will impact the welfare of their children, including their education.

Some aspects of intrahousehold resource allocation issues are significant for policymakers for at least two reasons (Fuwa et al., 2006). First, paying attention to the welfare of individuals rather than the welfare at the household level may influence the policymakers' views of who and where the poor are. There is a possibility, for example, that some households whose average per capita incomes are above the poverty line may still have household members whose actual living standards are below the poverty line due to an imbalance in the allocation of resources. Second, the way household members allocate

resources among themselves has the potential to affect the effectiveness of policy interventions and lead to unintended consequences for policymakers. Some policy interventions were followed by household responses that policymakers did not anticipate, for example, the introduction of new agricultural technologies and microcredit programs, which led to an increase in the use of child labor in family businesses and a decrease in the school participation of children from the families (Hazarika & Sarangi, 2008; Islam & Choe, 2013).

In 2007, the Government of Indonesia launched Program Keluarga Harapan (PKH) (Hope Family Program), the first conditional cash transfer program in Indonesia. This program seeks to improve the quality of human resources by providing conditional cash transfers to households that have access to certain health care and education services. PKH helps reduce the burden of household/family expenditure on very poor households (direct consumption effect), while investing in future generations through improved health and education (human resource development effect). This combination of short-term and long-term assistance is the government's strategy to sustainably lift PKH recipients out of poverty (Nazara & Rahayu, 2013). In addition, the government has also issued Bantuan Langsung Tunai (BLT) (Direct Cash Assistance Program) and Bantuan Langsung Sementara Masyarakat (BLSM) (The Program of Temporary Direct Assistance for the Community). The programs will improve the quality of children's human capital, especially their education. Households who have children and receive the programs can send their children to higher levels of education.

Several studies showed that the effect of the programs seems to vary. A study by Meydianawathi & Setyari (2018) on several household-based programs, including BLT, showed that the programs significantly improved the welfare of households using expenditures as a proxy. However, there has been no testing of the effectiveness of direct cash transfers in increasing children's human capital in families headed by women. The Central Bureau of Statistics (BPS) defines the head of a household as a person from a group of household members who is responsible for the daily needs of the household or a person who is considered or appointed as the head of the household. In reality, on the ground, the head of the family does not always refer to a man or husband because there are many households whose head is a woman. BPS data in 2018 shows that women head at least 15.5% of the 103 million households. This number increases each year. This paper aims to examine the impact of the BLT program on children's human capital conditions, seen from their education level. The current study is expected to provide significant inputs for developing future government policy directions, especially those related to poverty alleviation and gender mainstreaming.

METHODS

The data used in this study was taken from the Indonesian Family Life Survey (IFLS) wave 5, which was published in 2014. The objects of the study are households headed by women. Some women became the head of their household because they got divorced. Some women took over the leadership of their household because their husband was no longer the

primary breadwinner. After all, he had a disability or had lost his job. Some women became household heads because their husbands had been away for too long without providing for the family, and they did not get married again but had family responsibilities. Some women became the head of their household because their husbands could not function as their household head due to polygamy, unemployment, or illness. The majority of women became the head of their household because their husbands had passed away. Some of the women who are the head of their household live below the poverty line. They have diverse backgrounds in terms of economic class, social class, and marital status.

The analysis technique used in this study is multiple linear regression, which can be formulated with the following equation:

$$Y_i = \alpha + \theta BLT_i + \beta_k X_i^k + \vartheta BLT * loc_i + \varepsilon_i \quad 1)$$

Description:

Y_i = children's human capital

θ = regression coefficient of BLT program

β_k = regression coefficient of control variables

ϑ = regression coefficient of the interaction between BLT variables and location

X_i^k = control variables

X_i^k (control variables) is a group of variables considered to have an effect on children's human capital. In the study, the control variables are the power of women heading their household relative to their partners, their place of residence (rural or urban), their access to education, their assets, their age, the age of their spouse, the age of their children, the number of their family members, the order of birth of their children, and the status of their children. The hypothesis proposed here is that there is a positive impact of the BLT program on the human capital of children in the household. The human capital of the children in the households that receive BLT is higher than that in the households that do not receive BLT. It is also important to discuss further the interaction between the BLT program and the location of a household because the location of a household often determines the quality of human resources. Households in urban areas have easier access to basic services and more choices of schools with better school infrastructure. All this causes children in urban areas to have higher levels of education than those in rural areas. It is interesting to see whether children in rural areas still have lower levels of education, compared with children receiving BLT in urban areas, if the variable of the BLT program interacts with the variable of the location.

RESULT AND DISCUSSION

Direct Cash Transfers (BLT), a social protection program, is one of the most common poverty alleviation programs used, especially in developing countries. Humanitarian reasons are behind BLT, and it is believed that the program will improve the living

standards of low-income families by providing opportunities to build more substantial assets to maintain their livelihoods (Sulaiman, 2012).

Indonesia has enjoyed strong and stable economic growth over the past decade and a half, leading to poverty reduction and improvements in living standards. However, economic growth has not benefitted everyone equally, and geographic disparities remain large. Data shows that children, older people, and persons with disabilities experience higher poverty levels than the general population. Development in urban areas has been much faster than that in rural areas. Poverty is concentrated among children and the elderly, with women being more likely to be poor than men at almost all ages. Rural areas are significantly poorer than urban areas. Children from poor and vulnerable households are far less likely to benefit from improvements in public services than their wealthier peers, meaning that they are deprived during a crucial period of cognitive and physical development (OECD, 2019).

The comparison between the characteristics of male-headed households and those of female-headed households, using IFLS data, shows that males' income levels and years of schooling are relatively higher than females'. The characteristics of the respondents in this study show in Table 1.

Table 1. Descriptive Statistics of Respondents

Variable	Mean	Std. Dev.	Min	Max
child_educ	3.677	2.476	0	11
BLT ^d (d = 1)	0.176	0.381	0	1
education	1.220	1.091	0.083	12
income	21.499	25.914	0.00	100
urban ^d (d = 1)	0.503	0.500	0	1
age	37.226	6.529	21	67
age_spouse	41.762	7.44	24	79
hh_member	4.778	1.326	3	13
asset	0.292	0.469	0	19.8
birth order	1.513	0.711	1	6

Source: IFLS4, data processed

A child's education is measured by the number of years of schooling completed. This variable is used as an outcome variable. Education and income are relative figures compared to the education level and income of women's spouses, reflecting the impact of women's power in the household. The BLT program was measured by a dummy variable (whether the respondents received BLT or not). The test results can be seen in Table 2.

The analysis results are quite surprising because BLT, which is believed to be able to improve the quality of family welfare, including children's education, actually has a

negative impact. These results indicate a change in the behavior of BLT recipients or an unintended positive effect received by families who do not receive BLT because children's education tends to be higher in families who are non-recipients. (Izzati et al., 2020) found no evidence of BLT recipients changing their behavior either in employment status or working hours, but she found some evidence of their increased cigarette consumption or activities that pose a high risk to health or other harmful behaviors.

We put forward a different proposition in this study despite the facts above, considering two facts. The first fact is related to the descriptive statistics of the respondents, which shows a low share of the female-headed households receiving BLT. This condition may reflect the existence of discrimination in the provision of social protection programs in Indonesia. The unfair accessibility in education is due to the discrimination between urban and rural education and gender discrimination. Education in developing countries faces many obstacles at its core (Aleed, 2016). Programs are often associated with conventional households, in which the head of the household is a male. Therefore, female-headed households tend to be forgotten or not trusted so that they are most likely to be not included in the recipient database. In the solid patriarchal culture of Indonesia, female heads of households are considered a minority group. In a society with a very paternalistic culture, those who are oppressed and weak are more likely to be poor.

Table 2. Results of the Analysis of the Effect of BLT on Children's Education

Variables	coefficient (std.error)	t-stat
BLT ^d	-0.128** (0.0642)	-1.99377
education	0.0205 (0.0198)	1.03535
income	-0.00119 (0.000795)	-1.49685
Constant	-5.966*** (0.195)	-30.594872
Control Variables	Yes	
Observations	1,496	
R-squared	0.903	

Note: *** sig. at 1%; ** sig. at 5%; * sig. at 10%

The government has corrected the above condition by distributing BLT through village funds for economic recovery in times of crisis due to the COVID-19 pandemic. Nearly 2.5 million or the equivalent of 31% of BLT recipients from village funds are female heads of households. They should have received assistance through a social safety net program, but not recorded in the database. Therefore, they have assisted the village BLT.

The second fact is related to government assistance, due to which school fees are free. The BLT obtained is more focused on meeting daily needs (especially food). The relatively

small value of BLT is not enough to meet the educational needs at once. Indonesia has invested heavily in improving children's access to basic education. Nationwide, access to primary education is near-universal, and completion rates stood at 95 percent in 2018. The adjusted net attendance rate for junior secondary students was 90 percent, and 85 percent of the 16-18-year-old adolescents had completed lower secondary school education. Basic education is fee-free, and the country has also put in place a scholarship program to help meet out-of-pocket education expenses for children from low-income families. In 2016, the Government of Indonesia raised the duration of compulsory education from 9 years to 12 years to maximize the long-term economic potential of its large youth population. This change is expected to further boost the share of children completing high school and increase the demand for tertiary education (Indonesia Ministry of National Development Planning and the United Nations Children's Fund, 2019).

The provision of cash transfers in the form of cash transfer (as BLT) in principle aims to improve the behavior of parents and increase their ability to buy basic necessities (foods, clothes, houses), increase household investment for their children's future (for examples, buying books, supporting early childhood education, buying toys, and maintaining good health), reduce child labor, improve the quality of time for child care, and provide other sources of income (Fernald et al., 2008; Hanna et al., 2018). The amount of the transfer value received by households is insufficient to cover the decline in welfare. In addition, assistance is temporary or short-term, with the main objective to meet basic household needs. A study conducted by (Hastuti. et al., 2006) showed that the cash transfers received by households are mainly to meet basic needs. It is not easy to expect the remaining funds to be used for investment so that the benefits of the transfer will not have an impact on children's education in Indonesia.

Many studies investigated the contribution of cash transfers to reducing poverty, reducing malnutrition among children, and increasing school attendance rates. In some cases, cash transfers to female-headed households lead to larger economic gains because such households invest more in economic assets, increasing women's decision-making power and choices. However, it has been found that cash transfer programs may have unintended consequences for non-beneficiaries, which needs to be considered when designing such programs. Economic theory suggests that if a cash transfer program channels a significant sum of money into a small and isolated village economy, local commodity prices may go up, which in turn can have consequences for non-beneficiary households. Kandpal (2019) found that negative effects on non-beneficiary households were most likely to occur in geographically remote villages and where a large proportion of households were poor enough to be eligible to receive payments.

Robustness Check

It has been found that when interacting with the location of the household, BLT has a positive impact on the level of education of the children. This data indicates that BLT recipients in urban areas have better education levels than those in rural areas. Partially, there is a significant difference in the education of children living in cities, which

is relatively higher than that of children living in villages. This result further strengthens the assumption that there are significant differences in education access and infrastructure between rural and urban areas.

There are two causes of unequal access to education. The first cause is the inequality of education and differences in the allocation of resources between major cities and rural areas. Another variable is the distance between a student's house and the school, which is much farther in rural areas than in cities. This affects the accessibility in education for people living in rural areas. The second cause of unequal access to education is gender discrimination. Most females in developing countries are prevented from pursuing higher education due to some familial and social constraints and some school policies.

Despite its exceptionally large positive impact on household income, Sulaiman's (2012) study also found that the cash transfer program did not increase school enrollment rates. Moreover, there was an increased demand for child labor among households. Evidence suggests that cash transfer programs may not be sufficient to increase school enrollment among households in extreme poverty and may have unintended effects related to child labor.

Table 3. Robustness Check

Variables	coefficient (std.error)	t-stat
BLT ^d	-0.236*** (0.0834)	-2.8297
education	0.0192 (0.0198)	0.9697
income	-0.0012 (0.0007)	-1.4610
urban ^d	0.0719* (0.0429)	1.6759
age	0.00442 (0.0053)	0.8277
age_child	0.9440*** (0.0096)	98.4358
age_spouse	-0.0022 (0.0046)	0.4749
hh_member	0.0007 (0.0194)	0.0357
asset	0.0750** (0.0378)	1.9841
birth order	-0.100*** (0.0361)	2.7700
urban*blt	0.217* (0.113)	1.9203
Constant	-5.979*** (0.194)	-30.8196
Observations	1.496	
R-squared	0.903	

Note: *** sig. at 1%; ** sig. at 5%; * sig. at 10%

As described above, the poverty experienced by women is poverty from an economic perspective. It is poverty due to economic factors. The poverty experienced by some Indonesian people is 'complex' poverty in the sense that the people who experience it lack food and clothing and identity, information, access, participation, and control. Therefore, most Indonesian women are poor because they are economically backward and because they have limited access to information, education, politics, and health services. All this has resulted in their limited participation in development activities.

CONCLUSION

To have education may be the most crucial right in the 21st century. However, today many obstacles hamper education from contributing the best to developing countries. The obstacles include a lack of quality education, not up-to-date technological resources, and disparity in the accessibility in education. The research results show that BLT has a negative effect on the education level of children in households headed by women. Such an adverse effect may be due to discrimination in access to information, which places female-headed households as a minority group in Indonesian society. Households headed by women are still considered as a minority group, so they often are not entered into the database used for various social programs.

The interaction between the BLT program and the locations of female-headed households shows positive results. This condition shows that more resources should be made available in rural areas to have efficient access to resources and do not have to travel far away to meet their basic needs. The government should provide cash transfers for housewives or female heads of households as the direct targets so that the positive impact on the quality of children is more tangible than others. Data improvement is also significant lest households who are not entitled to BLT receive it under the pretext of justice or togetherness in society. This condition can minimize spillover effects that may arise.

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Foreign Ownership Shares and Trade Propensity in Indonesian Edible Oil, Vegetable and Animal Fats Industry

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Abstract

Presidential Regulation (Perpres) No 44/2016 states that in the vegetable and animal crude oil industry, copra industry, coconut oil industry, palm oil industry, foreign ownership is limited at a maximum of 95 percent. These industries are included in the edible oil, vegetable and animal fats industry (ISIC 104). This study analyzes the effect of foreign ownership share on the trade propensity in the edible oil, vegetable and animal fats industry in Indonesia using the Tobit model. The data used are the cross-section data from 2015 Annual Survey of the Manufacturing industry from Statistics Indonesia. The results show that firms with foreign ownership share of more than 95 percent have the same export propensity with foreign ownership of between 50 and 95 percent. However, the import propensity of firms with foreign ownership between 50 and 95 percent is the lowest compared to other ownership. The government should continue to restrict foreign ownership shares at the maximum of 95 percent in this industry.

Keywords:

export, foreign ownership, import, tobit model

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INTRODUCTION

One of the goals in the trade sector is increasing the export value-added of non-oil and gas products. The processed food sector is one of the main product of Indonesia's non-oil and gas exports (Hasni, 2018). Increasing exports can be done by inviting foreign investors in the form of foreign direct investment. Safitriani (2014) reveals that foreign direct investment in the long term will increase export value.

Foreign-owned firms can overcome the entry barriers to foreign markets. Foreign capital from developed countries has the opportunity to apply more advanced technology in the firms and use it to create new competitive products (Golikova & Kuznetsov, 2016). Technology acquisition from developed countries led to innovation and learning processes in developing countries which were the main source of export excellence at the firm level (Belitz & Mölders, 2016). Foreign firms have a faster technology transfer rate and increase incentives to adopt technology (Boddin et al., 2017). Technological innovations positively affect export intensity (Radicic & Djalilov, 2019). Absorptive capacity is vital in capturing positive spillovers as firms build competency by accumulating their own know-how and improving their ability to capture better external technologies (M. Kim & Choi, 2019). The exporters differ from non-exporters in terms of their firms' and owners' characteristics, their perceptions toward export barriers, their participation in their national government's export assistance program and network relationships (Revindo et al., 2019)

Knowledge transfers stemming from the transfer of managers from the parent to foreign affiliates (Cho, 2018). Apart from that, foreign firms also have international trade networks (Ramstetter, 1999). This happened because lower international trade transaction costs incurred by foreign firms when trading. Foreign direct investment also has a positive and significant effect on exports (Mijiyawa, 2016).

Foreign ownership can also increase imports of raw materials. Imports of raw materials occur when local raw materials are unable to meet the needs of foreign firms in terms of quality and quantity (Naully et al., 2020). The existence of foreign capital is still a matter of debate in Indonesia. Foreign capital restrictions are still being implemented to protect domestic firms. One of that is Presidential Regulation (Perpres) No. 44/2016 which states that in the vegetable and animal crude oil industry, copra industry, coconut oil industry and palm oil industry, the maximum foreign ownership is 95 percent. These industries are included in the edible oil, vegetable and animal fats industry. For this reason, it is interesting to analyze the impact of the foreign ownership shares on the export propensity of firms in the industry.

Research on the effect of the foreign ownership shares on firm exports has been conducted before. Ramstetter & Nguyen (2016) have proven that in Vietnam, wholly foreign-owned firms tend to export more than joint venture firms and the government. Ramstetter (2018) stated the same result on industries in Thailand which showed that the export propensity would be higher for firms that were wholly foreign owned. Bykova & Lopez-Iturriaga (2018) support positive impact of foreign ownership on the link between exports and firms' performance in Russian manufacturing companies. Therefore of the

sign of the relationship, the evidence clearly points to the existence of an influence of ownership concentration on a firm's export propensity (Miravittles et al., 2018). In addition, Charoenrat & Amornkitvikai (2021) have proven that foreign direct investment significantly and positively influence Chinese manufacturing firms' export intensity.

Research on the effect of the foreign ownership shares on trade propensity in manufacturing firms has also been conducted in Indonesia. Ramstetter (1999) shows that Indonesian manufacturing firms with a large percentage of foreign capital will have a high export propensity, but this is not directly proportional to the import propensity. Sjöholm (2003) concluded that foreign ownership in firms increases the possibility for firms to export. This is because foreign firms have networks, especially with the countries of origin of the foreign capital.

In the food and beverage industry, the presence of foreign ownership increases the chances of a firm to export 3.67 times compared to firms without foreign capital (Rifin 2017). Naully et al. (2020) have also conducted research on the Indonesian food industry and concluded that firms with foreign ownership have propensity to export and import, but the foreign ownership shares has no effect on export propensity.

This study aims to evaluate government policies on Indonesian edible oil, vegetable and animal fats industry related to restrictions on foreign ownership. This industry is chosen since these industries have significant contribution to Indonesian economy especially for the palm oil industry.

Previous study emphasizes on the importance of foreign ownership to export and import propensity at the aggregate level. Most studies focus on manufacturing or food industry level, meanwhile this research focuses on the edible oil, vegetable and animal fats industry. However, there is less empirical work that provides evidence on disaggregate level. The contribution of this paper is to bridge the gap by providing evidence on foreign ownership share to trade propensity. Articles on the edible oil, vegetable and animal fats industry in the firm level mostly in the palm oil sector discussing on efficiency ((Stephanie et al., 2018)

The paper is organized as follows: Section 2 describes the methods. Section 3 investigates the effect of foreign ownership shares on trade propensity with the characteristics of firm in the industry. Section 4 concludes.

METHODS

This study utilizes the 2015 Annual Manufacturing Industry Survey data from the Statistics Indonesia. This data is a cross section data. The 2015 data was used since it is the recent data available. The annual manufacturing industry survey data is often used to analyze the performance of Indonesian industry, such as that conducted by Blomström & Sjöholm (1999), Hill (1990b, 1990a), Sjöholm (2003), Ramstetter (1999), Takii & Ramstetter (2005), Takii (2004, 2005) and Naully et al. (2020). This data is firm level data in the manufacturing industry which has more than 20 labor.

The industry focused in this research is the edible oil, vegetable and animal fats industry which is included in the International Standard Industrial Classification 104

(ISIC 104). There are 910 firms in the 2015 Annual Survey of the Manufacturing Industry. After filtering the data based on the availability of value of capital and raw materials data, only 372 firms were utilized in the analysis.

Before analyzing the effect of foreign ownership share on the trade propensity, identification of the factors that influence the trade propensity was conducted. Trade propensity is the trend in exports of output and imports of raw materials so that both are used as dependent variables. The export propensity is indicated by the export ratio, which is the export value divided by the total output value produced by a firm. Meanwhile, the import propensity is indicated by the ratio of raw material imports, which is the value of imports of raw materials divided by the value of raw materials used by firms.

This study uses capital intensity, skilled labor intensity, productivity, the export and import propensity and the dummy variable of foreign ownership shares as independent variables. Capital intensity is the ratio of fixed capital divided by the number of workers. The capital/labor ratio is included in the model because it can describe the characteristics of the industry as well as the comparative advantage of the country, especially in developing countries where labor is relatively cheap compared to capital. A small capital-labor ratio indicates that more labor is used because it is relatively cheaper compared to capital. A small capital-labor ratio in an industry indicates that the firm is producing labor-intensive products. This industry has a comparative advantage and can compete with foreign firms in the international market because it relies on cheap labor (Ramstetter, 1999). Jongwanich & Kohpaiboon (2008) and Amornkitvikai et al. (2012) found a negative effect between the capital-labor ratio and export participation for Thai manufacturing firms. Meanwhile, Athukorala et al. (1995) found that the capital intensity variable had a significant positive effect on firms' export decisions. In addition, Kokko et al. (2001) stated that there was no significant effect between the two variables.

Skilled labor is also a factor affecting trade propensity. In this study, the intensity of skilled labor is the ratio of the number of non-production workers to the total number of workers. Ramstetter (1999) shows that the intensity of skilled labor has a negative effect on export propensity. Meanwhile Dueñas-Caparas (2006) and Roper & Love (2002) show that skilled labor has a positive influence on a firm's export decisions.

Labor productivity used in this research is the ratio of value added to the number of workers. Productivity is thought to have a positive effect on the decision to export. Firms with high productivity, export more than those with low productivity (Roberts & Tybout, 1997).

The variable ratio of export to output and ratio import of raw materials at the industrial level is used to describe the specific effects of the industry. Ramstetter (1999) argues that a firm has a high propensity to export in industries that tend to export and vice versa. Likewise on the import side, firms in industries that tend to import will have a tendency to import as well

The foreign ownership variable share uses a dummy variable for various groups of foreign capital ownership. Firm ownership is divided into four groups, namely firms that do not have foreign capital, firms with foreign ownership shares less than 50 percent (minority foreign ownership), firms with foreign ownership shares between 50 to 95 percent (majority foreign ownership) and firms with foreign ownership more than 95 percent. Domestic firms are used as the base. If the coefficient of the dummy variable in a group of foreign ownership shows a positive sign, it can be interpreted that foreign-owned firms in that portion have a greater tendency to export or import than domestic firms. Based on the factors that are thought to influence trade propensity (exports and imports), the variables used in the equation are as follows:

$$(X/O)_{ij} = f ((X/O)_j, (ES/E)_{ij}, (K/E)_{ij}, PTV_{ij}, D_{050}, D_{5095}, D_{95100}) \quad (1)$$

$$(M/R)_{ij} = f ((M/R)_j, (ES/E)_{ij}, (K/E)_{ij}, PTV_{ij}, D_{050}, D_{5095}, D_{95100}) \quad (2)$$

Where:

- X = exports (thousand rupiah)
- O = output (thousand rupiah)
- M = imports of raw materials (thousand rupiah)
- R = raw materials (thousand rupiah)
- K = fixed capital (thousand rupiah)
- E = labor (people)
- ES = non-production labor (people)
- PTV = productivity (thousand rupiah)
- D050 = dummy variable (1 = foreign ownership share is greater than 0% to less than 50%)
- D5095 = dummy variable (1 = foreign ownership share 50% to 95%)
- D95100 = dummy variable (1 = foreign ownership share is greater than 95%)
- i = firm i
- j = sub-industrial group j

The equation is estimated using the Tobit model. This model is used because the dependent variable is limited in which the value of the export and import ratio is limited to range from 0 to 1. Meanwhile using common regression analysis, the dependent predicted variable can be in the value of less than 0 or more than one. The zero number in the export propensity equation shows the firm does not export and the number one shows that the firm exports all the output it produces. Whereas in the import propensity equation, the zero number indicates that the firm does not import raw materials and the number one means the firm imports all the raw materials. The independent variable is converted into a logarithmic form to minimize the potential for heteroscedasticity (Kim & Park 2011). The dependent variable still uses its original form to maintain the

characteristics of the Tobit model that limit the dependent variable. Export propensity of industry, import propensity of industry and the intensity of skilled labor (the ratio of non-production labor to total labor) have zero values on several observations. Therefore, these variables were redefined by adding one from the original value to facilitate the use of the specifications used.

