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The Effect of Demographic Dividend, HDI, and Population Growth on Economic Growth in East Java

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Abstrak

Tujuan dari penelitian ini adalah untuk mengetahui pengaruh variabel independen, yaitu bonus demografi yang menggunakan data rasio ketergantungan, Indeks Pembangunan Manusia (IPM), dan pertumbuhan penduduk terhadap pertumbuhan ekonomi kabupaten/kota di Jawa Timur tahun 2010-2020. Pada penelitian ini, digunakan pendekatan kuantitatif menggunakan data sekunder yang didapatkan dari laman resmi BPS Provinsi Jawa Timur. Metode analisis data menggunakan regresi linier data panel. Hasil menunjukan bahwa variabel bonus demografi yang menggunakan data rasio ketergantungan, Indeks Pembangunan Manusia (IPM), dan pertumbuhan penduduk, secara parsial memiliki pengaruh negatif dan signifikan terhadap pertumbuhan ekonomi kabupaten/kota di Jawa Timur. Kemudian, semua variabel independen memiliki pengaruh secara simultan terhadap pertumbuhan ekonomi kabupaten/kota di Jawa Timur

***Kata Kunci** : Bonus Demografi, Rasio Ketergantungan, Indeks Pembangunan Manusia, Pertumbuhan Penduduk, Pertumbuhan Ekonomi*

Abstract

The objective of this research is to assess the impact of independent variables, specifically demographic dividend utilizing dependency ratio data, the Human Development Index (HDI), and population growth, on the economic growth of districts and cities in East Java from 2010 to 2020. The research employed a quantitative methodology, utilizing secondary data sourced from the official website of BPS East Java Province.. The data analysis method uses panel data linear regression. The result shows that the demographic dividend variable, which uses data on dependency ratio, Human Development Index (HDI), and population grwoth, partially has a negaive and significant influence on district/city economic growth in East Java. Then all independent variables have a simultaneous influence on district/ city economic growth in East Java

***Keywords:** Demographic Dividend, Dependency Ratio, Human Development Index (HDI), Population Growth, Economic Growth*

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INTRODUCTION

The demographic dividend refers to a situation where there is a shift in demographic patterns resulting from alterations in the population's age distribution.. The demographic dividend can be characterized by a reduction in the birth rate (fertility) and mortality rate (mortality) in the long term (Destu & Suprijati, 2019). Furthermore, the demographic dividend is a situation when the population outside the labor force (age <15 years and age >64 years) is smaller than the population in the labor force (age 15-64 years) (Saumana et al., 2020). With a larger population of productive age population, resulting in a low dependency ratio. As per the United Nations (2015) report, the dependency ratio indicates the proportion of children aged 14 years and below, as well as elderly individuals aged 65 years and above, in relation to the population of individuals aged 15 to 64 years who are of working age.. The dependency rate illustrates the influence that shifts in the population's age distribution can have on social and economic progress.. This is because the dependency rate links groups that are likely to become economically dependent with the most economically active groups, (Ul Huda et al., 2019).

Solow's economic growth model, explains that the components that affect a country's economic growth are capital, population growth, and technological progress (Solow, 1956). Furthermore, the Solow model presents research indicating a correlation, either positive or negative, between population growth and long-term economic growth. Therefore, it is necessary to control population growth in a country so that population growth can be controlled and can maximize one of its potential production factors, namely the population.

From the result of the population census of East Java Province from 1971 to 2020, the percentage of productive age population continues to increase, This is a result of the large number of young people in previous years, who then experience age aging in the next few years, those who are in the young population will enter the productive age population. Therefore, the population that can enter the workforce more than the population that has not yet entered the workforce or is not yet productive, and the population that is no longer productive.

The dependency ratio in East Java Province has witnessed a decline from 2010 to 2020, as reported on the official website of the East Java Central Bureau of Statistic.. In 2010, the dependency ratio of East Java Province was 46,09%. This means that every 100 people of productive age bear the burden of 46 unproductive people. Until 2020, the dependency rate of East Java Province was 43,1%. This means that every 100 people of productive age bear the burden of 44 unproductive people. By decreasing the dependency ratio, it means that population growth is also decreasing. Launching from the official website of the East Java Central Bureau of Statistic, population growth in 2010 compared to the previous year was 0,8%. The population growth rate continued to experience until 2019. Then population growth in 2020 has increased when compared to 2019, which is 2,43%.

The dependency ratio in East Java witnessed a continuous decline from 2010 to 2020, alongside a significant decrease in population growth during the same period. This decline was accompanied by a noteworthy rise in the Human Development Index (HDI), commonly referred to as HDI. Launching from the official website of the East Java Central Bureau of Statistics, the HDI figure for East Java in 2010 was 65,36%. It continued to increase until in 2020, the HDI of East Java was 71,71%.

The results of research (Nasution, 2021), show that the demographic dividend using dependency ratio data does not significantly affect regional economic growth in Indonesia. According to him, the foundation of the demographic dividend in Indonesia is not yet strong enough to be used as an engine of economic growth. In this study, the human

Development Index (HDI) has an influence on regional economic growth in Indonesia. According to him, human development is a contributor to the stabilization of the economic growth process. Based on (Radesi Bariaty et al., 2022), it shows that population growth has a negative and insignificant effect on economic growth in Langsa City. According to him, population growth is not always a problem for economic, quality population growth is also able to encourage economic growth, increasing population can expand the market and market expansion can increase the level of specialization in the economy which has a good impact on the economy, namely the level of economic activity will increase. In this study, the dependency ratio also had a positive and significant effect on economic growth in Langsa City. According to him, although the unproductive age population theoretically has no income, what happens in Langsa City is that children who are not yet productive already have their own income and the elderly population (65+ years) still have their own income obtained from severance pay or pension money.

From the description of the problem above, the following is the selection of variables in the study; 1) The selection of the demographic dividend variables using dependency ratio data is based on BPS reports, which show a significant decrease in the dependency ratio. With this, it is expected to have an influence on the economic growth of districts/cities in East Java. 2) The selection of HDI variables is based on BPS reports, which show a significant increase. With this, it is expected to have an influence on the economic growth of districts/cities in East Java. 3) The selection of population growth variables based on BPS reports, which show a significant decrease in population growth. With this, it is expected to have an influence on the economic growth of districts/cities in East Java. The purpose of this research was to analyze the impact of individual variables on the economic development of districts and cities in East Java.

RESEARCH METHODS

This study was conducted using a quantitative approach that will explain the effect of the demographic dividend using data on dependency ratio, Human Development Index (HDI), and population growth on the economic growth of districts and cities in East Java. The population in this study is the dependency ratio, HDI, population growth, and economic growth of 38 districts and cities in East Java. The time span in this study is between the 2010 and 2020 population censuses or from 2010 to 2020. The methodology employed in