Estimation using the Tobit model has a weakness. It cannot be performed statistical tests related to heteroscedasticity. To overcome this, Ramstetter (1999) estimates using weighted and non-weighted. A smaller standard error on the weighted regression results indicates that heteroscedasticity is a problem in the unweighted regression results. The regression results shown are weighted regression results.

RESULT AND DISCUSSION

The sample description used in this study can be seen in Table 1. The table shows that 15 percent of firms in the industry doing export, 58.93 percent of export firms are domestic firms. Additionally firms that doing import are 2.96 percent and 54.55 percent are foreign firms. This indicate that the majority of firms conducting export and import are domestics firms. Meanwhile for domestic and foreign own firms, majority of the firms do not conduct export or import.

Table 1. Number of Samples

Foreign Ownership	Export	Import	Export and Import	Non Export Import	Total
0% (domestic)	30	2	3	263	298
0% < foreign < 50%	2	1	0	8	11
50% ≤ foreign ≤ 95%	11	0	0	22	33
Foreign > 95%	6	1	4	19	30
Total	56	11	7	312	372

Fifty percent of domestic firms conducting export is firm producing crude palm oil (CPO). Meanwhile for foreign firms, 65 percent of the exporting firms also produced crude palm oil (CPO). Indonesia is the largest producer of crude palm oil, therefore not surprising that this sector contribute to the country's export.

Statistical descriptions of the variables used can be seen in Table 2. The table shows that the data used is heterogeneous. On average, firms in the edible oil, vegetable and animal fats industry export 8.6 percent of the products. Meanwhile, the import propensity of firm is 0.4 percent of the raw materials it uses. The average industrial export propensity is higher than firms, which means that on average 17.9 percent of the output produced by the industry is exported abroad.

Table 2. Statistical Descriptions

Variable	Average	Minimum	Maximum	Standard Deviation
Export propensity of firm	0.086	0	1	0.251
Import propensity of firm	0.004	0	0.994	0.055
Export propensity of industry	0.179	0	0.760	0.157
Import propensity of industry	0.000	0	0.029	0.004
Capital intensity (thousand rupiah)	3256583.509	141.8	397500740.2	28734022.45
Labor intensity	0.181	0	0.951	0.218
Productivity (thousand rupiah)	1070206	4264.25	74956379	4400581
Foreign Ownership (%)	16.747	0	100	35.294

Table 3 shows the estimation results of the factors that influence the export propensity of firms in the industry. Industrial exports have a positive effect on the export propensity of firm. This is because firms in the edible oil, vegetable and animal fats industry generally export.

Table 3. The Influence of Foreign Capital on the Export Propensity in the Edible Oil Vegetable and Animal Fats Industry

	Coefficient	<i>p-value</i>
Constant	-3.922	0.000
$\log (X/O + 1)_j$	3.347	0.000
$\log (ES/E + 1)_{ij}$	0.470	0.002
$\log K/E_{ij}$	0.026	0.059
$\log PTV_{ij}$	0.127	0.000
D_{050}	0.280	0.135
D_{5095}	0.718	0.000
D_{95100}	0.759	0.000
Number of sample	372	
Likelihood function	-2171.72	
H_0 : coefficient D_{050} = coefficient D_{5095}	-	
H_0 : coefficient D_{050} = coefficient D_{95100}	-	
H_0 : coefficient D_{5095} = coefficient D_{95100}	0.672	

The industry requires skilled labor to produce. Firms have an average skilled workforce of 18.1 percent of their workforce. Skilled labor has a positive effect on the export propensity of firms. The more skilled workers, the greater export propensity of firms. This result is different from that stated Ramstetter (1999) who found that skilled

labor had a negative effect on the export propensity of firms in the manufacturing industry in Indonesia. These results support the result of Naully et al. (2020) that in 2015, firms in the processed food industry no longer rely on cheap labor. A skilled workforce is needed to produce quality products.

Apart from skilled labor, capital intensity also has a positive effect on the export propensity of firms. This research shows that the edible oil, vegetable and animal fats industry requires a lot of capital. The greater the capital a firm has, the greater its propensity to export. These results support the result of Naully et al. (2020), Kokko et al. (2001) and Athukorala et al. (1995). However, these results contradict the research of Amornkitvikai et al. (2012), Jongwanich & Kohpaiboon, (2008) and Ramstetter (1999) which show that capital intensity has a negative effect on export trends.

The productivity of the firm has a positive effect on the firm's export propensity. This is in line with the results of Naully et al. (2020). Firms that have high productivity will have low production costs. The company will have higher competitiveness, thereby increasing the company's tendency to export. This is because the more output is produced per input unit, the lower the cost required to produce one unit of output and eventually will lower the price. Low prices will increase product competitiveness. Thus, high productivity will increase the firm's export propensity.

Foreign ownership also affects the export propensity of firms. The results indicate that coefficients on D_{050} were not significant. It suggest that firms with foreign ownership share less than 50 percent have the same export propensity as domestic firms. This occurs because firms with minority foreign capital have the same goals as domestic firms, namely to meet domestic needs. For D_{5095} and D_{95100} were significant and greater than D_{050} . The export propensity is higher for firms with foreign ownweship greater than 50 percent. But, statistical tests show the foreign ownership coefficients on D_{5095} and D_{95100} was similar. Firms with 50-95 percent foreign capital have similar export propensity with foreign ownership greater than 95 percent. This result is different from previous research conducted by Ramstetter (1999) and Naully et al. (2020). Both concluded that the greater the foreign ownership in the firm, the higher the tendency for its exports to be. This difference can occur because companies with majority foreign ownership (> 50%) have an export orientation. In addition, there are no differences in technology, managerial know-how and distribution networks in firms with foreign ownership of 50-95 percent with those greater than 95 percent.

Table 4 shows the impact of foreign ownership share on the import propensity of firms in the industry. The import propensity of the industry is influenced by the industrial import propensity. Higher industrial imports make firms tend to import more. This research also proves that skilled labor, capital intensity and productivity, apart from having a positive effect on firm export, also have a positive effect on firm import. Therefore an increase in skilled labor, capital intensity and productivity will not only increase export but also import.

Table 4. The Impact of Foreign Ownership Shares on the Import Propensity in the Edible Oil Vegetable and Animal Fats Industry

	Coefficient	<i>p-value</i>
Constant	-1.728	0.000
$\log (M/R+1)_i$	40.815	0.000
$\log (ES/E+1)_{ij}$	0.499	0.000
$\log K/E_{ij}$	0.052	0.000
$\log PTV_{ij}$	0.018	0.093
D_{050}	-	
D_{5095}	-0.629	0.000
D_{95100}	0.203	0.000
Number of samples	372	
Likelihood function	-321.28	
H_0 : coefficient D_{050} = coefficient D_{5095}	-	
H_0 : coefficient D_{050} = coefficient D_{95100}	-	
H_0 : coefficient D_{5095} = coefficient D_{95100}	0.000	

The dummy variable coefficient shows that firms with foreign ownership share between 50 and 95 percent have a lower import propensity than domestic firms. However, if foreign ownership is greater than 95 percent, the import propensity is greater than domestic firms. This can occur because in firms with 50-95 percent foreign ownership, the power of domestic capital owners is still large so they can determine the decisions taken, one of which is related to raw materials. The raw materials used can be obtained from domestically through partnership programs. In contrast to firms that are almost wholly foreign owned, it is difficult for these firms to obtain information on domestic raw material sources. These firms prefer to import from its global network. These results support the research conducted by Naully et al. (2020) who conducted research on the food industry in Indonesia. In addition, in this industry many firms are vertically integrated especially in the palm oil industry.

The research above reveals that companies that have foreign capital in the edible oil, vegetable and animal fats industry tend to export and import. Companies with majority foreign ownership have a tendency to export, but there is no difference between companies with 50-95% foreign ownership and above 95%. The smallest import trend occurs in foreign companies with foreign ownership between 50-95 percent. Based on these results, the government should continue to restrict foreign ownership in the edible oil, vegetable and animal fats industry in Indonesia at the maximum of 95 percent. The effect of foreign ownership share is similar between more than 95 percent or less than 95 percent as long as the foreign ownership is still the majority. On the other hand, foreign ownership share more than 95 percent tend to increase import therefore limiting foreign ownership share to a maximum of 95 percent will reduce raw material import.

In addition, increasing capital will increase export propensity. This is the main reason for the government to keep trying to attract foreign investors which brings capital.

CONCLUSION

Firms with majority foreign ownership have export propensity, but there is no difference between firms with 50-95 percent foreign ownership and above 95 percent. The smallest import propensity occurs in foreign firms with foreign ownership between 50-95 percent. The government should continue to restrict foreign ownership in the edible oil, vegetable and animal fats industry in Indonesia. Limiting foreign ownership share to a maximum of 95 percent will increase export, on the other hand will decrease import. Efforts to increase exports to firms in the edible oil, vegetable and animal fats industry can be done by increasing capital, skilled labor and firm productivity through foreign direct investment.

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The Flip Side of Economic Growth – Predictions from Indonesia

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Abstract

Special attention in the future will emphasize patterns or studies that are relevant and new in highlighting sustainable economic growth. We seek to identify the role of factors outside of fiscal and monetary policy on economic growth in Indonesia, such as happiness, demographic pressures, labor force, and human development. For this purpose, the OLS method has presented time-series data (2015-2019). Prediction studies show that happiness, demographic pressures, and human development can increase economic growth in a significant direction. Another finding is that the labor force cannot significantly control economic growth, slowly decreasing growth with a negative slope. Practical contributions to developing countries can account for endogenous (internal) growth over the long term. The quality of human resources must prioritize productivity, income, and real welfare. The government needs to plan a policy framework oriented to the fiscal and monetary side.

Keywords:

Economic growth, labor, population, human resources, time-series, Indonesia

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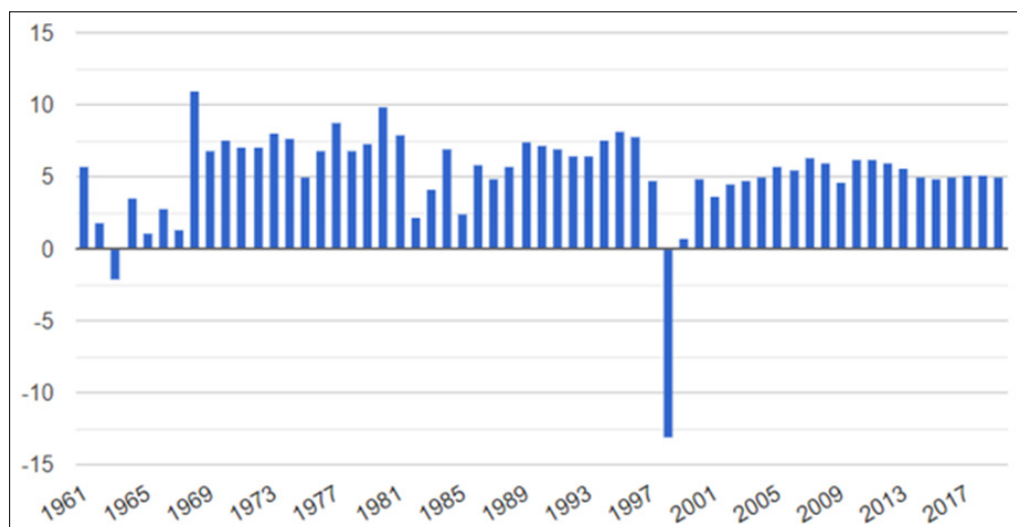
INTRODUCTION

Since the 20th century, there has been new empirical evidence with a comprehensive presentation of social science through the literature to provide new theoretical insights into the relationship between productivity, socio-economic development, and gender equality. In particular, the initiation and long-term pace of intensive socio-economic development and a significant determinant of productivity variation in developed countries with the slogan "gender equality" (Anderson & Kohler, 2015).

Some relevant literature has discussed the relationship between education and social realities, such as democracy, economic development, human development, happiness, and interaction (Zainurossalamia et al., 2021). However, only a few have investigated these social realities on the success of economic development. Empirically, the relationship between social reality and economic success is two-way. Many possibilities influence this democracy, health, education, and social happiness (Demirbolat, 2018).

In addition, there is much controversy over whether demand factors can affect the economic growth rate in the short run since wage contracts and asymmetric information can extend adjustments to long-run equilibrium. Apart from unanimity among economists on the role of the supply side, such as physical, human, and technological capital, to foster human development, to create economic growth and sustainable employment (Daud, 2017).

Figure 1. The rate of change of real GDP in Indonesia, 1991-2019



Source: The GE (2020)

This is supported by what we showed in Figure 1 economic growth from year to year (y-o-y) fluctuates. They recorded the highest GDP growth rate, reaching 10.92%. Meanwhile, the lowest growth occurred in 1998, which reached -13.13%. The Indonesian economic recession occurred because of the economic crisis, especially from 1997 to 1998. In comparison, the average economic growth at the global level in 2019 was 2.77%, so the average value of Indonesia's economic growth from 1961 to 2019 reached 5.60%

of 183 countries. This achievement explains that Indonesia's GDP growth is still on the world average, 2.60%. Several factors, including demographic pressures, the happiness index, the human development index, and the labor force, caused Indonesia's GDP growth difficulties.

Most demographers and economists agree that essential elements for improving one's standard of living include the existence of the industry, urbanization, improving the quality of health and education, and increasing opportunities for employment in the non-agrarian sector. Thus, all these factors lead to changes and perceptions of the human being towards the cost of living, determining the whole (Sinding, 2009).

Jones (2011) also expressed the revolution against this view, who connected the concept of development and population growth. These two dimensions will always be a topic of concern and give a particular part in debates as time changes. Since the 1960s, the most dramatic changes have been economic growth and population explosion in historical civilizations. These two relationships are very relevant and always interesting to discuss. On the one hand, exploring predictions about the employment and share of individuals globally also raises many conflicts (Wijaya et al., 2021). The world has entered a digital era where humans are always racing to develop the technology. This did not occur, and statistics cannot prove this congruence. With the rapid presence of technology, it should help people's work.

However, expectations and reality are very contradictory, so it reduces the number of jobs and affects the transformation of the workforce. It has integrated the progress in the development of information technology with all economic sectors (Wiedmann et al., 2020). At least, there is a reduction in some employment in specific sectors through the intensity of the increasing demand for labor in other sectors, such as services, finance, administration, banking, and government (Stryzhak, 2020). This study tries to see the determination of happiness, demographic pressure, labor force, and human development on performing economic growth in Indonesia during the last five periods.

According to Raisová & Ďurčová (2014), Malthus's model of per capita income is an essential part of measuring the welfare of the people of a country. Regarding economic growth, when per capita income exceeds the equilibrium level, we expect that productivity will increase and vice versa, the poverty rate suppressed. However, this model does not support case studies in some developing countries from the last ten decades.

Yiew & Lau (2018) also shared the understanding of economic growth theory to discuss the congruent problem, which was pioneered by two stages in neoclassical theory. The explanation for the "Solow model" in the first stage is that even though population increases can affect exogenously stable economic growth. From the second stage, economic development in the economic growth model affects the birth rate, so productivity predominantly affects endogenous factors in the economic system (Karra et al., 2017).

Using the word "happy" is a term of evaluation in equating perception. Sometimes, from this understanding, the assumption about people having a happy life is almost

the same as the perception that they have a prosperous life to fulfill their daily needs (physical and non-physical). In this way, the level of happiness is that people live well tautologically, meaning that it is only a measure of a decent life. Jency (2019) confirmed three basic views on measures of happiness, but only two have received significant attention in the philosophical literature. They defined happiness as "experience" as a whole and in part in life done with pleasure as an object to interpret it. Something closely related to family relations, so their treatment determines whether they are comfortable in the bond. Hedonism viewpoints can reduce the balance value in happiness because pleasure and displeasure are subject to nature (Conger et al., 2010).

There are currently demographic dynamics in developing countries because of population explosion and the availability of relatively adequate food. In facing the demographic bonus in the coming decades, the proportion of productive age population to the demand for work will increase (Hatton & Williamson, 2003). For case studies in most countries that are members of the Organization for Economic Co-operation and Development (OECD), pensions in the public sector and health care are both very universal. It entitles only a tiny proportion of older adults entitled to protection against health care costs and social security (Bovenberg, 2008). These two factors imply a lower state fiscal burden in the future. There is a "ceteris paribus," which raises the potential to offer "growth dividends" from several countries to their residents.

The level of labor force participation, commonly known as the term "labor force," refers to individuals economically actively working in specific economic sectors (Doğan & Akyüz, 2017). The number of workers includes those who have taken part in the labor market and do not work or take care of households but are looking for work. People who can work enter the labor force so that from the population that is not actively working. Polkowska (2019) and Pulignano (2019) state that those who do not work are not necessarily without income because this excludes people who work in the informal sector, wives who take care of the household, children, parents, people with disabilities, and residents of institutions.

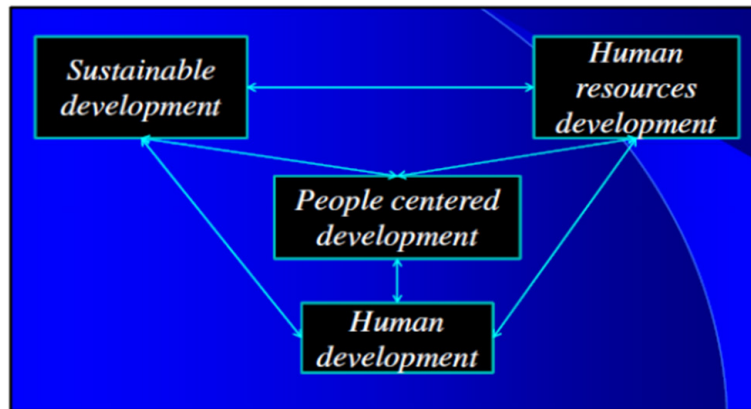
Although the characterization in applied economic analysis takes place, in theory, the particular search for labor is precise to be discussed and plays a role in determining a policy. Seeking to review performance, the theoretical structure centers on labor market analysis. A particular population determines labor force participants in a country, so this illustrates that the resulting goods and services can reduce the frequency of unemployment (Doğan & Akyüz, 2017).

Wijayanti & Darma (2019), Nafukho et al. (2004), and Capuzzi et al. (2016) view that problems in human resource civilization have caused adverse effects because of development, so the concept of sustainable development is needed. By world experts, this requires a perspective to analyze and evaluate the current condition of human resources. When the productivity of human resources increases, it will make life on earth better.

Human development must be in line with an educated population which includes four interrelated concepts, i.e., People-Centered Development (PCD), Human

Development, Human Resource Development (HRD), and Sustainable Development. The synergy of these four concepts can link the output to the Population-Oriented Development Index (PODI). In his measurement, Jalal (2014) uses five dimensions: sustainability, participation, equality, siding with the poor, and integration (see Figure 2).

Figure 2. Relationships in the concept of development



Source: Jalal (2014).

A theory is simply an explanation or interpretation of a set of phenomena. However, this has not been tested with certainty, but can be extensively, well supported, and accepted as an accurate description by the scientific community worldwide (Gänswein, 2011; UNDP, 2014; Dasic et al., 2020). In order to develop some hypotheses in this article, we need to present some opinions and confirm the previous empirical findings so that it can build the hypothesis.

This study is very appropriate to be reviewed and become the focus because it considers the novelty aspect. Empirical reviews and supporting theories have created a happiness gap in Indonesia because of the spatial impact caused by considerable demographic pressures. The effect that arises is the lack of a labor force that can trigger unemployment and increase poverty (Mubarak, 2020). Unproductive labor market competition also has a fatal impact on welfare, marked by an inadequate minimum wage. The consequences for improving HD are hampered, and the eventual results in socio-economic development will also be uneven.

METHODS

In this work, we collect data based on secondary data from The Global Economy report for Indonesia. Under the study objectives, the data referred to are happiness, demographic pressures, labor force, human development, and economic growth for five periods (2015-2019).

The objectivity of our study is decisive in Indonesia because this country very much depends on the primary sector (agriculture), but there is a degradation of human development and demographic pressures. With the quality of human development

declining in parts of Eastern Europe because of reduced birth rates of those busy working and losing their “productive age,” demographic pressure is widening. Productivity in human development declines, and high demographic pressure will affect the level of one's happiness, resulting in a decrease in productivity at work, leading to a recession in economic growth (Iosif, 2014; Duguleană, 2011).

The study approach is carried out quantitatively because it focuses on empirical models and the data summarized in time series for five periods. Some researchers consider the quantitative approach a “symbol of the scientific approach” because they explore it in depth through specific models or analysis tools (Quick & Hall, 2015). Broadly, this study can summarize the effect of happiness, demographic pressures, labor force, and human development on economic growth in Indonesia.

To answer each of the hypotheses we have designed, the econometric method, in this case, is the Ordinary Least Square (OLS). This estimation method is most commonly used when applied to regular regression because it can display many desired properties. In addition, OLS is a statistical model to determine the relationship between certain variables. This analysis has broad coverage and is applied in most fields of science (Mahaboob et al., 2018). In a linear relationship between the dependent variable and the independent variable it can form a linear mathematical model with the following conditions:

$$Y_i = \beta_0 + \beta_1 X_i + \varepsilon_i, i = 1, 2, \dots, n \quad (1)$$

Where: Y (dependent variable), β (coefficients), X (independent variable), ε (error term), i (parameter), n (observations). The model to be used in operation is:

$$EG_t = \alpha_0 + \alpha_1 H_t + \alpha_2 DP_t + \alpha_3 LF_t + \alpha_4 HD_t + \varepsilon_t \quad (2)$$

Where: EG (economic growth), α (constant), H (happiness), DP (demographic pressures), LF (labor force), HD (human development), t (time series), and ε (error term). To facilitate data analysis, we processed it with the Statistical Package for the Social Sciences (SPSS) software version 25. The program will present descriptive statistics, Person Correlation, correlation coefficient and coefficient of determination, and partial test stages.

RESULTS AND DISCUSSION

Kaur et al. (2018) inform that descriptive statistics summarize data in a measured manner by describing the relationship between variables in an observation. Researchers need to take this step before making inferential statistical comparisons because descriptive statistics are the first part. The overall variables in this study are the ratio (percentage) of fundamental indicators in achieving economic development in Indonesia with a measure of frequency.

The second step is the achievement of the Pearson correlation, where the value in the correlation is related to the relationship between the independent and dependent variables. According to Ratnasari et al. (2016), Pearson correlation is a type of correlation coefficient that explains the relationship between two variables as measured by the similarity of the

ratio scale. In addition, this value also shows the strength of the relationship between two continuous variables.

Table 1. Value of descriptive statistics (obs. 25)

Variables	Mean	Std. deviation
Economic growth	4.8600	1.30681
Happiness	5.8980	.23616
Demographic pressures	3.1600	.42778
Labor force	54.5760	.53854
Human development	.8086	.00623

Source: Author's tabulation.

Given that the size of each variable is different, it cannot be uniform. The achievement in descriptive statistics determines the various mean values of the five variables. Table 1 explains that the highest mean for the labor force for five periods is 54.5760 and the lowest in human development, namely 0.8086. From other calculations, economic growth is precisely the variable with the highest standard deviation reaching 1.30681.

There are three variables with negative values determining demographic pressures (happiness, labor force, and human development). Only one positive variable shapes demographic pressures, namely economic growth reaching 3.9%. Meanwhile, the most dominant performance of the Pearson correlation is from economic growth with the variables that influence it, where the four variables, only human development, has the lowest correlation up to -0.9% and the highest in shaping economic growth is the labor force amounted to 30.7%.

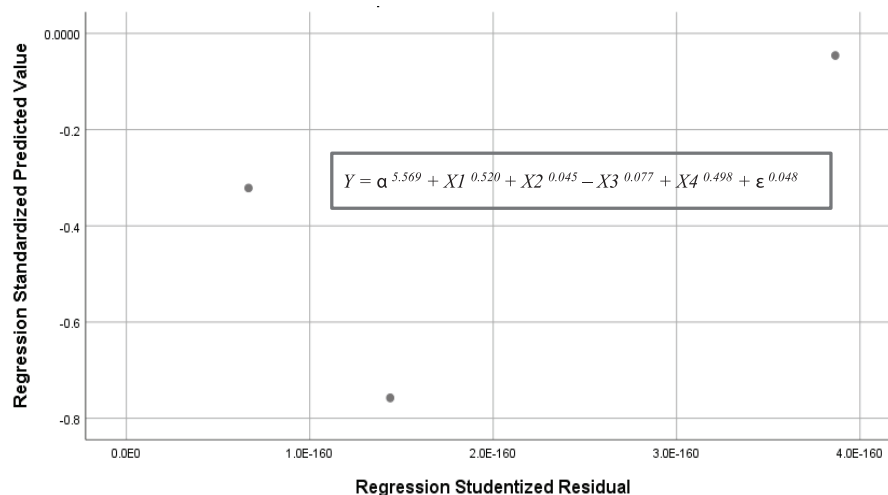
Table 2. Value of Pearson correlation and sig. (1-tailed)

Component	Variables	[1]	[2]	[3]	[4]	[5]
Pearson correlation	Economic growth	1.000	.195	.039	.307	-.009
	Happiness	.195	1.000	-.951	.463	.975
	Demographic pressures	.039	-.951	1.000	-.463	-.993
	Labor force	.307	.463	-.463	1.000	.429
	Human development	-.009	.975	-.993	.429	1.000
Sig. (1-tailed)	Economic growth	.	.377	.475	.307	.494
	Happiness	.377	.	.006	.216	.002
	Demographic pressures	.475	.006	.	.216	.000
	Labor force	.307	.216	.216	.	.235
	Human development	.494	.002	.000	.235	.

Source: Author's tabulation.

Table 2 also reflects the one-way probability that highlights the relationship between economic growth, happiness, demographic pressures, labor force, and human development. Here, it can see if there are no variables that are significantly consistent with their relationship to other variables. None of the variables significantly impact economic growth and the labor force. However, two variables each have a significant effect on happiness, demographic pressures, and human development. Please note that we use a probability level of 5% to measure a one-way relationship.

Figure 3. Scatter plot of the dependent variable



Source: Author's tabulation.

Figure 3 reports that a scatter diagram (distribution) shows the correlation between pairs of two kinds of variables and presents the closeness of the relationship between the two variables, which is often expressed as a correlation coefficient. The scatter plot function can also assess whether a variable replaces other variables (Ilmi et al., 2020). Here, there is a positive correlation, and it means that the combination of four variables (happiness, demographic pressures, labor force, and human development) can determine economic growth in Indonesia so that economic growth to be controlled.

Regression analysis is linear, so the dependent variable's increase must follow the proportional increase in the independent variable. It does not meet the linearity test, and it can carry data transformation out using quadratic, exponential, or other models that match the non-linear relationship pattern. We can use the correlation coefficient and determination in various statistical calculations. In OLS, the independent variable gives rise to the dependent variable.

The relationship between variables is linear, where changes constantly follow changes in the independent variable in the dependent variable—the coefficient of determination results from the square of the correlation coefficient. The calculation of the correlation coefficient and the coefficient of determination have a similar function, namely calculating the strength or absence of the relationship between two variables (Suparjo et al., 2021).

Interpretation for the correlation coefficient, the relationship between variables between 0 (very weak) to 1 (very strong), while the measure in the coefficient of determination can also determine the value of the residual factor.

Table 3. Model summary

Model	R	R Square	Adjusted R Square	Std. error of the Estimate	R Square Change	Durbin-Watson
1	.976	.952	.939	.15128	.952	2.289

Source: Author's tabulation.

Meanwhile, the regression structure proves that the correlation value (R) is 97.6%, meaning that the variables' closeness is extreme because it is almost close to 100%. The quadratic correlation (R^2) reached 95.2%, illustrating the value of confounding factors of 4.8% outside the study model. Based on Table 3, the Durbin-Watson (DW) value describes a test used to detect the occurrence of autocorrelation on prediction errors from a regression analysis, so the condition is that there is negative autocorrelation or is free from autocorrelation problems.

We need to describe the alignment between the study hypothesis and partial testing at this stage. The absolute requirement is whether the hypothesis is accepted or rejected based on statistical criteria in OLS. Table 4 describes the extent of the influence of the independent variable on the dependent variable. Constantly, the involvement of happiness, demographic pressures, labor force, and human development to predict economic growth in Indonesia is positive. If divided based on the relationship of each variable, only the labor force has a negative and insignificant effect on economic growth. This means that an increase in the labor force of 1% will reduce economic growth by 7.7% in the long run. Other analysis results confirm the positive and significant relationship between happiness, demographic pressures, and human development on economic growth. The continuity of these three variables implies that it can still consistently determine the increase in economic growth in the future. The most dominant variable for the sustainability of economic growth is demographic pressures because the probability is the smallest compared to the others.

Table 4. Estimates of regression

Hypothesis	Coeff.	SE	t-Statistic	Prob.	Tolerance	Accepted	Rank
(Constant)	1.389	1.750	1.023	.030			
H1	.520	.133	1.185	.045	.012	Yes	3
H2	.045	.102	.179	.016	.035	Yes	1
H3	-.077	.081	-.352	.252	.014	No	4
H4	.498	.278	1.214	.038	.048	Yes	2

Source: Author's tabulation, Note: Dependent variable (economic growth)*.

Our results show that most of the hypotheses are acceptable (H1, H2, and H4). For the rest, one hypothesis is rejected (H4). It should be noted that this article has answered the differences between some of the literature and previous studies. The major problem with the increase in economic growth is that there are increasingly actual differences between the poor and the rich, causing inequality in income from a country and even globally. Initially, when the leading economies (Adam Smith) first laid the foundations in economic theory, the income gap between the poor and the rich was narrower (Acemoglu & Dell, 2010). After that, when the industrial revolution was present in developing countries to reduce poverty, disparities widened, and the experience of countries classified as advanced was the opposite. Initially, several countries in the Asian region, such as South Korea, Singapore, and Japan, which were classified as developing countries, could economically develop the level of welfare of their population compared to other countries. This is more similar to what developed countries do through export expansion through increasing production capacity for goods and services (Soyer et al., 2020; Stefan, 2012).

Since 2010, observers and economists have been researching happiness, providing empirical knowledge of the mechanisms of happiness, and creating a model that looks at the processes that make people happy. The public has accepted the work's success because it contributes substantially to describing one's happiness and well-being. With the emergence of positive psychology, there has also been an increase in interest from the positive side in paying attention to positive things because of human involvement in economic activities, organizational life, affective experiences in the world of work, and their satisfaction with work (Furnham & Cheng, 2000; Haybron, 2003).

Explicitly, the demographic transition begins in the 21st century and is alleged amidst remarkable differences. Infant mortality rates have dropped sharply, with adult life expectancy also increasing. Although the fertility rate declined significantly from the 20th century in developed countries, it has penetrated developing countries. The existence of this demographic change in industrialized countries (such as China, the USA, and Japan) has sharp consequences in influencing the population's age structure, resulting in a reduction in the number of young (productive) people in adults. This transition has continued today. Developed countries will experience severe population decline in the coming decades. As a result, because most of the population postpone the "marriage period" and "desire to have children," the fertility rate will decrease, and the dependence of the elderly will increase significantly. This comparison ratio will also occur in developing countries (Lee, 2003; Bello-Ochende et al., 2010).

Variations will arise in the supply of labor in specific sectors. Case studies in many countries show that the supply of labor is closely related to the dynamics of the business cycle, which shows that the labor market is in a "perfect competition" point with the supply of labor that is tight so that the unemployment rate also increases drastically (Darma et al., 2020). The explanation for this phenomenon is prevalent because, during the economic recession, workers give up and become desperate to find work. Economists view these problems because of their meager chances of finding a job, so the psychological

and monetary costs of finding utility are much lower when compared to the labor force consequences. The policy that can pursue is through workers' wages, which are determined based on rates or turnover in the business cycle.

The highlighting of the importance of absolute value over ranking in dealing with the dimensions and indicators of HDI has become a concern with this issue. This is because countries are competing to display HDI rankings compared to solving genuine problems such as quality of education, quality of health, and connectivity of income distribution so as not to experience a significant gap. For this reason, the government needs to make efforts to design and practice development priority programs (Panigrahi & Sivramkrishna, 2002; Morse, 2003; Osberg & Sharpe, 2003; Cherchye et al., 2004; Segura & Moya, 2009).

Figure 4. Demographic pressures and labor market: young age v.s old age



Source: Peeters & Groot (2012), Note: Labor market (%) and demographic pressures (% of GDP)".

Studies of pure demographic pressures, labor force, and economic development have been reviewed in recent decades. We expect something new about the process to increase employment and economic growth. The period of transition from demographic pressures affects the population's lives (for example, the environment in which they live). The decline in fertility is the beginning of social development factors in specific periods (Fox et al., 2018). Many deaths have created new problems for labor productivity (Rizal & Fitrianto, 2021).

Figure 4 highlights the dynamic perspective between demographic pressures and the labor space for the 2008-2020 period. Interestingly, it centered most countries in the middle of going through a slight increase in the combination of a relatively high

variation in the labor space, although case studies in several countries appear to have seen a sizeable increase as for the average demographic pressure of total GDP from 2010 to 2020 at 8%. However, the limited set is heterogeneous for several countries preparing to face a decline in fiscal spending. This phenomenon also describes changes in demographic pressures versus the labor market space. Thus, a summary of these figures provides graphical information on the ranking of countries. They measured their performance by indicators of demographic pressure that have a direct two-way relationship with economic growth. The lack of seriousness of poor and developing countries in determining direction through instruments that are less synergistic with the provision of employment can also lead to new problems such as reduced labor happiness and fatal consequences for not achieving sustainable human development.

The highlight of this study, with the empirical results conducted by previous researchers, is essential for comparison. First, the relationship between economic growth and levels of well-being as measured by happiness over time is like this study. Stevenson & Wolfers (2008) and Clark et al. (2008) found that total income contributed to the level of happiness. Second, the results of studies by Nuță & Nuță (2020) and Fent el. (2008) found that demographic factors contribute to economic growth in parts of Europe, which has been contradicting our study's outcome. Third, Altuzarra et al. (2019) and Herman (2011) found that increasing female labor force participation can improve conditions for economic growth in several EU countries. The existence of a "U" shaped relationship between economic development and the female workforce confirms that the study hypothesis is in line with this. Only economic growth will guarantee new jobs generate human development and conditions for inclusive economic growth. Fourth, this work displays the human development represented by HDI in positive synergy for economic growth. The results are also in line with the study by Leiwakabessy & Amaluddin (2020), which reveals a strong two-way relationship between development and economic growth in Indonesia. As additional information, Ali & Cantner (2020) found empirical evidence of a positive level of welfare capable of significant human development for 20 European countries in 1996-2010.

It is also no less interesting to see the happiness of a person. Residents who live in an area can feel comfortable and, it is a sign that they will create harmonious conditions. The family environment is not the only aspect that plays a vital role in the population, but social relations, culture, health, education, work, and household income (Li, 2016). The presence of the government can accommodate these aspects to create security so that they can carry out activities as usual. We can imagine, in conflict-prone countries like Africa and the Middle East, it is very worrying for those who live there. This tense situation has a terrible impact on running the economy from the labor side and getting a decent life.

CONCLUSION

From the calculations using OLS analysis, we can conclude that happiness, demographic pressures, and human development have significantly affected Indonesian

economic growth in the last five periods, while the labor force did not have a significant effect. To rank, demographic pressure is the primary variable that can determine the dominant economic growth, so demographic pressure comes first. The performance of human development and happiness only leads to the second and third ranks. Happiness and human development also play an essential role in increasing economic growth, even though the relationship is not that big compared to demographic pressures.

Reduced per capita income can become an additional problem for the social disparity. Inclusive economic growth is a space where they can carry out the economic process itself. Whether it is in terms of production, distribution, and sustainable consumption of the population, all of them become the benchmarks of every country. Some issues remain open regarding the essential questions in this article to encourage future research. Overall, we recognize that there is still a lack of conformity with the study objectives. With these limitations, we hope it can provide something more varied to develop according to the topic being studied.

Policy recommendations need to be implemented by the government, which has a role as regulator, allocator, stabilizer, and distributor to revitalize several technical policies related to social mobility, education, health, and market structure to provide suitable public needs.

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The Relationship between Air Pollution, Economic Growth, and Life Expectancy: Empirical Evidence from Indonesia

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Abstract

This study investigates the relationship between air pollution, economic growth, and life expectancy in Indonesia. The observation period during 1985-2019 used time-series data obtained from the World Bank. Quantitative approach by applying two main models, namely the autoregressive distributed lag (ARDL) model by considering the effect of time-lapse and Granger causality with vector error correction method. Research findings prove that air pollution has a negative effect on life expectancy in the long run. Economic growth has a positive effect on life expectancy. In the short run, the current life expectancy is positively influenced by the life expectancy of the previous period. Air pollution has a negative effect on life expectancy, and economic growth has a negative effect on life expectancy. Another finding in the Granger causality model is a two-way relationship between air pollution and life expectancy. Other evidence exists of a two-way relationship between economic growth and air pollution. In addition, evidence of a unidirectional relationship of economic growth with life expectancy in the short run. The cointegration equation shows evidence of a long-run relationship between air pollution, economic growth, and life expectancy.

Keywords:

Air pollution, Causality, Economic growth, Life expectancy, ARDL

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INTRODUCTION

The relationship between air pollution and human health is still an exciting topic debated by experts. Air pollution due to greenhouse gas (GHG) emissions is still a significant problem in several regions of the world, including Indonesia, because it is possible to hinder sustainable development (Olivier et al., 2016). The significant increase in the effect of greenhouse gases that have been felt during the last decade has caused global warming, so this is a concern for various parties in the world because it is considered to be a threat to human life in the future (De Sherbinin et al., 2007; Fauzi, 2017; Harris et al., 2017). The concern of many parties in the world is also getting more significant for the environment, such as the Paris Agreement on the policy framework in suppressing the occurrence of climate change by reducing pollution emissions. This effort was initiated by the United Nations Framework Convention on Climate Change (UNFCCC). The treaty was ratified by 147 countries and entered into force in 2016.

Indications of global warming can be felt from the increase in the earth's average temperature due to the induction of GHG effects in the atmosphere, mainly caused by human activities (Fauzi, 2017; Misra, 2014; Patz et al., 2003). In addition to global warming, other possible effects of increased greenhouse gases could include increased acid rain and smog-filled cities, all of which can have harmful effects on human health. (Manisalidis et al., 2020; Perrino et al., 2020). However, it can also be said that countries produce a large amount of greenhouse gas emissions due to industrialization and large energy consumption, which encourages economic growth as most individuals will spend more on social security and health care which may have a negative effect. Desirable on each individual's health (Anil Cabraal et al., 2005; Kaygusuz, 2007). Although greenhouse gas emissions harm the biosphere and human health, they can also accelerate economic growth, allowing individuals to spend their money on health care. (Parrique et al., 2019). On the other hand, improving air quality can positively impact health and promote economic growth (Jiang et al., 2020; Selden & Song, 1994, 1995). Increasing healthy lifestyles and caring for the environment will benefit air quality and encourage economic growth (Mansor & Harun, 2014; Schraufnagel et al., 2019; Selden & Song, 1994).

This study refers to several recent studies on the relationship between economic growth, pollution, and life expectancy conducted by Ebenstein et al. (2015), Kunze (2014), and Jiang et al. (2020) found that there is a strong positive relationship between GDP and life expectancy. A doubling of income is expected to increase life expectancy, but in the absence of policy innovation, the relationship between the two is an inverted U-shape. Studies conducted by Sharma (2018) and Biyase & Maleka (2019) found that life expectancy, democracy, and the population had the expected positive impact on economic growth. The study by Cervellati & Sunde (2011); Rjoub et al. (2021); Ngangue & Manfred (2015), and He & Li (2019) found a positive movement between life expectancy and economic growth in a study in several developed and developing countries (Bashir et al., 2019). The results are robust to address the possible reverse causality between life expectancy and economic growth.

Additionally, related studies on the relationship between life expectancy and pollution have been carried out by Mariani et al. (2010); Agbanike et al. (2019); Kelly (2017); and Lelieveld et al. (2020) found that there is a positive correlation between life expectancy and environmental quality, both in the long-run and along the transition path. These results are consistent with life expectancy and environmental performance measures. In contrast, the impact of air pollution on life expectancy is negative and more robust in the long run. The available study on this topic is relatively limited because previous population-based studies have been based on the relationship between air pollution, population size, and income (Bashir et al., 2021; Biyase & Maleka, 2019; Carson et al., 1997; Ghanem, 2018; Jiang et al., 2020; Okunade & Osmani, 2020). Additionally, studies on the topic of the relationship between air pollution and relative mortality rates can also be found Cesur et al. (2017) and Dholakia et al. (2014). Analysis of mortality data requires a time series model to account for daily variations in pollution and the number of deaths. However, the use of time series models for this type of data is that the results can be biased from factors such as temperature and influenza epidemics, which are prone to variation over short periods (Goenka et al., 2012). Consequently, more recent studies have analyzed the relationship between air pollution and life expectancy as a measure of overall public health, as annual comparisons aggregate life expectancy.

This study focuses on the causal effects of air pollution, health, and spatial economic growth in Indonesia. This country has the largest archipelagic country globally and covers an area of almost 2 million square kilometers and in 2018 had a population of around 267 million. In 2019 it was ranked the 6th most polluted country out of 98 competitors worldwide. The average Air Quality Index (AQI) in 2019 was 141 with a PM_{2.5} level or has reached five times the exposure recommendation of the World Health Organization (WHO). The source of air pollution in Indonesia comes from forest fires. During October 2015, nearly 5,000 fires co-occurred in forests and peatlands. In just one day, about 80 million metric tons of carbon dioxide (CO₂) are generated, or five times more than the United States economy as a whole. The remaining pollution generated by the transportation sector, energy production by industry, and emissions from coal-fired power plants is increasing rapidly on the west side of the island of Java, intending to meet increasing public demand.

The relationship between air quality, life expectancy, and economic growth is still exciting to debate. The findings of this study are expected to provide essential insights and discussion material for policymakers about mitigating the impact of air on health and vice versa its benefits on economic growth. Additionally, the available studies on this topic are still relatively limited, especially in some developing countries such as Indonesia. Therefore, this study will examine the relationship between air quality as an indicator of greenhouse gas emissions, life expectancy as an indicator of the average number of years the population can live (human health), and economic growth as an indicator of increasing income per capita. Pollution is one of the problems faced by several regions in the world and has not been handled in Indonesia. The speed of decline in air quality

in several big cities in Indonesia has been seen in the last few decades, as evidenced by the monitoring data on particle parameters (PM10, PM2.5) and oxidant/ozone (O3), which tend to increase. Improvements in infrastructure such as roads also encourage transportation equipment to increase and increase the population.

A healthy lifestyle reflects concern for the environment, and if humans maintain health in their lifestyle, it also means maintaining the environment and the cleanliness of the air around them. A healthy lifestyle and pristine air quality will benefit the economy because each individual will produce goods and services or work for life. Therefore, there are two studies formulated in this study, namely: (1) how to empirically prove the effect of life expectancy as a proxy for health indicators and economic growth as a proxy for increasing per capita income on air quality in Indonesia both in the short and long-run; and (2) what are the results of proving the relationship between air quality, life expectancy, and economic growth in Indonesia, both in the short and long-run.

METHODS

The scope of this research is to look specifically at the short-run and long-run effects of increasing air pollution and growth on health. In addition, this study also looks at the empirical relationship between investigating relationship between air pollution, economic growth, and life expectancy. The data used in this study is time-series data with an observation period of 1985-2019. In addition, this study also uses secondary data obtained from the World Bank. Air pollution data is proxied from CO₂ emissions, life expectancy is proxied from the average age of the population in years, and economic growth is proxied from GDP per capita in US dollars.

Table 1. Data and Source

Variable	Descriptions	Unit measurement	Source
CO ₂	Air pollution (CO ₂ emissions)	Kiloton per capita	World Bank
GDP	Real GDP per capita	US\$, constant 2010	World Bank
LE	Life expectancy	Year	World Bank

The operational definitions of the variables used in this study are:

- (1) Air pollution (CO₂) is a condition of the concentration level of pollutants contained in the air. Air pollutants that significantly affect human life are proxied from carbon dioxide emissions (CO₂ emission) data.
- (2) Life expectancy (LE) estimates the average length of life of a population with the assumption that there is no change in the pattern of mortality (death) according to age in an area over a certain period. The indicator is a measure of the population's ability to survive longer. Life expectancy is strongly influenced by physical health, income, and environmental security.

- (3) Economic growth (GDP) is a condition in which there is an increase in the production of goods and services, followed by an increase in people's income in an area proxied from real GDP per capita in a certain period.

Model Specification

This study uses a quantitative approach by applying two main models: the autoregressive distributed lag (ARDL) model and the vector error correction causality model (VECM). However, before applying the model, a statistical testing stage is required. This is done to apply the two models above to produce valid estimates. To get good estimation results, several stages of statistical testing are needed. The testing stages are: (1) unit root test (stationary) to ensure that the data used has a stable trend; (2) the selection of the optimum lag criteria to give meaning to the dynamics of the variables in the model equation; (3) cointegration test to see the long-run equilibrium relationship between independent variables which, although individually, are not stationary; (4) normal test to see whether the residual variable generated by the regression model has a normal distribution or not with the Jarque-Bera test (JB-test); (5) multicollinearity test to ensure that there is no perfect or definite linear relationship; (6) autocorrelation test to ensure that the estimated residual variance is not too low from the actual; and (7) heteroscedasticity test to ensure that the variance of the residual term is unstable in each observation.

The Auto-regressive Distributed Lag Model

The autoregressive distributed lag model is one of the econometric approaches involving time-series data. If the regression model includes variable values that explain the current endogenous variables and past values (lagged), the model formed is called a distributed lagged model. -lag-model). In addition, the ARDL model is also formed by entering one or more past values (lagged) from exogenous variables to explain endogenous variables. The model formed is called the autoregressive (AR) model. In economics, the dependence of an endogenous variable on an exogenous variable is rarely instantaneous. Exogenous variables often react to endogenous variables with a time interval (lagged). The equations for the autoregressive distributed lag model that will measure the alleged effects of short-run adjustments towards a long-run balance of life expectancy and economic growth on air quality in each region in Indonesia are generally presented as follows:

$$\Delta \ln LE_t = \alpha_0 + \sum \alpha_1 \Delta \ln LE_t + \sum \alpha_2 \Delta \ln GDP_t + \sum \alpha_3 \Delta \ln CO2_t + \alpha_4 \Delta \ln LE_{t-1} + \alpha_5 \Delta \ln GRDP_{t-1} + \alpha_6 \Delta \ln CO2_{t-1} + \alpha_7 \Delta ECM_{t-1} + \varepsilon_t \quad (1)$$

Where: $\ln CO_2$ is air pollution (CO_2 emissions in kilotons per capita); $\ln LE$ is life expectancy (years); $\ln GDP$ is economic growth (real GDP per capita in dollars, constant, 2010); t is the time series (period 1985-2019); α_0 is intercept; $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6$ is the parameter coefficient of each exogenous variable and ε_t is residual.

The Vector Error Correction Model Granger Causality

A method for building a model of causality between economic variables in a non-structural manner. The methods are vector autoregressive (VAR) and vector error correction models (VEC). The VAR model was created based on the statistical properties of the data. In the VAR model, each endogenous variable in the system is considered a lagged value of all endogenous variables; thus, an autoregressive model in a univariate system is generalized to a "vector" autoregressive model consisting of a "vector" autoregressive model of time series variables in a multivariate system.

Engle & Granger (1987) combines cointegration and error correction models to establish a vector error correction model. According to him, the VEC model is more valid in measuring the level of relationship between cointegrated variables. This means that as long as there is a cointegration relationship between variables, the vector error correction model can be derived from the autoregressive distributed lag model. Each equation in the VAR model is an autoregressive distributed lag model. Thus, the VEC model is a VAR model with cointegration constraints. Since there is a cointegration relationship in the VEC model, when there are many short-run dynamic fluctuations, VEC expression can limit the long-run behavior of the endogenous variables and become convergent with their cointegration relationship (Zou et al., 2018, 2020). The equations of the causality model for vector fatigue correction in the study are presented as follows:

$$\Delta \ln LE_t = \alpha_0 + \sum \alpha_1 \Delta \ln LE_{t-i} + \sum \alpha_2 \Delta \ln GDP_{t-i} + \sum \alpha_3 \Delta \ln CO2_{t-i} + \alpha_4 ECT_{t-1} + \varepsilon_{2t} \quad (2)$$

$$\Delta \ln CO2_t = \alpha_0 + \sum \alpha_1 \Delta \ln LE_{t-i} + \sum \alpha_2 \Delta \ln GDP_{t-i} + \sum \alpha_3 \Delta \ln CO2_{t-i} + \alpha_4 ECT_{t-1} + \varepsilon_{1,t} \quad (3)$$

$$\Delta \ln GDP_t = \alpha_0 + \sum \alpha_1 \Delta \ln LE_{t-i} + \sum \alpha_2 \Delta \ln GDP_{t-i} + \sum \alpha_3 \Delta \ln CO2_{t-i} + \alpha_4 ECT_{t-1} + \varepsilon_{3t} \quad (4)$$

Where: $\ln CO2$ is air pollution (CO_2 emissions in kilotons per capita); $\ln LE$ is life expectancy (years); $\ln GDP$ is economic growth (real GDP per capita in dollars, constant, 2010); t is the time series (period 1985-2019); α_0 is intercept; $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6$ is the parameter coefficient of each exogenous variable and ε_t is residual; ECT_{t-1} is the vector error correction coefficient (short-run adjustment towards long-run equilibrium); ε_t is residual.

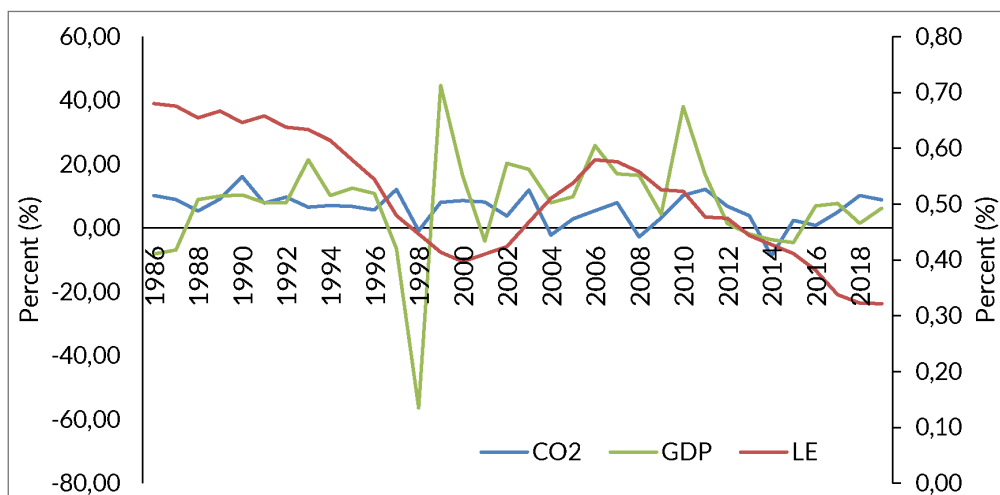
RESULT AND DISCUSSION

The development of carbon dioxide emissions in Indonesia currently shows a fluctuating trend, carbon dioxide emissions produced by Indonesia in 2019 have reached 632 million tons. This number increased from the previous year of 581 million tons or grew by 8.85 percent. During the 1985-2019 growth in carbon dioxide emissions increased by 6.09 percent. This increase in carbon dioxide emissions is also in line with

the economic growth rate in Indonesia, which is 6.31 percent during the same period. Most of Indonesia's carbon dioxide emissions come from illegal or licensed logging and peat forest fires that always occur during the dry season (Santika et al., 2017). In addition, carbon dioxide emissions are also produced from burning fossil fuels for energy in the industrial, manufacturing, and transportation sectors, which can also directly encourage the growth of other economic sectors.

Life expectancy in Indonesia during 1985-2019 shows a fluctuating trend throughout the year (Figure 1). During the study period, growth in life expectancy reached 0.51 percent, with an average of 66.39 years. It is undeniable that public health in Indonesia still needs serious attention. The slowing growth in life expectancy is caused by high air pollution. Meanwhile, per capita income growth in 2019 was US\$ 4,136, and this figure increased from the previous year of 6.21 percent.

Figure 1. Trends in CO₂ Emissions, Life Expectancy, and Economic Growth



The development of economic growth seen from per capita income (purchasing power parity) from 1985 to 2019 showed a fluctuating trend. The growth of income per capita during the study period was 6.31 percent. The main factor driving Indonesia's economic growth is domestic demand, especially household consumption, investment, and government consumption. However, during the last five years, Indonesia's economic growth has slowed. This is related to the relatively limited export performance in line with the trend of weakening world trade due to increasing pressure originating from external turmoil.

Table 2 reports the statistical description of research data for each variable, according to the results of the descriptive statistics implying that the variables' central tendency is relatively good. The standard deviation results show a relatively small value, implying that the standard deviation or dispersion is still relatively average. Meanwhile, the skewness value indicates that the size of the data used in the distribution of values is symmetrical, then the kurtosis value indicates that the degree of tailedness is lower

than 3, so the data in this study is platykurtic. The results of the Jarque-Bera test also show that the data in the study are relatively normally distributed. The observation period is 35 years.

Table 2. Descriptive Statistics

Descriptive	lnLE	lnCO ₂	lnGDP
Mean	4.194	5.599	7.169
Median	4.194	5.710	6.971
Maximum	4.273	6.449	8.327
Minimum	4.099	4.439	6.092
Std. Dev.	0.052	0.583	0.774
Skewness	-0.161	-0.437	0.228
Kurtosis	1.873	2.036	1.576
Jarque-Bera	2.004	2.467	3.258
Probability	0.367	0.291	0.196
Sum	146.797	195.974	250.918
Sum Sq. Dev.	0.092	11.588	20.390
Observations	35	35	35
Correlation			
lnLE	1.000		
lnCO ₂	0.591	1.000	
lnGDP	0.439	0.610	1.000

Source: Author calculations

The results of the diagnosis of the relationship matrix between independent variables indicate that the relationship matrix between independent variables in this study has medium and low categories. Thus, this research model does not have symptoms of statistical multicollinearity assumptions, which means the research model can be continued to the next estimation stage.

Unit root test

Testing the feasibility of the data is done by identifying whether the time series data used has stability in the observed period, such as the average, variance, and covariance of the independent variables that are not entirely influenced by time.

The results of the stationary test on the variables presented in Table 3 show that in the level stage test, all variables contain a unit root, which means it is not stationary, meaning that at the level stage, the variables in this study cannot be continued in the next estimation stage. Based on the 5 percent alpha value in the first difference test, all

variables do not contain unit-roots. Thus, the variables used in the study are at the first differences stage. It is concluded that the time series data used is stationary.

Table 3. Unit Root test

Variable	Unit root test				
	Critical value (%)	level		1 st differences	
		t-stat	ADF-test	t-stat	ADF-test
lnLE	1%	-3.661		-2.639	
	5%	-2.960	-2.851	-1.951	-2.767***
	10%	-2.619		-1.610	
lnCO2	1%	-3.639		-3.646	
	5%	-2.951	-2.448	-2.954	-4.808***
	10%	-2.614		-2.615	
lnGDP	1%	-3.639		-3.646	
	5%	-2.951	-0.399	-2.954	-5.861***
	10%	-2.614		-2.615	

Note: ***1%, **5%, *10% at significant level

Lag Order Selection Criteria

Determining the optimal lag criteria in this research model is essential because choosing an adequate lag length for each variable can give meaning to the dynamics of the variables in the model equation. Bahmani-Oskooee & Brooks (2003) determining the optimal lag length can use one of the information criteria from the Akaike information criterion (AIC) and Schwarz information criterion (SC) equations.

Table 4. Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-45.239	NA	0.004	3.014	3.152	3.060
1	135.509	316.310	8.95e-08	-7.719	-7.169	-7.537
2	171.063	55.5522*	1.73e-08*	-9.378*	-8.417*	-9.060*
3	177.339	8.6299	2.15e-08	-9.208	-7.834	-8.753

*Indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Cointegration relationships can only be formed by variables that are integrated to the same degree. The results of testing the optimum lag length on the times series data

presented in Table 4 report that the optimal lag criterion in the data is lag two. This can be seen from the LR, FPE, AIC, SC, and HQ criteria, which show statistically supports lag two if these variables are tested with a lag distribution model.

Cointegration test

The next stage is cointegration testing using the Augmented Dickey-Fuller (ADF) method, and this is to obtain long-run relationships between variables in the modeling. This test is done as a start to avoid false regression. If the linear combination between variables is stationary or $r = I(0)$. This means that although the variables used are not stationary, these variables tend to be in equilibrium in the long run. Therefore, the linear combination of these variables is called cointegration regression, and the resulting parameters are referred to as long-run coefficients. The cointegration test results presented in Table 5 show that the variables of economic growth, electricity consumption, and carbon dioxide emissions in Indonesia are cointegrated from the two tests through Trace and Max-Eigen. The results of the cointegration test are presented in Table 5.

In the 1985-2019 period, the three variables of life expectancy, economic growth, and air pollution in Indonesia have a long-run balance. The trace statistic test indicated that the three equations had cointegration at a significance level of 5 percent. Meanwhile, the Max-Eigen statistical test also shows that three equations are cointegrated at a significance level of 5 percent.

Table 5. Johansen cointegration test

Hypothesis	Trace test	Critical value	Prob.**	Max-Eigen test	Critical value	Prob.**
$r = 0^*$	33.754	29.797	0.016*	16.409	21.131	0.201
$r \leq 1$	17.344	15.494	0.026*	11.334	14.264	0.138
$r \leq 2^*$	6.011	3.841	0.014*	6.010	3.841	0.014*

Trace and Max-eigenvalue test indicates one cointegrating eq(s) at the 0.05 level; *Denotes rejection of the hypothesis at the 0.05 level; **MacKinnon-Haug-Michelis (1999) p-values

The ARDL Model Estimation Results

Table 6 presented shows that air pollution (CO_2 emissions) negatively has a significant effect on life expectancy in the long run, where a 1 percent increase in air pollution in the current period would reduce future life expectancy by -0.071 while keeping other factors constant. Meanwhile, economic growth has a positive sign and significantly influences life expectancy. Economic growth that increases by 1 percent today will increase life expectancy in the future by 0.014 while keeping everything else constant.

The negative and statistically significant estimate for ECM_{t-1} of -0.656 provides strong evidence of a long-run relationship between series in the Indonesian case. The

coefficients are statistically significant at the 5 percent level and reveal that the short-run deviation is corrected by 5 percent towards the long-run equilibrium path each year. The empirical model also passed major diagnostic tests. Diagnostic tests revealed that the short-run model error terms were normally distributed and free from serial correlation and heteroscedasticity. The functional form of the short-run model is also well defined, as revealed by the Ramsey reset test. We also provide an approximate stability test of the ARDL limit test using the CUSUM test. The results illustrated in Figure 2 show that the CUSUM statistical plot is within the critical limit.

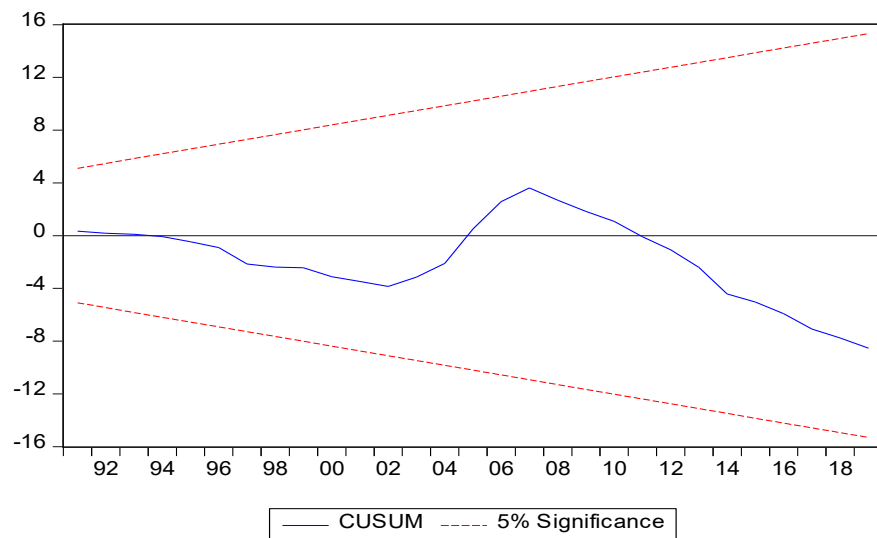
Table 6. The selected ARDL model result

Dependent Variable = lnLE				
Long-run results				
Variable	Coefficient	SE.	t-Stat	Prob.*
Constant	3.691	0.921	4.007	0.000
lnCO ₂	-0.071	0.004	-17.755	0.000
lnGDP	0.014	0.003	4.667	0.000
R ²	0.8590			
F-stat	63.168			
Short-run results				
Variable	Coefficient	SE.	t-Stat	Prob.*
Constant	2.822	0.482	5.850	0.000
ΔlnCO ₂	-0.325	0.131	-2.494	0.019
ΔlnGDP	-0.130	0.023	-5.506	0.000
ΔlnLE _{t-1}	0.940	0.016	6.288	0.000
ECM _{t-1}	0.656	0.174	3.763	0.008
R ²	0.9485			
F-stat	16.056			
Diagnostic tests		F-stat		
Serial correlation		5.393 (0.642)		
Heteroscedasticity		4.123 (0.389)		
Normality		0.929 (0.628)		
Ramsey reset		0.731 (0.399)		

Notes: ***1%, **5% and *10% at significant levels respectively.

Figure 2 shows the Cumulative Sum of Recursive Residual (CUSUM) stability test, which shows that the model used is stable because the CUSUM line is still between the 5 percent significant line. Thus, the stability of life expectancy is affected by changes in air pollution and economic growth in Indonesia.

Figure 2. Recursive Cumulative Residual Sum Plot. The straight line represents the critical limit at the significance level of 5 percent.



The VECM Granger Causality Estimation Results

The existence of a long-run relationship (cointegration) between variables such as air pollution, economic growth, and life expectancy encourages us to apply Granger's VECM causality approach, which provides information about causality between variables for both the long and short-run. Therefore, accurate information about the direction of causality between variables helps policymakers to have a clear picture of the issue, enabling interested parties to formulate health and economic policies to improve the environmental quality of an area, at the same time being able to promote sustainable economic growth to maintain a high standard of living over the long-run.

Table 7 reports the results of the Granger causality test. Long-run causality is indicated by the significance of the coefficient of the error correction term lagging one period ECT_{t-1} in equation (2, 3, 4) using the t-test. Short-run causality can be detected by the joint significance of the LR test of the lagging explanatory variable in the equation. Our empirical results show that ECT_{t-1} has a negative sign and is statistically significant in all VECM equations. Long-run causality results reveal that feedback effects are found between economic growth, air pollution, and life expectancy. The relationship between economic growth and air pollution is two-way. Likewise, a two-way causality was found between air pollution and life expectancy. Granger's economic growth led to life expectancy, but the same was not valid for the opposite side. Based on the results of short-run Granger causality estimates, there is evidence of a two-way relationship between air pollution and life expectancy at a significance level of 5 percent. This study also found evidence of a two-way relationship between economic growth and air pollution at a significance level of 5 percent. In addition, there is evidence of a unidirectional relationship of economic growth with life expectancy at a significance level of 5 percent. The cointegration estimation results in the equation show evidence of a long-run relationship between life expectancy, economic growth, and air pollution at a significance level of 5 percent.

Table 7. VECM Granger Causality test

Dependent Variable	Causality test			Log-run ECT _{t-1}
	Short-run			
	ΣΔlnLE _{t-1}	ΣΔlnCO _{2 t-1}	ΣΔlnGDP _{t-1}	
ΔlnLE _t	-	5.592** (0.042)	13.088*** (0.001)	-0.571*** [-4.276]
ΔlnCO _{2 t}	11.177** (0.003)	-	5.103** (0.059)	-4.182** [-5.361]
ΔlnGDP _t	2.804 (0.2461)	5.519** (0.045)	-	-1.751*** [-3.686]

Note: *10%, **5% and ***1% at significant levels respectively; () probability; [] t-stat

Relationship between Air Pollution and Life Expectancy

The study findings provide strong evidence that air pollution negatively and significantly affects life expectancy. This finding is in line with the study by Ebenstein et al. (2015). The two-way relationship between environmental pollution has attracted the interest of many economists and researchers. Air pollution is one of the core elements of the environment, and if air pollution increases, it affects human health by affecting metabolism. Various studies have similar results that high air pollution increases mortality, and there is a positive relationship between mortality and air pollution (Tran et al., 2018; Wang et al., 2020).

Additionally, the study conducted by Varabyova & Müller (2016); Chaabouni & Saidi (2017) showed similar results, proving that high air pollution increases mortality and has a negative relationship with carbon emissions or air pollution. The use of a time series model for this type of data is that the results can be biased from factors such as temperature and influenza epidemics, which are susceptible to variation over a short period (Goenka et al., 2012). As a result, more recent studies have analyzed the relationship between air pollution and life expectancy as a measure of overall public health, as annual comparisons aggregate life expectancy.

Other supporting studies have also been carried out by (Mariani et al., 2010), who found a positive correlation between life expectancy and environmental quality, both in the long run and along the transition path. These results are consistent with stylistic facts relating to life expectancy and environmental performance measures. The study by Agbanike et al. (2019) found that carbon dioxide (CO₂) emissions on life expectancy in Nigeria were harmful and more robust in the long run. The study conducted by Kelly (2017) found a negative relationship between average exposure to air pollution and life expectancy for cases in 111 countries. Furthermore, Lelieveld et al. (2020) found that air pollution harms life expectancy in Europe and East Asia. Average Global life expectancy loss from air pollution dramatically exceeds that figure by force (all forms together), that is, by order of magnitude (Loss of life expectancy 2.9 and 0.3 years, respectively).

Relationship between Economic Growth and Air Pollution

The findings in the study prove that there is a two-way relationship between economic growth and air pollution. In theory, economic growth means an increase in actual output created from production and consumption activities, these activities are believed to produce waste and pollution that cannot be reused for further production, consumption, and distribution activities, which are then disposed of into water, air, and soil that cause the environment in an area to be damaged and polluted, this causes the health of the population to be less well maintained. A recent study on the relationship between economic growth, pollution, and life expectancy conducted by Ebenstein et al. (2015) found a strong positive relationship between GDP and life expectancy. A doubling of income is expected to increase life expectancy by 3.5 years and reduce 121 deaths per 100,000. The study by Kunze (2014) found that an increase in life expectancy reduces economic growth without policy innovation. The relationship between the two is in the form of an inverted-U. In addition, the study by Jiang et al. (2020) found regional differences in the relationship between air pollution and economic growth in the two countries. In both countries, an inverted U-shaped pattern was found in the metropolitan area, while in the non-metropolitan area, an inverted U-shaped pattern.

Relationship between Economic Growth and Life Expectancy

The findings by applying the ARDL model show that economic growth has a positive and significant impact on life expectancy. This evidence is quite strong because it is supported by several studies conducted by Weil (2014). His findings suggest a two-way relationship between health and economic growth. On the other hand, the research conducted by Andrew et al. (2015) found that slower reductions in pollution concentrations only increased average life expectancy by 0.35 years. This visit has implications for public health because reducing air pollution can reduce overall mortality. The health consequences of pollution in developing countries are difficult to isolate because income growth often coincides with increases in air pollution (Ebenstein et al., 2015). Various literature by Ebenstein et al. (2015), Kunze (2014), and Jiang et al. (2020) found that there is a strong positive relationship between GDP and life expectancy. A doubling of income is expected to increase life expectancy, but in the absence of policy innovation, the relationship between the two is an inverted U-shape. Recently, a study conducted by Sharma (2018) examined the impact of health (proxied by life expectancy) on economic growth in 17 developed countries. Using the general method of moments and macroeconomic data, he concludes the significant overall impact of health, human capital, education (proxied by schools) on economic growth.

Additionally, the study by Cervellati & Sunde (2011) examined the relationship between life expectancy and economic growth for the period 1940-2000 and found that the effect of changes in life expectancy was different at each stage of the demographic

transition. Ngangue & Manfred (2015) investigate the impact of life expectancy on Gross National Income per capita growth in developing countries. The study found a positive relationship between life expectancy and economic growth. Increased life expectancy has a positive impact on growth in developing countries. However, the results are mixed when classifying developing countries according to their income level because the effect is insignificant in middle-income countries.

CONCLUSION

The application of the ARDL model found evidence that in the long run, air pollution (CO₂ emissions) negatively and has a significant effect on life expectancy. Meanwhile, economic growth has a positive sign and significantly influences life expectancy. In the short run, it is evident that the current life expectancy is positively and significantly influenced by the life expectancy of the previous period. Air pollution has a negative sign and a significant effect on life expectancy, and then economic growth negatively and significantly affects life expectancy. The results of Granger causality estimation in the short run found evidence of a two-way relationship between air pollution and life expectancy. Other evidence exists of a two-way relationship between economic growth and air pollution. In addition, evidence of a unidirectional relationship from economic growth to life expectancy. The cointegration estimation results in the equation show evidence of a long-run relationship between life expectancy, economic growth, and air pollution at a significance level of 5 percent.

The findings of this study provide direction for policymakers, showing how pollution reduction policies promote economic growth by improving public health by reducing air pollution-related diseases. The policy implication is that air pollution reduction can be achieved by replacing conventional energy sources with renewable energy sources. Policymakers and stakeholders Together play a role in this by encouraging less polluting energy resources. This can be done by imposing a tax on air-polluting companies, reducing air pollution in the environment, and increasing life expectancy.

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Economic Growth and Inflation: Evidence from Indonesia

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Abstract

This study aims to determine the relationship of economic growth with inflation in Indonesia between 2010 and 2014. The research method uses static data panel analysis with economic growth as the dependent variable and inflation, investment, and population as independent variables. Research shows that inflation, investment, and population, where the three variables have the same aim (positive) relationship with economic growth. The effect of investment on economic growth is more significant than inflation on economic growth. The positive relationship between inflation and economic relations shows that inflation can increase economic growth. This can be maintained if the government represented by Bank Indonesia can always keep inflation at a low/mild level. Inflation targeting policy needs to be maintained by referring to the inflation targeting of previous years.

Keywords:

Economic growth, inflation, Indonesia, static panel data analysis

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INTRODUCTION

Indonesia, consisting of 13.466 islands with 1.922.570 miles of land area and 3.257.483 wide miles of water, has become the dust of hope for more than 237 million people (Statistics, 2010). The agrarian country blessed with abundant natural resources has catapulted the populated desire to have a prosperous life. The population welfare can be measured from the GDP per capita of its netizen. Table 1 shows the GDP per capita of Indonesian countries, several ASEAN countries, and China from 2009 to 2012. GDP per capita of Indonesia only remained in a range of \$2100 to \$3700. Compared to our neighboring country that is still in one clump, named Malaysia, in a range of \$8400 to \$10800, income per capita of Indonesian people is only a third of the income per capita of Malaysian people. GDP per capita of Indonesia is only a bit higher than Vietnam, which is in a range of \$1100 to \$1700. In 2012, the Indonesian Central Bureau of Statistics mentioned that the income per capita of Indonesia ranked 102 from 161 countries.

Table 1. GDP Per Capita of Several ASEAN Countries and China (in US\$)

Country	2009	2010	2011	2012
Indonesia	2,262.7	3,125.2	3,647.6	3,700.5
Malaysia	7,312.0	9,069.0	10,427.8	10,834.7
Singapore	38,577.3	46,570.0	53,121.2	54,577.1
Vietnam	1,232.4	1,333.6	1,543.0	1,755.3
China	3,800.5	4,514.9	5,574.2	6,264.6

Source: World Bank

A portrait of the GDP per capita of Indonesia from the period 2009 to 2012 is only a tiny picture of Indonesia's economic growth. From the GDP side, Indonesia, with a large number of residents, can be expected to have a significant income (GDP), as displayed in Table 2. Based on the GDP of ASEAN countries and China above, Indonesia has the biggest GDP among the ASEAN country. With the largest population in the world, China has eight times the GDP of Indonesia. Based on population, in 2015, China had 1,367,485,000 population, while Indonesia had 255,994,000 population (the U.S, 2017), where China's population is five times more than Indonesia's population. For GDP per capita, China is nearly two times larger than Indonesia.

Table 2. GDP of Several ASEAN Countries and China (in Billion US\$)

Country	2011	2012
Indonesia	893.0	917.9
Malaysia	298.0	314.4
Singapore	275.4	289.9
Vietnam	135.6	155.8
China	7,492.4	8,461.6

Source: World Bank

The welfare rate cannot be separated from its economic growth. Economic growth is often used as a measuring instrument of a country in managing a long-term and short-term economy. Economic growth shows that economic activities will generate more income for people in a certain period. This was possible because economic activities occur because of factors production to produce an output. Economic growth shows the growth of goods and services produced in an economic area for a specific time (Statistics, 2018). High economic growth will increase society's income (the amount of money circulating will rise), but unfortunately, it is challenging to avoid inflation (The Theory of Quantity).

Today, the conversation about economic growth and the factors that influenced it is being discussed, one of them is inflation. Inflation has become one of the indicators that cannot be ignored in an economy. Since 2000 inflation targeting has been set periodically by the Indonesian government. From 2016 to 2018, the government has issued a Ministry of Finance Regulation (PMK) Number 93/PMK.011/2014 about inflation targeting in 2016, 2017, and 2018. In the Ministry of Finance, Regulation determined that inflation was 4% in 2016, 4% in 2017, and 3, 5% in 2018, each with a deviation of 1%. Regarding inflation targeting, some studies have been done to look at the correct limit of inflation so that inflation would not hamper economic growth (Vinayagathan, 2013; Risso & Carrera, 2009; Hwang & Wu, 2011).

Inflation is a tendency of prices to rise in general and continuously. Inflation can have positive implications or negative implications. Boediono (2014), in general, describes the cause of inflation as the following: the first, the amount of money circulating is increasing, whether it demand deposits or a currency, where this condition is known as the theory of quantity. Second, The theory is known as Keynes theory describes that inflation can happen if the demand for goods has exceeded the available amount of goods, or it can be said that people want to live beyond the limits of their abilities.

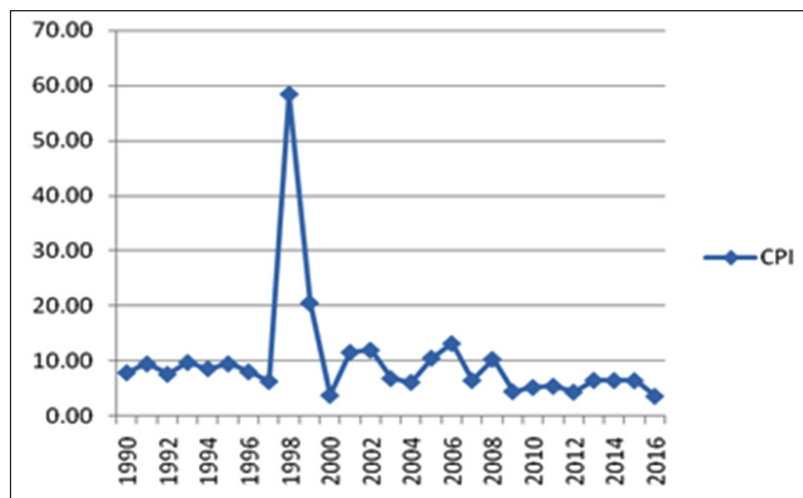
High inflation can harm an economy. This is why the government has periodically set an inflation target. When inflation is high, prices will increase continuously, the value of currencies decreases, and society tends to dislike cash, followed by decreasing production activity (Nopirin, 2014). However, low inflation will have a benefit for the economy. The rising prices that occur will encourage manufacturers to expand production. The effect of this production expansion will drive positive economic growth. Samuelson & Nordhaus (2004) said that when inflation is low, the prices will be stable, and society will trust the money because the value of money can be maintained, and the society wants to make a real investment.

Much discussion links the relationship between economic growth and inflation are done. The research discusses that economic growth caused inflation (Hartini & Utomo, 2004). However, there is also research proving that inflation affects economic growth (Caporin & Maria, 2002), even there is also research proving that both have a bidirectional causality (Caporale & Skare, 2011). The cases above indicate that it will always be a controversy whether inflation affects the economic growth or the economic growth that affects inflation, or both are mutually affected.

This research will discuss one of the controversial elements above: Does inflation affect Indonesia's economic growth? This case is interesting to discuss when Indonesia's inflation is known to always be at a low level after the global economic crisis in 2008, as graphic one shows. Based on the theory, low-level inflation will be helpful to an economy where inflation will drive the society to make a real investment.

Much empirical proof about the effect of inflation on economic growth is produced. In their study about *Determinants of Economic Growth: A Cross Country Empirical study* Barro (1997) finds that higher inflation is in line with the lower economic growth rate. The research used a Panel Data method with 100 countries from 1960 to 1990. Research by Caporin & Maria (2002) entitled *Inflation and Growth: panel data evidence* empirically analyzed the relationship between inflation and economic growth in 19 countries from 1979 to 1997. The variables used in this research are GDP per capita, inflation, the standard deviation of inflation, consumption expenditure, investment, ongoing foreign investment, foreign debt, school level, and birth rate. This research shows that the effect of inflation on economic growth varies for each country. Fischer (1993), in his research, used a cross-section and regression panel method has found a negative relationship between inflation and economic growth.

Figure 1. Indonesia Consumer Price Index



Source: World Bank

Mamo (2012), in his research, try to find the relationship between inflation and the economic growth in sub-Saharan Africa using a panel data analysis and the causality relationship between economic growth and inflation. The dependent variable used in this model is economic growth, and the independent variable is inflation, investment, population, and GDP per capita. This research shows a negative relationship and significance between inflation and economic growth. Besides, research shows that inflation affects economic growth in all sample countries, and economic growth has affected inflation in two countries. Inflation can also predict economic growth in all sample countries, and economic growth can also predict inflation in two sample countries. Azam & Emirullah

(2014) do research at nine-country in Asia and the Pacific to know the impact of the inflation rate, corruption, and other variables on GDP per capita. The result stated that inflation rate and corruption are relatively negative significant towards GDP per capita. Risso & Carrera (2009) research inflation and economic growth in Mexico. The result shows that if inflation is up to 9%, it will hamper economic growth. However, under 9%, inflation does not significantly affect economic growth.

Another research do Mallik & Chowdhury (2001) find a positive long-term relationship between economic growth and inflation in Bangladesh, India, Pakistan, and Sri Lanka. Munir & Mansur (2009), in their research about the relationship between inflation rate and the economic growth rate in Malaysia during 1970 – 2005, find if the inflation rate is above the threshold (threshold of inflation), then the economic growth rate will go slow. However, if the inflation rate is under the threshold (threshold of inflation), economic growth has a positive relationship. The same case also happened in Hasanov's (2011) research in Azerbaijan. The research has analyzed the possible effect of threshold inflation on economic growth from 2000 – to 2009. This analysis shows that if the inflation is above the threshold of inflation, there is a negative relationship with economic growth, but if the inflation is under the threshold, then there is a positive relationship with economic growth.

Studies about the impact of globalization and financial development on economic growth in China and India have been done. The result stated that globalization had accelerated the economic growth in India, but in China, the result is different. Globalization is hampering economic growth because globalization has increased export rivalry. Another result is the acceleration of capitalization and inflation as a proxy aggregate request, positively related to economic growth in China and India (Kandil et al., 2017). Studies in Vietnam and China find a tight relationship between money supply growth and inflation. In China, the correlation coefficient is valued as 1 for both variables, yet in Vietnam, the value is 0,991, and for both countries, the correlation coefficient is positive (Doan Van, 2019). Another study with China as the sample has found that if inflation is up to 2,5%, it will hamper economic growth, but if it is under 2,5%, then inflation would drive economic growth (Hwang & Wu, 2011).

A positive or negative relationship between inflation and economic growth is the most obtained result in some research for both variables. However, no relationship between inflation and economic growth also had been discovered by some researchers. Vinayagathan (2013) revealed the relationship between inflation and economic growth in 32 ASIAN countries, and the result shows that if inflation is up to 5,43%, it will hamper economic growth. However, if inflation is under that limit, it would not have any relationship to economic growth. Manamperi (2014) researches inflation and economic growth in BRICS (Brazil, Russia, India, China, and South Africa) countries. The result shows no long-run relationship between inflation and economic growth in Brazil, Russia, China, and South Africa, but a positive long-run relationship is found in India. A negative short-run relationship is significantly found in Brazil, Russia, China, and South Africa, while a positive short-run relationship is found in India.

The importance of economic growth and inflation in the economy and the controversy over the relationship between economic growth and inflation are exciting and essential to examine. Previous studies conducted in various countries, including Indonesia, concluded different results on economic growth with inflation. In previous research conducted in Indonesia, the character of each province in Indonesia was not accommodated. The study examines the relationship of economic growth with inflation based on conditions in Indonesia by capturing individual characteristics (provinces in Indonesia) and time, given the very diverse conditions of the various provinces. The static data analysis panel method is used to capture the characteristics of the province and the time.

METHODS

This research uses secondary data from the Indonesian Central Bureau of Statistics and the Indonesian Investment Coordinating Board. The data refer to economic growth data, inflation, investment, and the population. The data type used in this research is panel, time-series, and cross-section. Time series data are obtained from 2010 to 2014, and the cross-section data includes 33 provinces in Indonesia.

In this research, the variable of economic growth is the dependent variable. Data used here is the value of Gross Regional Domestic Product (GRDP) based on the constant introductory price of 2000, with the Indonesian Central Bureau of Statistics as the source of data. Inflation is the independent variable and the focus of this research. By definition, inflation tends to rise in general and continuously—Source of data by Indonesian Central Bureau of Statistics. The variable of investment is the independent variable. Data used in this research is the value of foreign investment (PMA), with the Indonesian Investment Coordinating Board as the data source. The variable of the number of populations is the independent variable. The population data is used here, with the Indonesian Central Bureau of Statistics as the data source.

Using this panel data enables us to observe based on individual and time characteristics. This panel data can accommodate the variable of heterogeneity which is not put in a model (unobserved individual heterogeneity), able to reduce the collinearity between variable and the estimate on panel data able to minimize the refraction produced by the individual aggregation because the data unit are increasing (Baltagi, 2005).

Panel data are form by merging of time series data and cross section data, so it can be made by this equation:

$$Y_{it} = \alpha + \beta X_{it} + \varepsilon_{it} \quad (1)$$

$i = 1, 2, \dots, N;$

$t = 1, 2, \dots, T$

$i = i$ individual

$t = t$ of the period

N.T: increasing of panel data

There are two analysis methods used in this panel data: static panel data analysis and dynamic panel data analysis. This research uses static panel data analysis as the analysis method. Three approaches are generally used in static panel data: Pooled Least Square, Fixed Effect Model (FEM), and Random Effect Model (REM). In FEM and REM, both of them can be differentiated based on the assumption of whether there is a correlation between the error component with the independent variable (regressor) (Firdaus, 2011).

Chow test is used to determine which method will be used between pooled least square and fixed-effect model. The Chow test must be conducted first to determine all the approaches above. If the result of this test showed the fixed effect model better, then the Hausman test has to be done next. The Hausman test determines which method we should use between the fixed and random effects. Hausman test is required to see whether there is a correlation between regressor and the personal effect or not. The relationship between the variables above can be seen in the following equation:

$$\ln PE_{it} = \alpha_0 + \alpha_1 INF_{it} + \alpha_2 \ln INV_{it} + \alpha_3 + JPEN_{it} + \varepsilon_{it} \quad (2)$$

Where

$\ln PE_{it}$: Constant Gross Regional Domestic Product (GRDP) province in the t year (Million Rupiah)

INF : Inflation of i province in t year (in percentage)

$\ln INV$: PMA value foreign investment of i province in t year (Million US\$)

$JPEND$: Amount of population of i province in t year (Thousand)

RESULT AND DISCUSSION

The relationship between economic growth and inflation in Indonesia is interesting to be noticed, especially with the use of panel data which can control the heterogeneity of individuals. The sample of this data is taken from 33 provinces in a range of 2010 to 2014. The first test we should do is the Chow test. This test compares which model is better between the PLS model and the FEM model.

Table 3. Chow Test

Effects Test	Statistic	d.f	Prob
Cross-section F	408.538159	(32,1290)	0.0000
Cross-section chi-square	763.674113	32	0.0000

Table 3 shows the result of the Chow test, using the actual level of (α) =10% has obtained the result of Probability (Prob) is 0.0000. So, we can conclude that the result of the Chow test is to receive H_1 . Thus, at this stage, the obtained result is that Fixed Effect Model (FEM) is better than Pooled Least Square (PLS) model. The next stage is to select whether to use a Fixed Effect Model (FEM) or Random Effect Model (REM). This test will be done using the Hausman test.

Based on the Hausman test in Table 4, where the comparing is done between Fixed Effect Model (FEM) and Random Effect Model (REM), has obtained the result of Probability (Prob) is 0.0000. Using the actual level of (α) =10%, the Prob is < 0, so the result of this test is receiving H_1 . This case means that Fixed Effect Model (FEM) is the most appropriate model to use. This model will be used in this research.

Table 4. Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f	Prob
Cross-section random	25.043031	3	0.0000

The coefficient of determination or Goodness of Fit indicates whether the estimation of that model is good or not. After receiving which model is the most appropriate, the regression is due by that model/equation. Table 5 shows the regression result; coefficient of determination (R^2) valued 0.997121. The value of R^2 reflects how much the variation of the dependent variable (PE) can be described by the independent variable (INF, INV, JPEND) (Nachrowi & Hardius, 2006). If R^2 approaches 0, the dependent variable (PE) cannot be described by the independent variable (INF, INV, JPEND). If R^2 approaches 1, the more the dependent variable (PE) can be described by the independent variable (INF, INV, JPEND).

The coefficient of determination in this research showed the value is approaching 1, and this described that 99,7% variation of the variable PE (GRDP) could be described by INF variable (inflation), INV (investment), and JPEND (the amount of population). The rest of 0,3% can be described by variables outside the model. In Table 5 can be seen that all of the independent variables, inflation (INF), investment (log INV), and the amount of population (JPEND), are positively influenced to economic growth (log PE) as dependent variables on α =10%. This case means that inflation is increasing if the economic growth increases. If the investment is increasing, then the economic growth increases. If the amount of population is increasing, the economic growth also increases.

Table 5. Fixed Effect Model

Independent Variable	Coefficient	Value of Statistic T	Probability
INF	0.010229	3.433142	0.0008
LOG(INV)	0.034449	4.179711	0.0001
JPEND	0.00016	5.522857	0.0000
C	15.89592	79.42931	0.0000
R-squared	0.997121		
Adjusted R-squared	0.99634		

In their research, the positive relationship between inflation and economic growth is also found in Mallik & Chowdhury (2001). They find a positive relationship between inflation and economic growth in Bangladesh, India, Pakistan, and Sri Lanka. They describe that in this condition, what economic policy needs to do is seek economic growth that is consistent with stable inflation. Munir & Mansur (2009), Hasanov (2011), and Hwang & Wu (2011), in their research, also find a positive relationship between inflation and economic growth. However, this positive relationship is only happening when inflation is under the threshold of inflation that the government has set. Based on this finding, the government is being proposed to keep inflation under the threshold of inflation that has been set. In general, these two research results show that keeping inflation at a low/light rate is essential.

The value of the coefficient on each variable can be interpreted as the following: The coefficient on the variable of inflation rate (INF) amounted to 0,0102 means that every 100% increase in the inflation rate will affect the economic growth to increase by 1,02%. The coefficient on investment variable (log INV) amounted to 0,034 means that every 100% increase in investment will increase economic growth by 3,44%. The coefficient on the variable of the number of population (JPEND) amounted to 0,00016 means that every 100 thousand population increase will affect the economic growth by 0,016%.

The theory can explain the positive relationship between the three variables with economic growth that low inflation will encourage a reasonable price increase, so that producer will expand production (investment), which leads to economic growth. The number of inhabitants as a multiplier is based on its growth. The estimation results also show that investment in economic growth (0,03) is more significant than inflation's effect on economic growth (0,01).

Overview of Economic Growth

From 2010 to 2014, almost 33 provinces positively impacted GRDP economic growth, showing stable economic growth in almost all provinces. Based on the region, Java island made an enormous contribution to GRDP. As shown in Table 6, Java island gave a stable economic contribution in 5 years as big as $\pm 57\%$. This result was mainly contributed by manufacturing, construction, and retail trade activities supporting Java Island as the economic center. Maluku-Papua islands gave the lowest contribution, as much as $\pm 2\%$, although those islands have the most mining and quarrying activity. Sumatera island provides the second-largest contribution, is known to have a relatively vast agricultural land, plantations, and forests gave a stable contribution of around 22%. This contribution was donated by the Agricultural-Forestry-Fishing sector, Manufacturing and Mining quarrying.

The research results of Akinlo et al. (2020) state that the agriculture sector can contribute to economic growth in Nigeria. It is suspected that the value chain in the agricultural sector in Nigeria has given multiple players an effect on the manufacturing,

pharmacy, and ICT services sector, which in turn increases the export of agricultural products in addition to exports of crude oil. The study results in Nigeria are fascinating to observe when juxtaposed with conditions in Indonesia. Different economic activities in different provinces or islands in Indonesia contribute to GRDP. Economic activity in Maluku-Papua Island, namely Mining-quarrying, while in Sumatera Island, namely Agriculture-Forestry-Fishing, Manufacturing, and Mining-quarrying, has contributed very differently to GRDP. The difference in the contribution to the GRDP can be observed from the value chain side of each developing sector in the area.

Table 6. Percentage of GRDP on Big Islands in Indonesia

Islands	2010	2011	2012	2013	2014
Sumatera	22,39	22,39	22,31	22,15	22,03
Jawa	57,28	57,40	57,51	57,69	57,90
Bali & Nusa Tenggara	3,03	2,93	2,87	2,88	2,90
Kalimantan	9,41	9,44	9,40	9,24	9,06
Sulawesi	5,19	5,31	5,45	5,55	5,64
Maluku & Papua	2,70	2,53	2,46	2,50	2,48

Source: Indonesian Central Bureau of Statistics

Mining-Quarrying activities in Maluku-Papua only stop on raw materials explorations. As for Agriculture-Forestry-Fishing activities in Sumatera are continuing into manufacturing. This case could be seen in Table 7, which serves percentage data of GRDP Distribution by Island and Sector. The 17 data groups only serve three-sector data: Agriculture-Forestry-Fishing sector, Mining-Quarrying sector, and Manufacturing sector. It can be seen that the most significant economic activity in Maluku island – Papua is the Mining and Quarrying sector that takes 33,3%, but the manufacturing sector only takes 9,8%. Exploration on the Mining Sector that is not continued with processing only gives a bit advantage to the economy because this Mining commodity will be exported by their raw form (ores/concentrates), which only give a bit of economic value-added. Constitution No. 4 of 2009 about Mining of Mineral and Coal enforced since January 12, 2014, mandates that mining products like gold, iron ore, nickel, coal have to go through value-adding/downstream before being exported. Ika (2017) proves that the potentiality of increasing revenue can be realized from value-adding policy/downstream the non-renewable mineral resources.

In Sumatera, the dominant economic activity is the Agriculture-Forestry-Fishing sector that is 23,3%, and the manufacturing sector 20%. The raw material that results from the Agriculture-Forestry-Fishing sector is processed from the manufacturing sector. Value-adding/downstream on Agriculture-Forestry-Fishing sector could be seen in the manufacturing sector developing in those areas. Saragih (2018) said that most

of the manufacturing industry in Sumatera island is based on agro-industry, oil, and natural gas.

Table 7. Average Percentage of GRDP Distribution by Island and Industry

Islands	Sector		
	Agriculture, Forestry, and Fishing	Mining and Quarrying	Manufacturing
Sumatera	23,258	15,56	20,416
Jawa	8,272	2,404	29,55
Bali & Nusa Tenggara	21,304	7,104	4,98
Kalimantan	11,616	38,188	18,418
Sulawesi	26,28	8,504	10,668
Maluku & Papua	14,054	33,288	9,79

Source: Indonesian Central Bureau of Statistics

Overview of Inflation Policy

Bank of Indonesia (BI) since 2005 embraced the Inflation Targeting Framework (ITF) by using interest rate as the operational monetary target, as previously used base money as their operational monetary target. In its journey, ITF applied as the flexible ITF. This is based on a lesson taken by the 2008 finance global crisis, where the central bank needs the flexibility to anticipate monetary problems.

Inflation and Economic Growth

Inflation and GRDP 2010 – 2014 on the main island of Indonesia were interesting to scrutinize. Based on Table 8 inflation rate of the island outside of Java, in general, was more significant than the inflation rate in Java island. The unbalance of supply and demand has caused a high inflation rate in the region outside of Java island. This condition on those islands increases their requirements on electricity, fuel, transportation, communication, housing, food, and others. High demand on some expenditure groups, such as housing group, water, electricity and fuel, transportation group, communication, financial services, food and beverage group, cigarette and tobacco group, and clothing group, has a significant effect on inflation rate outside of Java island. Sumatera island, Kalimantan and Bali – Nusa Tenggara donating a high inflation rate. This can be understood by their high Agriculture, Forestry and Fishing, Mining quarrying activities in Sumatera and Kalimantan, and Bali - Nusa Tenggara is the tourism center.

The supply limitation can be seen in how much the logistic cost is needed to the region outside of Java island. A Logistics system that has not been efficient was causing a considerable amount of additional fees to some commodities or products to be moved from their production place into their consumer (Trade, 2013). One of the domino effects of the inefficient logistics system is the expensive fuel outside Java island.

Unfortunately, fuel has become the main requirement for investment and tourism, such as Sumatera, Kalimantan, Bali, and Nusa Tenggara. These days government has made strive fuel's policy into one price throughout Indonesia. This was made in 2016 by issuing ESDM ministerial regulation No. 36 of 2016, and the implementation started in January 2017.

Table 8. Inflation on Big Islands in Indonesia

Islands	2010	2011	2012	2013	2014
Sumatera	8,3	4,0	3,7	8,8	8,9
Jawa	6,6	3,4	4,2	8,0	8,2
Bali & Nusa Tenggara	8,7	5,3	4,8	8,2	7,5
Kalimantan	8,4	5,1	5,7	7,8	8,0
Sulawesi	5,8	3,7	5,0	6,6	8,5
Maluku & Papua	6,2	3,3	4,9	8,3	8,7

Source: Indonesian Central Bureau of Statistics

Investment and Economic Growth

The report issued Board (2017), as shown in Table 9 was, indicated a high investment rate on Java island, Sumatera and Kalimantan. This was following the enormous GRDP contribution of Java island, Sumatera, and Kalimantan to economic growth. The manufacturing sector dominated the investment in Java island, mainly by motor vehicle industry and other transportation equipment, metal, machinery, electronics industry, paper and printing industry, textile industry, rubber, plastics industry, chemical and pharmaceutical industry, and food industry.

Table 9. Percentage of Investment Value on Big Islands in Indonesia

Islands	2010	2011	2012	2013	2014
Sumatera	4,61	11,43	15,18	11,88	13,53
Jawa	70,91	67,86	55,61	60,64	54,31
Bali & Nusa Tenggara	3,10	5,25	4,59	3,11	3,49
Kalimantan	12,40	10,57	13,06	9,55	16,06
Sulawesi	5,30	3,94	6,13	5,24	7,23
Maluku & Papua	3,67	0,96	5,43	9,57	5,37

Source: Indonesian Investment coordinating Board

Java island as the economic center has advantages by having various complete infrastructure. The availability of electricity, big roads, airport, port complete with their support equipment, and adequate network telecommunication became attractive by an investor to build investment in Java island. As Sumatera and Kalimantan were rich

in their natural resources, Sumatera and Kalimantan island were the most significant production areas of palm oil, rubber, coal in Indonesia, where Indonesia is one of the biggest producers palm oil, rubber, and coal globally.

Total Population and Economic Growth

The population amount could become an opportunity or threat to a country. Indonesia has a large population, trying to make its population an asset. Results of the research (Table 5) show that population amount in Indonesia had a positive influence on economic growth. This condition was related to the demographic bonus. The production side and consumption side could see the demography bonus. Demography bonus in the production side, explained that productive age being the booster on developing the industrialization. However, in Indonesia, a demography bonus on the production side could not be relied upon as the crutch of economic growth. Demography bonus on the consumption side, showing a new middle class with a high consumption rate, could drive economic growth. According to Jati (2015), in Indonesia, economic growth was being pushed by a demography bonus on the consumption side.

CONCLUSION

Research about the relationship between economic growth and inflation rate in Indonesia is carried out by using the panel data of 33 provinces. Data are obtained by combining the cross-data section and time data series, so it is expected to make the estimated parameter more accurate. After the research, the result can be concluded as the following: economic growth is influenced significantly by inflation, investment, and the amount of population, where the relationship between the three of them have the same aim (positive) with the economic growth. Besides, the result also shows that the influence of investment on economic growth is more significant than inflation's influence on economic growth.

The economic growth could be influenced by economic activity developed in those regions. Sumatera island contributes a large enough on GDRP, developing the Agriculture-Forestry-Fishing sector and manufacturing sector. High inflation occurs in a region that has unbalanced supply and demand conditions. In those regions, the demand for primary needs secondary and tertiary needs are high but not sustained by adequate supply. A high logistics charge causes this inadequate supply.

The results of this study indicate that inflation can encourage economic growth. When inflation is low, prices will be stable, and people will trust money because its value can be maintained to be motivated to invest in the real sector. Therefore, the government needs to continue to maintain the stability of inflation at a low/light level. Inflation stability at a low/light level can be applied through the inflation targeting policy. The government must continue to evaluate the inflation targeting set in previous years so that inflation can be used to drive the economy.

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Convergence and Determinants of Health Development in North Sumatera Province

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Abstract

Health contributes to increasing productivity in generating quality human resources. Health development aims to attain the highest public health degree fairly and equally. Convergence reduces the gap between regions and makes development more equitable. One of the booming health development indicators is life expectancy. The government must collaborate across sectors, namely the social and economic sectors, to accelerate the convergence process. This study aims to identify convergence and analyze the determinants of health development in North Sumatera Province. To this purpose, panel data of 33 districts/cities in North Sumatera Province over 2012-2019 is investigated using the Generalized Method of Moment (GMM) as dynamic panel data analysis. The results showed that convergence in health development measured by life expectancy occurred in North Sumatera Province. The most influential variables in health development were socio-economic variables.

Keywords:

convergence, GMM, health development, life expectancy

How to Cite:

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INTRODUCTION

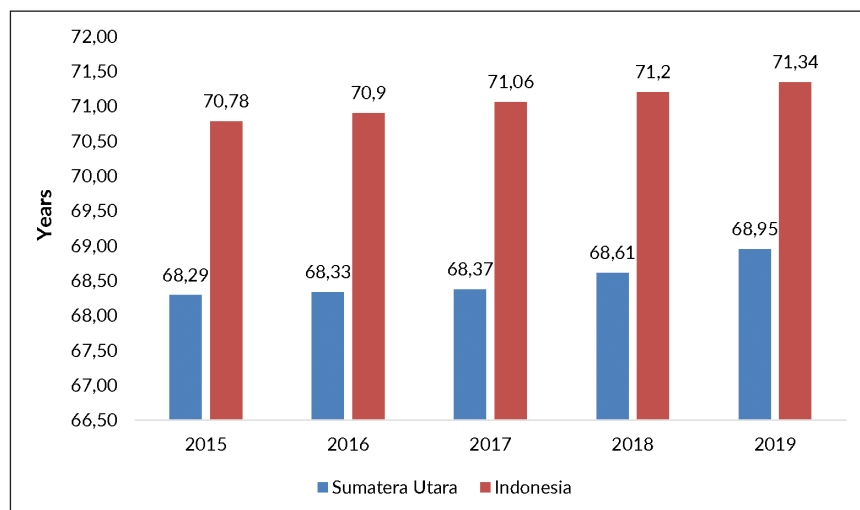
Health is the core of well-being and a prerequisite for increased productivity (Todaro & Smith 2011). Human capital is strongly influenced by education and health problems. It contributes to economic growth by increasing the skills and production capabilities of the workforce. Health development is one of the agendas in realizing the *Sustainable Development Goals* (SDGs). It is reflected in the third goal of ensuring a healthy life and improving the well-being of all at all ages.

Health development aims to attain the highest public health degree. The success of health development can be seen through life expectancy, the infant mortality rate (IMR), the maternal mortality rate (MMR), and nutritional status. Life expectancy is one of the primary vital indicators of a country's population health and economic development (Mahumud et al., 2013). As an indicator of health status, life expectancy is used as one of the bases in health program planning and to evaluate government performance in improving the health and well-being of its population (BPS, 2019).

Foreman et al. (2018) research show that life expectancy is expected to grow worldwide by 2040. In that year, Indonesia's life expectancy is estimated to reach 76.77 years and will be ranked 6th for the Southeast Asia region. Life expectancy in Indonesia has continuously increased from 2015 to 2019 from 70.78 in 2015 to 71.34 in 2019. Although it continues to increase, unequal achievement of life expectancy among provinces in Indonesia may raise a problem in the long term since it can increase inequality in health development.

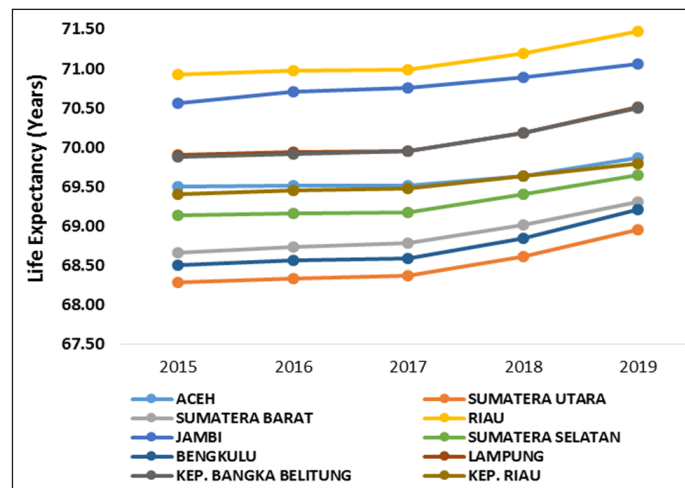
Life expectancy in all provinces on the island of Sumatera is below the national figure in 2019 except Riau province, and North Sumatera Province is the lowest one. North Sumatera is a province with the fourth largest population in Indonesia. The low life expectancy in the North Sumatera Province will undoubtedly affect the human development index, which measures the quality of human resources. Of course, it will also affect the achievement of the national human development index.

Figure 1. The trend of Life Expectancy in Indonesia and North Sumatera



During the 2015-2019 period, life expectancy in North Sumatera Province has always been below the national figure. This needs to be a concern because life expectancy is one indicator of the success of health development. The life expectancy of North Sumatera Province, which is relatively low compared to other provinces, certainly affects the achievement of national health development. In 2019, the life expectancy in North Sumatera Province ranked 24 out of 34 Provinces in Indonesia. Moreover, it was the lowest one during Sumatera Island's 2015 to 2019 period. On the contrary, during the 2016 to 2019 period, North Sumatera Province recorded the highest Gross Regional Domestic Product (GRDP) based on the constant prices in Sumatera Island and ranked fifth in Indonesia in 2019. This phenomenon showed that increased income did not positively affect the life expectancy in North Sumatera Province, thus, differing from the research conducted by Paripurna (2017) and Bilas et al. (2014), where per capita income has a positive effect on life expectancy.

Figure 2. Life Expectancy (LE) by Provinces in Sumatera Region



Source: Central Statistics Agency (processed)

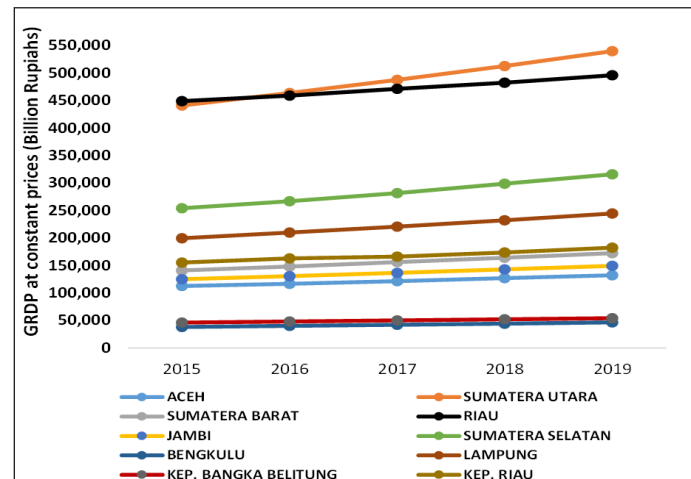
One of health development principles is fairness and equality, which means everyone has the same rights in obtaining the highest degree of health. However, the challenge for long-term development in the health sector is reducing the gap in public health status. The expected health development outcome is equitable development throughout Indonesia. Convergent health development shows that areas with low health development can catch up with areas with high health development.

There was a tendency that the difference between the highest and the lowest life expectancy was likely to decrease from 2012 to 2019. In 2011, the difference was 11.13 years, decreased to 10.82 years in 2019. Regions with the lowest life expectancy from 2012 to 2019 had a faster average growth rate than regions with the highest life expectancy. This phenomenon shows a tendency for health convergence in North Sumatera Province.

As convergence reduces the gap between regions and makes development more equitable, convergence is expected in health development and economic development.

The Lancet Commission states that a "Grand Convergence" in health will be achieved by 2035. Achievement of convergence would prevent about 10 million deaths in 2035 across low-income and lower-middle-income countries relative to a scenario of stagnant investments and no improvements in technology (Jamison et al., 2013).

Figure 3. GRDP based on constant prices by Provinces in Sumatera Region



Source: Central Statistics Agency (processed)

To advance the goal of "Grand Convergence" in global health by 2035, Goli et al. (2019) tested the convergence hypothesis in the progress of the health status of individuals from 193 countries and found that with a current rate of progress (2.2% per annum), the "Grand Convergence" in global health can be achieved only by 2060 instead of 2035. Using the MIMIC (Multiple Indicator Multiple Causes) models to estimate health status in the European Union, Stańczyk (2016) found beta convergence in 2002-2012 period, with a convergence rate of 1 % and the half-life being about 60 years, and found the evidence of spatial dependence in the analyzed phenomenon.

Research conducted by Goli et al. (2019) found that the "Grand Convergence" in global health can be achieved only by 2060 instead of 2035 if the current rate of progress (2.2% per annum) persists. The convergence rate was found to have decreased from 1950 to 2015, while the non-parametric test of convergence shows an emerging process of regional convergence rather than global convergence.

Maynou et al. (2014) state that their study was the first that showed a lack of convergence in health across the European Union (EU) region. Although they found (beta) convergence, they also identified significant differences across both time and regions in the catching-up process. Moreover, they tested (sigma) convergence and found no reduction on average in dispersion levels of mortality and life expectancy.

Goli et al. (2013) have found β convergence regarding life expectancy, child immunization, and underweight children across central states in India. Cavalieri and Ferrante (2019) also found β convergence for infant mortality rate and life expectancy at birth in Italy. The results showed that fiscal decentralization enhanced 'catching-up'

effects for both health outcomes. Using the mortality rate by age as an indicator of health status, Gachter and Theur (2011) found mixed results in the sigma convergence in their research on the convergence of health status in Austria. Meanwhile, the weighted standard deviation increases inequality for the four examined variables.

However, several studies have found no convergence in health. Kumar (2015) found that infant mortality and life expectancy had not been converged in 1996-2012, and no club convergence was formed in South Asian countries. The analyses highlight that the relative positions of countries in South Asia have changed little, and the trend of significant inequalities among the countries continues. Clark (2011) found that convergence occurs in life expectancy but diverges in infant mortality in 195 countries in the period 1955-2005. In developing countries, economic development improves life expectancy more than reduces infant mortality. His research concluded that health outcomes follow the 'Kuznets Welfare Curve.' Blum's model of health determinants explains that four main factors contribute to overall health status. These are environment, behavior, health care, and heredity. Folland et al. (2013) argue that health status is an increasing function of health care which is affected by biological characteristics, environment, and lifestyle.

In a study on Indonesian Life Expectancy, Kristanto et al. (2019) found that health personnel and health insurance positively and significantly affect life expectancy. Dependency ratio and poverty have a negative and significant relationship with life expectancy. Meanwhile, the availability of health facilities and income inequality have a weak relationship with life expectancy. Using Geographically Weighted Regression (GWR) to identify variables that affect life expectancy in every district in East Java, Aidi et al. (2014) found that the number of poor people, the number of health facilities, the percentage of health complaints, and the percentage of children under five years old were immunized, had a significant effect on life expectancy. Through a study on strategies to improve health status in Banten Province, Paripurna (2017) found that immunization, GDP per capita, number of hospitals, number of doctors had a positive and significant effect on life expectancy, while district/city government health spending had no significant effect.

Research on health convergence has been widely carried out around the world, among others by Goli et al. (2019), Stańczyk (2016), and Maynou et al. (2014). However, similar research is rarely carried out in Indonesia. Previous studies were generally conducted at the national level, but this research was conducted at the provincial (regional) level because, in general, development policies are determined in each province (region). Research on the determinants of life expectancy has been carried out, among others by Bilas et al. (2014), Aidi et al. (2014), and Paripurna (2017). Meanwhile, research that analyzes the convergence of health development and the factors that influence health development has never been carried out in Indonesia, especially in North Sumatera Province. This study uses the Generalized Method of Moments (GMM) method to identify convergence and analyze the factors that influence health development. Based on previous descriptions, this study aims to identify the convergence of health development in North Sumatera Province and analyze factors that influence it.

METHODS

The data used in this study were secondary in the form of panel data, encompassing data from 33 districts/cities in North Sumatera Province for eight years from 2012 to 2019. Secondary data were obtained from the Central Statistics Agency of North Sumatera Province and the Health Office of North Sumatera Province. The variables used in this study were life expectancy (LE) as the dependent variable and seven independent variables, namely GRDP per capita, government spending on health, expected years of schooling, proper sanitation, health facilities, health resources, and immunization coverage.

Dynamic panel data analysis is used in this research as panel data analysis, using the Generalized Method of Moments (GMM) with the Sys-GMM approach. The dynamic relationship results in the emergence of endogeneity problems so that if the model is estimated with static panel data analysis, it will produce biased and inconsistent estimators (Firdaus, 2011). This is due to the lag of the dependent variable, namely life expectancy, as the independent variable in the model specifications.

The best GMM dynamic panel data models must meet three criteria. First, there is no bias, and the estimator must be between the fixed effect and pooled least square (PLS). Second, valid instruments are checked using the Sargan test. Third, it is consistent. If the m1 statistic shows that the null hypothesis is rejected, m2 shows that the null hypothesis is not rejected.

The model specifications used to test convergence hypothesis, and determinants of health development in North Sumatera Province is:

$$LE_{it} = \alpha + \beta_1 LE_{it-1} + \beta_2 \ln GRDP_{cap_{it}} + \beta_3 Govspending_{it} + \beta_4 EYS_{it} + \beta_5 San_{it} + \beta_6 Healthfac_{it} + \beta_7 Healthres_{it} + \beta_8 Immun_{it} + \varepsilon_{it}$$

The GMM model was used to identify conditional β convergence. The convergence process of health development occurs when the β_1 coefficient is less than one. According to Azijah et al. (2015), the rate of convergence velocity (λ) is expressed as $-\ln(\beta_1)$. According to Jan and Chaundhary (2011), the time needed to close the initial half gap (H) is calculated by the formula $\ln(2)/\lambda$.

RESULT AND DISCUSSION

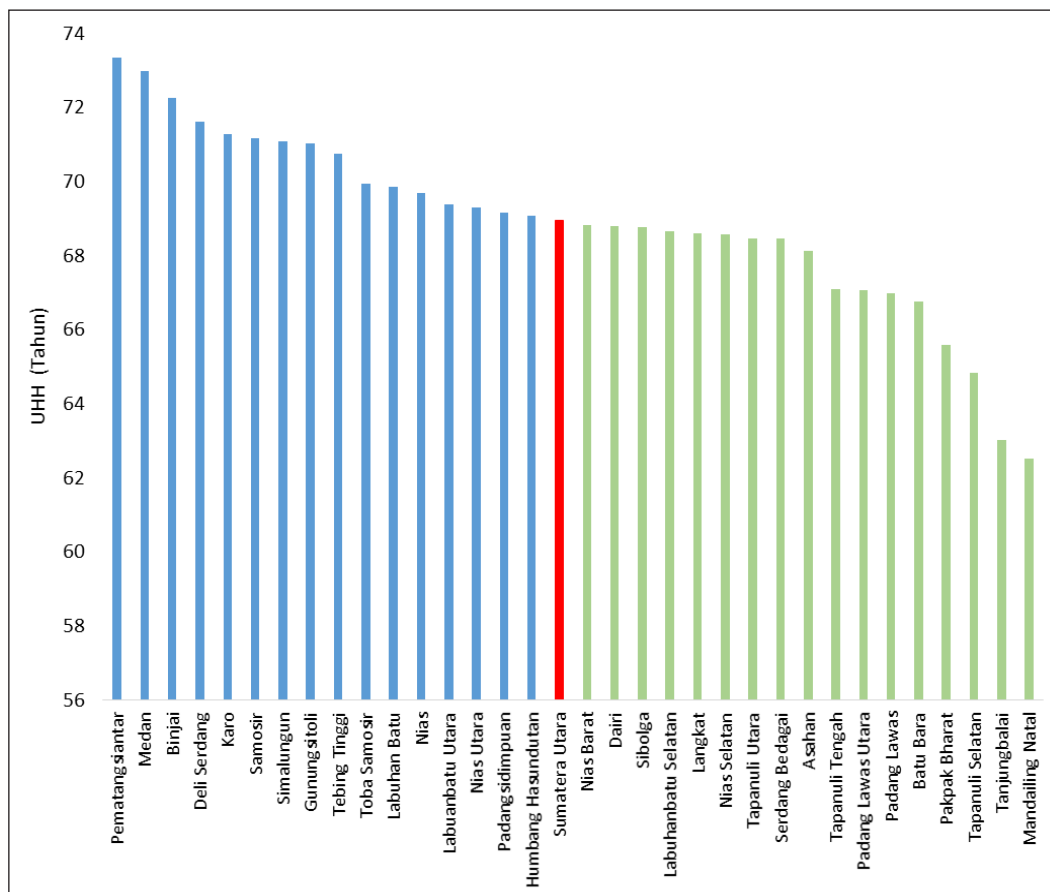
Life expectancy in North Sumatera Province in 2019 was 68.95 years, which increased by 1.14 points compared to 2012. It means a newborn baby who was born in 2019 has an opportunity to stay alive/survive until 69 years old on average. Life expectancy in North Sumatera Province continued to increase from 2012 to 2019. The same thing happened in districts/cities of North Sumatera Province.

As shown in Figure 4, 17 districts/cities (51.51%) have a life expectancy rate below the provincial rate. Pematang Siantar had the highest life expectancy (73.33) in North Sumatera Province in 2019, while Mandaliling Natal had the lowest one (62.51). The gap between them is 10.82 years. The target of life expectancy in the Medium-Term Development Plan in North Sumatera Province Year 2018-2023 is 70.00 years in 2023.

There are 9 districts/cities that have been able to achieve this target in 2019, namely Simalungun, Karo, Deli Serdang, Samosir, Pematangsiantar, Tebing Tinggi, Medan, Binjai, and Gunung Sitoli.

The GMM model with the Sys-GMM approach was used to identify convergence in health development in North Sumatera Province in estimating the dynamic panel data model. The best GMM model must meet three criteria, namely: First, unbiased. If the estimator is between the estimator Pooled Least Square (PLS) and Fixed Effect Models (FEM). The lag coefficient of dependent variables generated by PLS will be biased upward, while the lag coefficient of dependent variables generated from FEM will be downward biased. The estimated result of the lag coefficient of the dependent variable with Sys-GMM indicates a value of 0.9577. It is between the FEM (0.7897), and PLS (0.9915) estimates. This means that the resulting estimator is not biased.

Figure 4. Life Expectancy by Districts/Cities in North Sumatera Province Year 2019



Source: Central Statistics Agency (processed)

Second, consistent. The Arellano-Bond test is an autocorrelation test on the GMM approach to determine estimation consistency. In the Arellano-Bond test, $m(1)$ statistics showed that the null hypothesis was rejected ($p\text{-value} = 0.0013 < 0.05$), and $m(2)$ showed no rejection of the null hypothesis ($p\text{-value} = 0.1303 > 0.05$). Thus, it can be

concluded that the estimation of dynamic panel data with the Sys-GMM approach has been consistent.

Third, valid instrument. The Sargant test conducts the instrument validity test. If the Sargant test value is more significant than alpha 5%, then H_0 is accepted, which means that the instrument used in the study is valid and usable. The results obtained from the Sargan test show that the value is 0.9989, greater than alpha (0.05), then H_0 is accepted. It means that the instrument used in this study has been validated and can be used.

The test results of the best dynamic panel data model show that the criteria are not biased, consistent, and valid instruments have been met, which means that the dynamic panel data model used is already the best. The dependent variable lag coefficient (L1. LE) is worth 0.9577. The estimated parameter is statistically significant because of the probability value of 0.0000, with the standard error value of 0.0186.

The dependent variable lag coefficient (β_1) is 0.9577 or less than 1, indicating that the conditional β convergence of health development persists among districts/cities in North Sumatera Province. This demonstrates that areas with lower life expectancy have faster growth to catch up with areas with higher life expectancy rates. Convergence reduces the gap between regions. Thereby, health development becomes more evenly distributed. It indicates a decrease in health inequalities during the analyzed period. Jamison et al. (2013) stated that achieving convergence would prevent about 10 million deaths by 2035 in low- and middle-income countries. Goli et al. (2019) stated that reduction in mortality reflects improvements in the health and well-being of populations. The convergence of health development in North Sumatera Province will reduce mortality rates so that the highest degree of public health can be achieved.

Table 1. Summary of Best Dynamic Panel Data Model Test Results

Test	Value	Probability
LM Test		
m1	-3.21	0.0013
m2	-1.51	0.1303
SarganTest	31.86	0.9989
L1. LE		
PLS	0.9915	0.0000
Sys-GMM	0.9577	0.0000
FEM	0.7897	0.0000

Currently, Indonesia, including the Province of North Sumatera, is still facing the threat of a double burden of disease where the trend of non-communicable diseases (NCD) is increasing every year while infectious diseases are still not wholly overcome, such as tuberculosis, HIV/AIDS, malaria, and so on. This is further exacerbated by the

emergence of a new disease (New Emerging Disease) at the end of 2019, known as Corona Virus Disease (Covid 19). In March 2020, WHO declared this incident a pandemic and ongoing. This pandemic occurred throughout the world, including Indonesia, resulting in a health crisis that increased morbidity and mortality rates.

Previous studies conducted by Gachter and Theurl (2011), Maynou et al. (2014), Goli et al. (2013), Hembram and Halder (2014), Stańczyk (2016), and Goli et al. (2019) have also found health convergences. In general, studies of health convergence use life expectancy and infant mortality rates as health variables. The convergence speed of health development in North Sumatera Province is 4.32 percent. With this rate of convergence speed, the half-life is about 16.04 years *ceteris paribus*. This convergence speed is faster when compared to the convergence speed in Stańczyk (2016)), which found convergence at a speed of 1.16 percent per year, with the half-life being about 60 years in the European Union.

The convergence model in Table 2 provides information on factors affecting health development in North Sumatera Province. Based on the convergence estimates, GRDP per capita, education, proper sanitation, health facilities, and immunization coverage variables have a significant effect on health development in North Sumatera Province. GRDP per capita has a positive and significant effect on health development in North Sumatera Province at a significance level of 0.05. A positive influence of GRDP per capita on health was found in many studies, among others conducted by Bilas et al. (2014), Delavari et al. (2016), Paripurna (2017), and Miladinov (2020). Clark (2011) stated that GRDP per capita exerts significant positive effects on a country's life expectancy average, but it more effectively improves life expectancy among poorer nations than among wealthier nations. Bayati et al. (2013) stated that income affects people's lives and is a major socio-economic factor affecting health. Therefore, health development conducted in North Sumatera Province should pay more attention to economic factors, namely income. The higher a person's income, the more person's spending on health. Thus, it will contribute to the improvement of health status.

Table 2. Estimation of Life Expectancy Convergence Model of North Sumatera Province with Sys-GMM Dynamic Panel Data Method

Variable	Coefficient	Standard Error	P-Value
LE L.1	0.957699	0.01865	0.000
ln Grdp per capita	0.225988	0.07607	0.003
government spending on health	- 0.000141	0.00014	0.330
EYS	0.135768	0.02301	0.000
sanitation	0.002758	0.00074	0.000
health facility	0.087683	0.00216	0.000
health resources	- 0.000013	0.00002	0.567
immunization	0.002417	0.00033	0.000
Convergence speed	0.04322		
Half-life	16.037		

Education, which was represented by the expected years of schooling in this study, is a variable that gives the most considerable influence on life expectancy. The positive influence of education on life expectancy is in line with previous studies that have been conducted, yet using different variables as a proxy of education. Ali et al. (2016) exploited school participation figures while Delavari et al. (2016) engaged literacy figures, and Bayati (2013) utilized the education index. In general, people with higher education have access to better health information, so it tends to apply it to achieve better health conditions.

Proper sanitation has a positive and significant effect on life expectancy. This is matched with research conducted by Pratiwi and Wibowo (2016) and by Kustanto (2015). North Sumatera Province still has 12 districts/cities with the percentage of households with proper sanitation below 50%. During 2015-2019, the percentage of households who have access to proper sanitation in North Sumatera Province continued to increase. However, the increase has slowed since 2017. Sanitation is one of the most common health problems in developing countries. The availability of proper sanitation must be continuously enhanced because it is related to increasing the quality of environmental health, which is one of the most influential factors to health degree improvement.

Health facilities, represented by the number of primary health care, have a positive and significant effect on health development in North Sumatera Province at the significance level of 0.05. This follows research conducted by Paripurna (2017) and Aidi et al. (2014), which found that health facilities significantly affect life expectancy. Primary Health Care is the first level of health facilities that are most accessible for the community because of its availability up to the sub-district level. People who experience health complaints can check themselves to the nearest health center. Thus, the health problems experienced might be resolved more quickly.

In general, the fulfillment of primary health care needs can be seen from the ratio of Primary Health Care to sub-districts. The ratio of Primary Health Care to sub-districts in North Sumatera Province in 2019 was 1,33. This illustrates that the ideal ratio of Primary Health Care to sub-districts, namely 1 Primary Health Care in 1 sub-district, has been fulfilled. The ratio of Primary Health Care per sub-district can describe the condition of public accessibility to primary health services (Dinkes Sumut 2019). Putri (2015) states that if the addition of health facilities and services is not accompanied by improvements in the service system equal distribution of facility affordability per 100 000 population in each region, the additional output expected to increase health status will not be optimal.

Immunization coverage has a positive and significant effect on health development in North Sumatera Province at a significance level of 0.005. These results follow previous studies conducted by Paripurna (2017) and Aidi et al. (2014). According to data obtained from the Provincial Health Office of North Sumatera in 2019, 4.922 out of 6.133 existing villages are Universally Child Immunization (UCI). This achievement has not met the target of 83% following the Strategic Plan of the Provincial Health Office of North Sumatera. Therefore, the Province of North Sumatera must continue to strive to

improve its immunization coverage to meet the target that has been set, in line with the results of research that enhancing immunization coverage has a significant effect on improving health development in North Sumatera Province.

Government spending on health has no significant effect on life expectancy. This finding differs from Sihaloho (2016) and Sari et al. (2016) research. The proxy of government spending in the health sector used in this study is the percentage of health sector budgets to the total regional budgets and expenditures (APBD). Article 171 paragraph (2) of Law Number 36 of 2009 on Health states that the government's health budget, district/city, is allocated at least 10 percent of the regional budgets and expenditures (APBD) beyond salary. However, the health budget data used in this study still include the salary component.

Human resources, represented in this study by the number of doctors and midwives for each district/city, also have no significant effect on life expectancy. This could be due to the uneven distribution of health workers in each district/city of North Sumatera Province. This result differs from previous research conducted by Paripurna (2017) and Kristanto et al. (2019). In line with this study, Tanadjaja et al. (2017) found that the ratio of general practitioners and the ratio of nurses per 10.000 inhabitants had no significant effect on life expectancy in Papua

Health problems are complex problems because they can be influenced by many health-related factors and factors outside the health sector. The results showed that the main factors affecting health development in North Sumatera Province are socio-economic factors. Therefore, health development in North Sumatera Province must address these issues and be implemented across sectors, involving other sectors outside the health sector; thus, health development aims to improve the level of public health as high as possible.

CONCLUSION

Based on the analysis of results that have been presented, some conclusions can be drawn. First, the convergence of health development in North Sumatera Province occurred during 2012-2019, with a convergence rate of 4.32 percent and the half-life being about 16.04 years. Second, determinants of health development in North Sumatera Province in 2012-2019 are GRDP per capita, expected years of schooling, sanitation, health facilities, and immunization, where all of those variables have a positive effect.

The government must carry out cross-sectoral cooperation, especially in the social and economic sectors, to accelerate the convergence process of health development in North Sumatera Province. In order to improve the health development achievements, the government needs to increase promotive and preventive health efforts because, in line with the results, sanitation and immunization coverage have a positive effect on health development in North Sumatera Province. In addition, it is also necessary to increase the health sector budget, especially for activities that directly impact public health, so that it can have a positive influence on health development in North Sumatera Province.

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The Impact of Monetary Policy and International Trade on Economic Growth and Inflation in ASEAN-4 Countries

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Abstract

Economic growth and price stability are the main goals of macroeconomics, among other goals. The central bank can influence the economy to achieve the desired condition through its monetary policy. This study aims to analyze the effect of monetary policy and international trade on economic growth and inflation in four ASEAN countries (Indonesia, Malaysia, the Philippines, and Thailand), using panel data analysis and vector autoregression. The impulse response results show that monetary policy with an interest rate policy instrument hurts economic growth in the short run and is positive in the long run. In the short run, an expansionary monetary policy has effectively accelerated economic growth, vice versa. International trade positively affects economic growth in ASEAN-4 countries in the short run and vice versa in the long run. Panel data analysis shows a price puzzle regarding the effect of interest rates on inflation. Likewise, the effect of international trade on inflation shows a positive influence. An increase in exports encourages an increase in aggregate demand and prices. The implications of the results of this study are the need for policy coordination monetary policy, trade policy, and policy in the real sector so that the effectiveness of monetary policy increases.

Keywords:

economic growth, inflation, monetary policy, international trade

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INTRODUCTION

The economy will experience a boom or recession in line with the business cycle: aggregate demand increases and drives prices up (Mankiw, 2010). High economic growth will ultimately hamper ongoing growth if not accompanied by price stability policies. How monetary policy promotes economic growth within price stability is an interesting discussion. As the monetary authority, the central bank faces obstacles in maintaining price stability by taking into account sustainable economic growth. The determinant of inflation is the supply and demand sides. Monetary policy stance through interest rates faces challenges in maintaining price stability because interest rates affect the economy from the demand side (Mishkin, 2016). Various studies that have been conducted related to the effect of monetary policy on economic growth show different results.

The central bank can carry out comprehensive monetary policy by increasing the money supply or lowering policy interest rates. An increase in the money supply (a decrease in interest rates) will cause an increase in prices because people hold large amounts of money, which encourages increased domestic demand. Empirical studies by Nouri & Samimi (2011) in Iran, Onyeiwu (2012) in Nigeria, and Mahendra (2008) in Indonesia show that there is a positive effect of expansionary monetary policy on economic growth. Amrini et al. (2014) shows that an expansionary monetary policy driving inflation. Another research by Herlina (2013), Maslan (2017), Astuti & Hastuti (2020) in Indonesia, Albu (2006) in Romania, and Obamuyi (2009) in Nigeria also found that monetary policy with an interest rate instrument was able to influence economic growth through its influence on investment and maintain price stability. However, a different result was shown by Amarasekara (2008) study, which found that contractionary monetary policy could not contain the inflation rate in Sri Lanka.

In a global era, a borderless world causes economic openness to influence economic growth and inflation. The broader market encourages economic growth that can disrupt price stability. In an increasingly integrated world economy, a country that is successful in its economy is a country that has succeeded in rapidly encouraging and maintaining the existence of international trade (Krugman, 2011). International trade is increasing due to the ease of transportation and information technology. Many benefits will be obtained through international trade, including obtaining goods that cannot be produced at home, benefiting from specialization, and technology transfer (Makhmutova & Mustafin, 2017; Elias et al., 2018). However, international trade can become an obstacle to high economic growth if a growing number of imports is not accompanied by an increase in exports with a flat growth rate (Ijirshar, 2019). Reduced national income due to an increase in imports is more significant than the increase in national income due to an increase in exports will cause a decline in economic growth.

The positive relationship between international trade and economic growth is explained by the efficiency effect from rent-seeking decreased and the benefits derived from external and internal economies of scale from international trade liberalization (Rodriguez & Rodrik, 2001). This efficiency effect is considered the primary source of long-term economic

growth from the new or endogenous growth theory, which predicts international trade and investment in physical capital and human capital can increase economic growth (Mogoe & Mongale, 2014). International trade can increase product market share, investment efficiency, and positive externalities for firms (Sun & Heshmati, 2010). An outward-oriented trade policy will specialize in economic sectors with economies of scale to increase efficiency through research and development, human capital accumulation, or learning by doing. This efficiency will encourage economic growth (Solomon & Tukur, 2019).

Meanwhile, a study conducted by Fitriani (2019) proves that international trade, in this case, exports, positively influences economic growth. Likewise, with a study conducted by Solomon (2007). The data used in Indonesia's aggregate data from 1980 to 2006 covering gross domestic income, real exports, real imports, the real exchange rate of the rupiah against the dollar, the number of workers, and the crisis that hit Indonesia, with the ARDL (Autoregressive Distributed Lag) method. Real exports and real imports positively affect economic growth in the long term. The openness of international trade also boosts economic growth (Keho, 2017; Sun & Heshmati, 2010) and decreases inflation in various countries (Leibovici, 2019; Gilchrist & Zakrajsek, 2019; Mishra & Topalova, 2007). Meanwhile, Moyo et al. (2017) and Elias et al. (2018) show that international trade cannot drive economic growth in Nigeria. The results of this study are supported by research by Aziz (2010) and Arslan et al. (2019), where trade openness encourages more imports to inhibit economic growth and impact inflation.

Research related to monetary policy and international trade on economic growth and inflation has not shown consistent results over time. Research by Astuti & Hastuti (2020) in Indonesia, Awad (2011) in Egypt, and Adeoye & Shobande (2017) in Nigeria found that expansive monetary policy with an interest rate instrument promotes growth. However, Amarasekara (2008) found that contractionary monetary policy is not effective in curbing the inflation rate in Sri Lanka. The openness of international trade as an engine of growth (Keho, 2017; Sun & Heshmati, 2010) decreases inflation in various countries (Leibovici, 2019; Gilchrist & Zakrajsek, 2019; Mishra & Topalova, 2007). However, other studies have shown different results. International trade will drive economic growth (Elias et al., 2018; Moyo et al., 2017), where trade openness encourages imports to inhibit economic growth and impact inflation (Aziz, 2010; Arslan et al., 2019).

This study fills the research gap by combining factors that affect economic growth and inflation, in previous studies only analyzing factors that affect economic growth (Akinwale & Grobler, 2019; Kallianiotis, 2019; Olamide et al., 2019a; Olamide et al., 2019b; Okoro et al., 2020; Solina & Ocampo, 2020) and inflation (Dua & Goel, 2021; Temitope, 2020; Tung, 2021) separately. In addition, this study uses panel data autoregression vector analysis, where previous research only focused on time series data analysis (Tadesse & Melaku, 2019; Tahir & Hayat, 2020; Tulasi, 2021) or panel data analysis (Younsi & Nafla, 2019; Okoro et al., 2020). This study will re-confirm whether the monetary policy stance through interest rates is the right instrument in maintaining price stability and encouraging economic growth, particularly in Indonesia, Malaysia, the Philippines, and Thailand. Likewise, the more open the economy, whether to encourage

economic growth through the expansion of the export market or hamper economic growth because the economy is flooded with imported goods which will reduce domestic production.

METHODS

The data used is panel data consisting of the countries of Indonesia, Malaysia, the Philippines and Thailand with a time series of quarterly years for the period 2008.Q1-2019.Q4. This study uses two panel data models as follows:

$$\text{Model 1} \quad \text{growth}_{it} = \alpha_0 + \alpha_1 \text{ir}_{it} + \alpha_2 \text{trade} + e_{it}$$

$$\alpha_1 < 0; \alpha_2 \neq 0$$

$$\text{Model 2} \quad \text{inf}_{it} = \beta_0 + \beta_1 \text{ir}_{it} + \beta_2 \text{trade} + \varepsilon_{it}$$

$$\beta_1 < 0; \beta_2 \neq 0$$

Where growth denotes economic growth (in percent), inf is inflation (in percent), ir is the central bank's interest rate (in percent), trade is the number of exports and imports (percentage of Gross Domestic Product), i is countries (Indonesia, Malaysia, Philippines, and Thailand), and t is a quarterly time series.

There are three models, the Pooled Least Square (Common Effect) method, the Fixed Effects model, and the Random Effects model. A testing stage is running to determine the most appropriate technique for estimating panel data regression, Chow test to choose between the Pooled Least Square (common) methods or the Fixed Effects technique. The second is the Hausman Test to choose between Fixed Effects or Random Effects techniques (Gujarati & Porter, 2009).

In addition to using panel data analysis, this study uses analysis Vector Autoregressive (VAR) because VAR is equipped with an impulse response, the response of endogenous variables due to innovations (surprises) from other endogenous variables. By using impulse response analysis, the impact of changes in one of the independent variables can be simulated on future fluctuations in the dependent variable. VAR will only produce a reasonable estimate of the overall data used is stationary. Suppose the data is not stationary and VAR estimated at the level without including cointegration restrictions. In that case, the result will make parameters estimated in VAR are consistent, but parameter estimates are inefficient because information about the cointegration is ignored (long term relationship). An alternative solution is to use the Vector Error Correction Model (VECM) to produce more precise and efficient parameter estimates (Gujarati & Porter, 2009; Gujarati, 2012). The VAR model in this study is as follows:

Model 3:

$$\text{growth}_{it} = \sum_{j=1}^n \alpha_i \text{ir}_{it-j} + \sum_{k=1}^n \alpha_j \text{trade}_{it-k} + e_{it}$$

$$\text{ir}_{it} = \sum_{j=1}^n \alpha_i \text{growth}_{it-j} + \sum_{k=1}^n \alpha_j \text{trade}_{it-k} + e_{it}$$

$$\text{trade}_{it} = \sum_{j=1}^n \alpha_i \text{growth}_{it-j} + \sum_{k=1}^n \alpha_i \text{ir}_{it-k} + e_{it}$$

Model 4:

$$inf_{it} = \sum_{j=1}^n \alpha_i ir_{it-j} + \sum_{k=1}^n \alpha_j trade_{it-k} + e_{it}$$

$$ir_{it} = \sum_{j=1}^n \alpha_i inf_{it-j} + \sum_{k=1}^n \alpha_j trade_{it-k} + e_{it}$$

$$trade_{it} = \sum_{j=1}^n \alpha_i inf_{it-j} + \sum_{k=1}^n \alpha_i ir_{it-k} + e_{it}$$

RESULT AND DISCUSSION

The results of the stationarity test at the level of data or I (0) in Table 1 show that the variables of economic growth (growth) and international trade (trade) are significant at the significance level (α) of 5 percent. This is indicated by the statistical probability value of ADF, which is smaller than 0.05 ($\alpha = 5\%$), meaning that the variable does not have a unit root, or it can be said that the data is stationary. Other variable data such as inflation (inf) and monetary policy interest rate (ir) have not shown data stationarity at the level. Thus, to find out the inflation variable data and policy interest rate will be stationary at what degree the next test stage is needed, the integration degree test at the first difference of degree one, I (1).

Table 1. Unit Root Test, I(0)

Variable	Probability ADF statistic
growth	0.0135*
inf	0.0776
ir	0.8586
trade	0.0421*

Note: * Significant at $\alpha = 5\%$

The results of the integration degree level I (1) test in table 2 show that the inflation (inf) and the monetary policy interest rate (ir) have been stationary at the level first difference, where the statistical probability value of ADF is smaller than 0.05. ($\alpha = 5\%$).

Table 2. Unit Root Test, I(1)

Variable	Probability ADF statistic
inf	0.0000*
ir	0.0000*

Note: * Significant at $\alpha = 5\%$

Cointegration testing was carried out to obtain long-term relationships between variables. The relationship that affects each other is seen through the cointegration of each variable itself. If there is cointegration between variables, then the relationship affects each other as a whole, and information is spread in parallel. The cointegration test model I using the Johansen method in table 3 shows three linear combinations of the model's

variables with a (long term) cointegration relationship. This can be seen from the Fisher probability value statistic.

Table 3. Results of Cointegration

Hypothesized.	Fisher Stat.*		Fisher Stat.*	
No. of CE(s)	(from trace test)	Prob	(from the max-eigen test)	Prob
Model I				
None	48.87	0.0000	37.21	0.0000
At most 1	21.16	0.0067	18.09	0.0205
At most 2	15.88	0.0441	15.88	0.0441
Model II				
None	26.88	0.0007	20.16	0.0097
At most 1	14.09	0.0795	10.96	0.2042
At most 2	15.31	0.0535	15.31	0.0535

Model II cointegration test results in Table 3 using Johansen, it appears that the value of statistical probability Fisher is smaller than 0.05 ($\alpha = 5\%$) at the Ho of None. This means an independent linear combination of the variables contained in the model. The alternative hypothesis that there is an integration relationship is acceptable.

The length test was optimum lag carrier out to eliminate the autocorrelation problem. So that by performing the optimum lag test, it is expected that autocorrelation problems will not arise. Determination of the optimum lag uses several information criteria as follows: Likelihood Ratio (LR), Schwarz Criterion (SC), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Hannan Quinn (HQ).

So, according to the results of the optimum lag test in model I, which is summarized in table 4, it shows that Schwarz Criterion (SC) has a grace period of one with a significance level of 5%, Hannan Quinn (HQ) has a grace period of two at a significance level of 5%. In contrast, Likelihood Ratio Test (LR), Final Prediction Error (FPE), and Akaike Information Criterion (AIC), Hannan Quinn (HQ) has a grace period of five at the 5% significance level. Thus, this study will use lag the optimum 5.

Based on the results of determining the optimum lag of Model II in table 4, at lag optimum 1, two criteria are proposed, namely Schwarz Criterion (SC) and Hannan Quinn (HQ). The rest shows the five of lag optimum, namely the Likelihood Ratio (LR), Final Prediction Error (FPE), and Akaike Information Criterion (AIC). Then, this research will use the lag optimum 5.

Impulse Response Function is a method used to determine the response of an endogenous variable to a shock particular. Because the shock of the instance variables-i affects the variables-i was alone but transmitted to all other endogenous variables through the dynamic structure or the structure of lag thein the VAR. In other words, IRF measures

the effect of a shock on the innovation of endogenous variables at that time and in the future. Meanwhile, IRF aims to isolate a shock to be more specific, which means that a variable can affect by shock a particular shock. If a variable cannot affect by shock, then the specific shock is not known, but shock in general.

Table 4. Determination of Optimum Lag

Model I						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-905.1997	NA	292.0688	14.19062	14.25746	14.21778
1	-340.6878	1093.742	0.049647	5.510747	5.778125*	5.619384
2	-325.2599	29.16835	0.044915	5.410312	5.878223	5.600426*
3	-315.9907	17.09020	0.044754	5.406104	6.074549	5.677697
4	-300.2677	28.25222	0.040338	5.301058	6.170036	5.654128
5	-285.9162	25.11517*	0.037170*	5.217440*	6.286952	5.651988
6	-280.7131	8.861468	0.039548	5.276768	6.546812	5.792793
7	-278.3868	3.853032	0.044058	5.381043	6.851621	5.978547
8	-277.8539	0.857635	0.050538	5.513342	7.184453	6.192323
Model II						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-864.2003	NA	153.9110	13.55000	13.61685	13.57716
1	-240.6199	1208.187	0.010395	3.947185	4.214563*	4.055822*
2	-227.7899	24.25667	0.009794	3.887342	4.355253	4.077457
3	-215.8329	22.04566	0.009358	3.841139	4.509584	4.112732
4	-211.9294	7.014089	0.010145	3.920772	4.789750	4.273842
5	-188.4104	41.15834*	0.008101*	3.693912*	4.763423	4.128460
6	-182.9138	9.361320	0.008580	3.748653	5.018698	4.264679
7	-175.5374	12.21713	0.008833	3.774022	5.244601	4.371526
8	-167.9005	12.29075	0.009067	3.795320	5.466431	4.474301

Note: * Significant at $\alpha = 5\%$

The response of economic growth to shock monetary policy can be seen in Figure 1a, were from the first to the second period, it has decreased and shows a negative trend. In the third period, the response of economic growth to the shock of monetary policy increased but remained on a negative trend. Then in the fourth period, it declined again. Nuru (2020) obtained the same result, an increase in interest rate will be responded to by an increase in economic growth. In the short term, expansionary monetary policy is effective in stimulating output. In the fifth period, it began to increase. Then, the sixth period increased and showed a positive trend. In the seventh

period, it experienced a decline. However, it was still on a positive trend. However, in the tenth period, the response to economic growth due to monetary policy shock disappeared. In the long term, monetary policy through changes in policy interest rate instruments is no longer effective in driving output increases. This result is by Kallianiotis' research (2019) in the United States, the decline in the benchmark interest rate has no impact on actual output, especially in the post-global crisis period where interest rates are close to zero.

Figure 1. IRF Model I

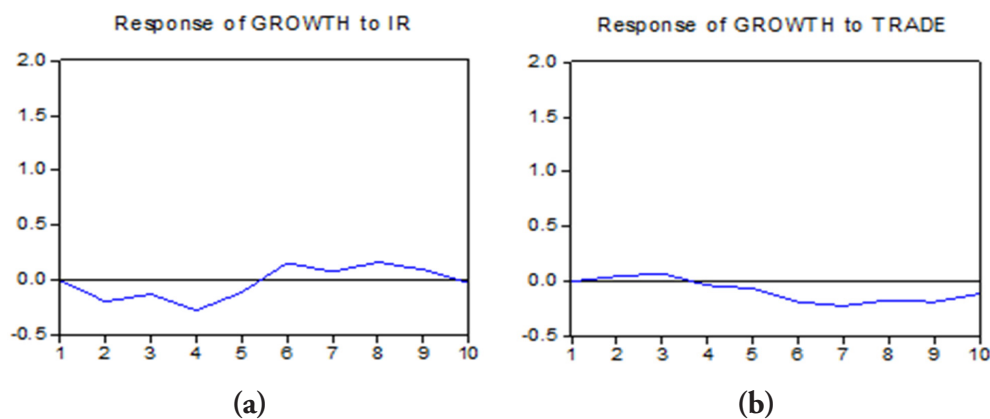
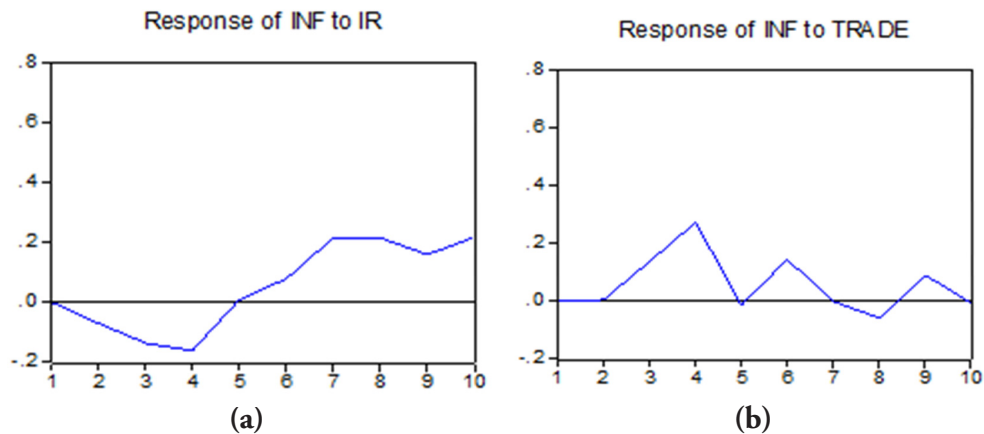


Figure 1 shows the responses of economic growth to international trade shocks. The responses are positive trends from the first to the third period. In the fourth to seventh period, it has decreased until the trend of response to economic growth was negative. In the eighth period, it increased to the tenth period, but the response of economic growth to international trade still showed a negative trend. In the short term, economic openness reflected in the increase in international trade will encourage economic growth, but not long term. Economic openness worsens the economy in the four ASEAN countries. The inability of international trade as an engine of growth is due to the dominance of imported goods in the local market and the high dependence on imported raw materials. The study of Okoro et al. (2020) found that trade between Economic Community of West African States (ECOWAS) countries can encourage economic growth in the region, but international trade of ECOWAS countries with the world has no effect on economic growth. The same result is shown by Akinwale & Grobler (2019), international trade affects economic growth in South Africa in the short term. Younsi & Naffa's (2019) study shows that economic openness can encourage economic growth in developed countries but not in developing countries. Research by Raza et al. (2018) in the United Arab Emirates shows that exports positively affect economic growth. However, imports harm economic growth, and Tahir & Hayat's (2020) research shows a positive effect of trade openness on economic growth in Brunei Darussalam.

Figure 2. IRF Model II



The inflation response to shocks monetary policy in the first to fourth periods decreased with a negative trend because the IRF line was below the horizontal line. It is increasing and shows a positive trend, at the fifth to the seventh period. In the eighth period, it was relatively stable, showing no change. In the ninth period, it experienced a decline, but the trend still showed positive, and in the tenth period, it experienced a positive trend again (Figure 2a.). This study indicates that in the first five periods, the contractionary monetary policy effectively overcame the problem of inflation, where an increase in policy interest rate could reduce inflation. However, in a more extended period, where the economy has experienced adjustment, contractionary monetary policy becomes counterproductive because the increase in interest rate drives inflation higher.

An increase in policy interest rate can reduce inflation in the short term, but there is a price puzzle in the long term. This result follows Nuru (2020). The contractive monetary policy effectively restraining the inflation rate, but if this policy is carried out in the long term, it will encourage higher inflation. An increase in interest rate means an increase in the cost of capital which will cause a decrease in company profits. Companies that want to keep profits at the same level will charge higher product prices. Dua & Goel (2021) show a long-term relationship between inflation and the factors that influence it, including the interest rate. A determinant of inflation from the supply side implies that the monetary policy stance through interest rate may reduce its effectiveness in the long term because the cause of inflation does not only come from the demand side. Macroeconomic policy coordination between monetary policy and policy in the real sector is a must to maintain price stability, in addition to the importance of maintaining public expectations of inflation (Tulasi et al., 2021). Other studies show the same result, and monetary policy can influence inflation (Tung, 2021). However, Temitope (2020) shows different results, where interest rates have no effect on inflation in South Africa.

The inflation response to shock the international trade in the first to second periods experienced a positive trend because the IRF line was right on the horizontal line (Figure 2b). The inflation response to international trade shock has increased positively in the second to fourth periods. Then the inflation response fell back in the fifth period giving

a negative trend. In the sixth period, the inflation response to shock the international trade increased again with a positive trend. Furthermore, in the seventh to eighth period, the inflation response to the shock of international trade has decreased by showing a negative trend, again increasing in the ninth period towards a positive trend. Inflation tends to respond positively to economic openness. The broader market causes an increase in aggregate demand and prices. In Leibovici's research (2019), an open economy has a more robust response to inflation expectations than a closed economy. The Gilchrist & Zakrajsek (2019) study in the United States found different results that an increase in international trade reduced price fluctuations. Based on the test results with the Chow test models I and II (Table 5), it can be seen that the probability value of cross-section F is 0.0000, meaning that H_{0is} is rejected or H_a accepted. In the chow test, H_a is the Fixed Effect Model.

Table 5. Chow Test Results

Model I				Model II			
Redundant Fixed Effects Test				Redundant Fixed Effects Test			
Equation: EQ01_GROWTH				Equation: EQ02_INF			
Test cross-section Fixed Effects				Test cross-section Fixed Effects			
Effects Test	Statistic	d.f	Prob	Effects Test	Statistic	d.f	Prob
Cross-Section F	10.072041	(3,154)	0.0000	Cross-section F	13.118147	(3,154)	0.0000
Cross-Section Chi-Square	28.665128	3	0.0000	Cross-section Chi-square	36.411583	3	0.0000

The role of monetary authorities in maintaining financial stability, monitoring the capital flows, and sustaining economic growth becomes more challenging, especially after the excellent inflation period of 1970-1980 and the global financial crisis of 2007. Besides the additional challenges and triple mandate to maintaining the price and the financial and economic stability, containing inflation remains the most vital task. Maintaining price stability by containing inflation to a moderate rate has often been considered the most essential responsibility of central banks and monetary authorities. In pursuit of price stability, several countries have adopted the strategy of explicit inflation targeting (Pham et al., 2020).

After the chow test was carried out with the results that the Fixed Effect Model was the appropriate model for panel data regression, and then do the Hausman Test. The test determines whether the Fixed Effect Model or the Random Effect Model is most appropriate. Based on the test results with the test Hausman (table 6) for the model I show that the Chi-Square probability value is 0.1236, meaning that H_{0is} is accepted. Thus, H_a is rejected, so the Random Effect Model is appropriate for this panel data test. Model II shows that the Chi-Square probability value is 0.0000, meaning that H_{0is} is rejected. Then, the suitable model for this panel data of Model II is the Fixed Effect Model.

Table 6. Hausman Test Results

Model I				Model II			
Correlated Random Effects - Hausman Test				Correlated Random Effects - Hausman Test			
Equation: EQ01_GROWTH				Equation: EQ02_INF			
Test cross-section Random Effects				Test cross-section Random Effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.	Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	4.181206	2	0.1236	Cross-section random	28.353731	2	0.0000

Based on testing the monetary policy rate variable on economic growth, the probability value of the t-statistic is 0.0109 percent, and the coefficient value is negative, meaning that any change in the reference interest rate affects economic growth. As for the variable international trade on economic growth, the probability value of t-statistic is 0.7189 percent, so any changes in international trade do not affect economic growth (see table 7).

Table 7. Random Effect Model I and Fixed Effect Model II

Model I Dependent Variable: Economic Growth			Model II Dependent Variable: Inflation		
Variable	Coefficient	Probability t-statistic	Variable	Coefficient	Probability t-statistic
ir	-0.625686	0.0109*	ir	0.570458	0.0003*
trade	-0.021289	0.7189	trade	0.260935	0.0000*

Note: * Significant at $\alpha = 5\%$

The regression results of the monetary policy rate have a significant influence on economic growth with a regression coefficient of -0.625686, meaning that every 1 percent increase in the reference interest rate will result in a decrease in economic growth. By -0.62 percent. This means that every central bank raising interest rate will reduce economic growth because by increasing the reference interest rate, people will reduce consumption, preferring to save, and reduce credit loans to banks because of higher interest rates so that consumption and investment will decrease. Meanwhile, the international trade variable has no significant effect on economic growth, meaning that there is no effect when there is an increase or decrease in international trade on economic growth. Developing countries tend to have a small market share in the global market. The economy is driven more by the domestic market, so economic openness does not significantly impact output. The results of this panel data analysis support the research of Younsi & Nafla (2019).

The test of the reference interest rate variable on inflation shows that the probability value of the t-statistic is 0.0003 percent, and the coefficient value is positive, meaning that every change in the reference interest rate affects inflation (table 7). In the international

trade variable on inflation, the probability value of t-statistic is 0.0000 percent, meaning that every change in international trade has a significant effect on inflation.

The regression coefficient of the monetary policy rate is 0.570458, meaning that every 1 percent increase in the reference rate will result in a change in the increase in inflation of 0.57 percent. This means that each central bank increases the policy rate, followed by an increase in inflation. The regression coefficient for international trade is 0.260935, meaning that every 1 percent increase in international trade will result in changes in the increase in inflation of 0.26 percent. When an increase in international trade, export, and imports affects domestic prices, it can increase prices. This study is in line with Leibovici's (2019) research but differs from Aron & Muellbauer (2007) research, where an increase in trade openness causes a decrease in the average inflation rate in South Africa.

From the policy perspective, the spillover effects of the global monetary policy shocks, if not properly understood and effectively managed, could pose difficulties to the domestic policy design in emerging economies as it can disrupt capital flows (Han & Wei, 2018). The study of the transmission of international monetary policy shock to emerging countries is not new. The literature shows that these shocks are transmitted to these economies through well known financial and trade channels, including interest rate, exchange rate, domestic credit, and asset price (Tumala et al., 2021). Adjustment to domestic and global economic conditions must be the primary concern of the central bank in order to maintain economic stability and promote sustainable economic growth. In an increasingly open economy, it causes a decrease in the effectiveness of monetary policy (Douch, 2019). The central bank is directed to use a price targeting policy framework to maintain price stability and encourage economic growth.

CONCLUSION

The study shows that the effectiveness of monetary policy in influencing output and prices in the four ASEAN countries only applies in the short term. The central bank can actively implement monetary policy to stimulate economic growth and overcome inflation. However, these policies cannot be long-term because they can be counterproductive, which will worsen the economy. International trade affects economic growth in the four ASEAN countries in the short term but not in the long term. An outward-looking-oriented policy can be a policy strategy that can encourage economic growth. However, an increasingly open economy will also increase market opportunities for imported goods in the long term. Increasing the competitiveness and efficiency of domestic production is the main requirement so that economic openness does not worsen the economy in the long term.

International trade variables concern examining exports and imports individually. An increasingly open economy, seen from the indicator of an increase in the share of international trade to GDP, shows a positive impact on economic growth in a relatively short time but can cause an increase in inflation. International trade policies are needed to increase the competitiveness of local products in the international market by considering the availability of local raw materials to limit the demand for imported goods, leading

to price increases. Research variables are more concerned with the monetary policy transmission channel through the interest rate channel, where the policy interest rate will transmit to the real sector through the money market and banking interest rates. Further research can develop the models by adding variables and research objects not to be limited to only four countries in ASEAN.

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The Effect of Asthma and Acute Respiratory Infections in Childhood on Educational Attainment in Indonesia

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Abstract

Asthma and Acute Respiratory Infections (ARI) is one of the most chronic respiratory diseases children suffer. According to the Global Initiative for Asthma (GINA) in 2018, the prevalence rate of asthma is between 1-18 percent of the total population in each country. This study aims to analyze the effect of childhood-asthma and ARI history on educational attainment. We use data from Indonesia Family Life Survey (IFLS) wave 1993 and 2014. The Ordinary Least Square (OLS) regression method was used to assess that effect. The results indicate childhood-asthma and ARI history do not affect a person's educational attainment in adulthood.

Keywords:

early health; asthma; educational attainment.

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INTRODUCTION

Childhood is a period full of great opportunities and challenges for individuals to live, learn, grow to achieve their highest potential (WHO, 2019). Poor health during childhood can disrupt the learning process so that individuals prevent achieving this potential. According to the World Health Organization (2007), chronic respiratory diseases among children, including asthma and acute respiratory infections (ARI), have increased in almost all countries globally, and more than 50 percent of sufferers live in a middle-income country.

Referring to the Global Initiative for Asthma (GINA, 2018), asthma is a heterogeneous disease usually characterized by chronic airway inflammation. Furthermore, asthma is also defined by a history of respiratory symptoms such as wheezing, shortness of breath, chest tightness, and coughing that vary from time to time and in intensity, along with restrictions on expiratory airflow. Meanwhile, according to the Ministry of Health 2018 (Kementerian Kesehatan Republik Indonesia, 2018), Acute Respiratory Infection (ARI) is a disease that attacks the respiratory tract that can be transmitted through the air. Based on the 2018 Global Initiative for Asthma report, the asthma prevalence rate is between 1-18 percent of the total population in each country (GINA, 2018). In Indonesia, asthma and acute respiratory infections (ARI) are still relatively high. Based on the 2018 Basic Health Research (Kementerian Kesehatan Republik Indonesia, 2018), the prevalence of asthma in residents of all ages is 4.5 percent, while the prevalence of ARI is 4.4 percent.

In developing countries, childhood asthma and ARI have a significant adverse effect on the child's daily activities, schooling, family life, and finances (Bousquet et al., 2005). Previous studies suggest that chronic illnesses suffered by individuals have consequences for the education and participation of individuals in the labor market so that they can affect future income (Feldrnan et al., 1980; Gold et al., 2014; Mazurek et al., 2012; Champaloux et al., 2015; Hamilton et al., 2004). The results of a recent study conducted in Finland found that one-fifth of school dropout cases are caused by poor health conditions in childhood (Msocsc et al., 2018). The Ministry of Health of the Republic of Indonesia (2013) states that asthma is a chronic disease that often arises during childhood and young age to interfere with daily activities both at school and in the social environment. The disease also can disrupt the growth and development of children.

The studies on the effect of asthma on individual education show different results. By using a measure of the level of completed education, Champaloux et al. (2015) found that adolescents suffering from chronic illnesses, one of whom was asthma, tended not to finish schools, so they had lower educational attainment than those without a history of chronic illness. In America, children with asthma have a lower education by looking at reading skills because the average children with asthma do not go to school for 26 days per year, so they have difficulty reading (Feldrnan et al., 1980). Feldrnan's findings in America were confirmed by the study of Gold et al. (2014) conducted in Asia-Pacific. The study found that asthma individuals reported asthma resulting in their absence from school, work, and reduced productivity.

In line with previous studies, Ridder et al. (2013) conducted a study to analyze the high dropout level in Norway. Ridder et al. (2013) used several indicators that influence the level of dropout. Somatic diseases (such as asthma, diabetes, migraine, and epilepsy), somatic symptoms, psychological distress, insomnia, difficulty concentrating, self-health assessment, and weight index. The results show that low levels of health impact educational participation. In the long term, the absence of individuals at school can reduce individual achievement.

Although most studies found negative associations between asthma and individual educational outcomes, Mazurek et al. (2011) and Sturdy et al. (2012) found the opposite results. Mazurek found that individuals who had a history of asthma in childhood tended to have higher levels of education and worked in jobs with higher socioeconomic status, such as managers, teachers, and technicians, than those who did not have a history of asthma. The same thing was found by Sturdy et al. (2012) that asthma is not associated with low educational attainment in the UK. Educational attainment in the UK is caused by social inequality and ethnic issues. These findings indicate that there is some addition to internal factors from within individuals.

Difference findings in studies by Champaloux et al., 2015; Feldrnan et al., 1980; Gold et al., 2014; Mazurek et al., 2012; Hamilton et al., 2004; Crump et al., 2013, do not regardless of the different methods of measurements. Crump et al. (2013) measure individual educational attainment by looking at the level of an individual's reading and arithmetic skills and finding a negative relationship between the two measurements. Champaloux et al. (2015) emphasized the educational attainment of high school graduates who were graduated to measure individual educational attainment. Educational attainment is the highest level of formal education completed by individuals (UNESCO, 2010). Existing studies find various factors affecting individual educational attainment, including individual characteristics, family characteristics, and environmental characteristics (Tansel, 2002; Mendoza, 2018; Yang et al., 2014). Individual characteristics that are thought to influence educational outcomes include a person's health conditions.

The ability to read and count (Crump et al., 2013) and the level of senior secondary education completed (Champaloux et al., 2015) were used by previous studies to measure individual educational outcomes. Champaloux et al. (2015) only see individuals who can complete senior secondary education and ignore individuals who can complete primary and secondary education. In contrast to Crump and Champaloux et al., this study will refer to the size of the Baroo-Lee school attainment to look at the achievement of individual education levels in detail from primary education levels to tertiary education levels. Based on differences in size, the authors try to complete the study conducted by Champaloux by using different educational achievement measures. We use Baroo-Lee's educational attainment measurement by looking at the last level of education completed by individuals. According to Baroo-Lee (2019), the level of individual education does not change from ages 25 to 64 years. Baroo-Lee (2019) groups individual education levels into seven groups, including No formal education; Primary education group; Early secondary education group; Further secondary education groups; and tertiary education groups. In Indonesia, the primary education group is equivalent to SD/MI, the initial secondary education group is equivalent

to SMP/MTs, and the secondary education group is equivalent to SMA/SMK/MA. In contrast, the tertiary education group is equivalent to DI/DII/DIII/DIV, S1, S2, and S3. We consider that individuals can generally complete education up to the S3 level. In this study, we assume that individual education has not changed from age 21-64 years.

Various findings by previous researchers clearly state two different associations between asthma and acute respiratory infections on childhoods on their educational attainment. Champaloux & Young (2015); Feldman et al. (1980); Gold et al. (2014); Hamilton et al. (2004) find a negative effect of childhoods illness and individual educational attainment. Meanwhile, Mazurek et al. (2012) and Sturdy et al. (2012) find the positive effect. We tried to fit out our study with Champaloux et al. (2015) by using different measures of educational attainment. We use Barro-Lee's educational achievement measurements by looking at the level of last education completed by individuals. We analyze this issue using the Indonesia Family Life Survey (IFLS), a multi-topic longitudinal survey in Indonesia. The primary question we consider is how individuals who have asthma and Acute Respiratory Infection (ARI) in childhood affect their educational attainment.

METHODS

We use six variables to find out our research purpose. The dependent variable is educational attainment proxied by the length of formal education individuals can complete. Based on the purpose of the study, we wanted to see the effect of the individual early health status of asthma and ARI on the current educational achievements. Thus, our crucial variable in this study is the individual's early health status (suffers Asthma/ARI) ages 0-15 years.

In addition to health, other factors are thought to affect individual educational outcomes. Parental education has a vital role in individual education because parents who have a higher level of education will want their children to pursue higher education, too (Takeda & Lamichhane, 2018). Another factor that is thought to influence the achievement of one's education is the family's economic condition where the individual lives. Income received by the household is a supporting capacity for individuals to study (Yang et al., 2014). However, to reduce the level of measurement errors in household income, the authors use household expenditure for one year to represent the family's economic condition. To minimize the results of biased estimates, we include several control variables, including parental education, household expenditure, and gender of the individual.

Our quantitative research study uses primary data from the Indonesia Family Life Survey (IFLS). IFLS is a longitudinal survey in Indonesia from 1993 to 2014, representing 83 percent of Indonesia's population in 1993. IFLS covers various aspects of socioeconomic and health life at Indonesia's individual, household, and group levels (Strauss et al., 2016). This study used IFLS data in 2014 (IFLS5) and IFLS data in 1993 (IFLS1). Assuming that the level of individual education has not changed from age 21-64 years, the sample in this study is limited to individuals in the 2014 IFLS survey data aged 21-64 years. The 2014 IFLS survey data was used to determine the sample in our study, which refers to book 3b in the EH (Early Health) section by looking at the answers to the question

“How was your health in childhood?”. At the same time, data on parental education and economic conditions of the households where individuals lived as a child were obtained from the 1993 IFLS survey data (IFLS1).

We use the Ordinary Least Square (OLS) method to determine the effect of individuals with asthma and ARI in childhood on their educational achievements is. The OLS method is an estimation method that minimizes errors in predicting population mean values and sample values. To produce a good regression model, the regression model must meet the Best Linear Unbiased Estimator (BLUE) element. The way to find out that the regression model is a BLUE model is to do a classic assumption test. The classic assumption test consists of tests of normality, multicollinearity, autocorrelation, and heteroscedasticity (Gujarati & Porter, 2010).

Regression analysis is used to find out how the dependent variable can be predicted through predictor variables, partially or simultaneously. The equation model in this study refers to the model built by Champaloux et al., (2018) is as follows:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \varepsilon_i \quad (1)$$

Where

Y = Educational Attainment

X_1 = Medical History (Asthma and URI)

X_2 = Gender

X_3 = Father's Education Level

X_4 = Mother's Education Level

X_5 = Household Expenditures

RESULT AND DISCUSSION

Descriptive Statistical Analysis

The number of observations used in this study was 48,219 respondents. Based on Table 1, the average level of education that respondents can complete is 10.34 years or the same level as high school. In contrast, the average education of fathers and mothers is equivalent to the elementary level. Compared to the education of fathers and mothers, the average length of education of respondents is more than twice their parents' education. This data shows that the average respondent has a higher level of education than his parents' level of education. The number of individuals with a history of asthma and ARI is only 2.2 percent of the total observations. While the gender of male respondents by 48 percent and female respondents by 52 percent.

The family's economic conditions when individuals aged 0-15 years can be seen from the variable household expenditure. The household expenditure shows the total expenditure or consumption of all types of goods and services consumed by all household members for one year where the respondent lived when he was 0-15 years old. The average amount of household expenditure for one year is 4,898,962 thousand rupiahs. If converted to expenditure per month, household expenditure is approximately 400 thousand rupiahs.

Table 1. The Descriptive Statistical Analysis

Variable	Observation	Mean
Educational Attainment (Years)	48.219	10,34
Early Health Status (1=Have asthma/ARI on childhoods)	48.219	0,022
Gender (1=Male)	48.219	0,48
Mothers Education Levels (Years)	48.219	4,36
Father's Education Levels (Years)	48.219	5,61
Household Expenditure (Years per Rupiah)	48.219	4.898.962

Source: Authors' data (2019)

Table 2 shows our study results. Individuals who have asthma and ARI in childhood are negatively associated with their educational attainment in the future. This result aligns with studies conducted by Champaloux et al. (2015). The negative association between the two is suspected because individuals with a history of asthma have higher absenteeism in schools than those without a history of asthma and ARI (Feldrnan et al., 1980; Gold et al., 2014). However, our study results were not statistically significant.

Table 2. Regression Results

	(1)	(2)	(3)	(4)	(5)
	Educational Attainment	Educational Attainment	Educational Attainment	Educational Attainment	Educational Attainment
Early Health Status	0,353*** (0,11)	0,353*** (0,11)	-0,068 (0,09)	-0,085 (0,09)	-0,089 (0,09)
Gender		-0,05 (0,03)	-0,023 (0,02)	-0,061** (0,02)	-0,063** (0,27)
Father's Education Level			0,474*** (0,003)	0,293*** (0,004)	0,293*** (0,004)
Mother's Education Level				0,276*** (0,004)	0,274*** (0,004)
Household Expenditures					5,85*** (6,26)
Constant	10,70*** (0,016)	10,72*** (0,023)	8,03*** (0,027)	7,80*** (0,026)	7,79*** (0,02)
Observation	48.219	48.219	48.219	48.219	48.219

t statistics in parentheses

p< 0.05, *p< 0.01.

In Indonesia, the average level of a person's education is relatively low. According to the Central Statistics Agency (2019), the average length of schooling of Indonesia's population in 2018 is 8.9 years for men. In comparison, girls' average length of school is 8.26, or equivalent to junior high school. Educational problems are multidimensional problems that are not only influenced by one or two things. Even today, there is still debate about the causal relationship between health and education—the debate questions whether health affects one's education or vice versa. Empirical evidence and existing theories indicate that the higher level of education of a person will have an impact on the quality of health, the better, and conversely, the better the condition of health will result in the higher level of education achieved by individuals (Agupusi, 2019; Eide & Showalter, 2011; Grossman, 2008).

Studies on the effects of respiratory ailments and individual education show different results. Hamilton et al. (2004) state that there is no difference in education between individuals who have a history of asthma and those who do not have a history of asthma. However, there are indications that individuals with a history of asthma will experience a loss in employment. However, this finding was broken by a study conducted by Mazurek et al. (2012). Mazurek et al. (2012) found that children who have asthma tend to work in areas with higher social status, such as managers because those who have asthma tend to avoid jobs that can trigger a recurrence of their disease. In the end, they try harder to learn to obtain jobs with higher socioeconomic status.

Based on the estimation results that have been stated previously, we found that the negative association between childhood medical history and later educational attainment was not statistically significant. Several reasons can be pointed out. First, in this study, the number of individuals with asthma and ARI in childhood is minimal, with only 2.2 percent of the total samples studied or 1,060 people from 48,219 people. Secondly, the insignificant results indicate that in this study, other factors are more influential on the educational attainment for an individual than the history of asthma and ARI suffered by an individual in childhood.

These results are in line with Sturdy et al. (2012) findings in the United Kingdom. Sturdy found that other factors besides health influence a person's educational attainment. Ethnic factors and economic conditions are the dominant factors affecting individual educational outcomes in the UK. In line with Sturdy's findings, this study found other factors outside of health that significantly affect individual educational attainment. We find that the father's education, mother's education, gender, and family economic conditions statistically significantly affect individual educational attainment.

The level of education achieved by individuals cannot be separated from family support. In human capital theory, parents' higher education level is one of the critical variables affecting individual education levels. Parents with higher education are aware of the importance of education for their children. So that parents will strive to provide better education for their children, even parents tend to want their children to pursue education beyond the level of education they had achieved. In the long run, parents with

a high level of education will influence the third generation of educational attainment in their families (Agupusi, 2019). As a result, individuals with parents with a higher level of education tend to have higher educational attainments.

Almost all aspects of an individual's life are closely related to the role of their parents or family. Parents who have an important role in the family are also the main source of support for the economy and non-economy for individuals in all aspects of their lives. Low-income family economic conditions also affect individual education achievements (Sturdy et al., 2012). An empirical study in China finds that the level of family income or the better economic conditions of the household will increase the level of education of their children (Lin & Han Lv, 2017).

The economic cost of asthma and ARI is considerably both direct and indirect costs. Direct costs for medical and indirect costs such as time lost for daily activities (Bousquet et al., 2005). Asthma and ARI are diseases closely related to air quality in an individual's living environment. Information to World's Air Pollution (2019), three regions in Indonesia, including Pontianak, Sampit, and East Jabung, have poor air quality for groups sensitive to respiratory problems. Even Jakarta is an area with an unhealthy air quality category. With these conditions, it is feared that it could increase the prevalence of asthma and ARI in Indonesia. Other factors that trigger asthma and ARI symptoms are exposure to second-hand tobacco smoke. Poor control of asthma and ARI symptoms is a significant issue that can lead to adverse clinical and economic outcomes (Bousquet et al., 2005).

CONCLUSION

As a statistical, our study found that asthma and ARI suffered by individuals during childhood did not significantly influence individual educational attainment. The relatively small number of individual respondents who suffered from asthma and ARI in childhood presumably causes it. However, we find the negative direction. It shows that early health condition is one of the crucial factors that determine an individual's educational attainment in the future. We found other factors that significantly affected the educational attainment of individuals, including the level of parental education, family economic conditions, and gender.

Parents and governments should control several causative factors that can cause the increasing prevalence of asthma or ARI in Indonesia to increase an individual's educational attainment. One of the other ways is by controlling air pollution in their living environments. Further studies are still relevant to be carried out considering that asthma and ARI are closely related and sensitive to changes in environmental conditions. We have limited the number of samples of individuals who have a history of asthma and ARI. For robust results, it requires more samples of sufferers of asthma and ARI in childhood.

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Countries	2010	2015
ASEAN Countries		
Indonesia	5,814 (71)	5,54 (71)
Malaysia	6,608 (36)	6,62 (36)
Thailand	6,436 (42)	5,96 (50)
Filipina	6,403(44)	5,71 (63)
Singapura	7,719 (11)	8,00 (6)
Vietnam	6,080 (61)	5,64 (68)

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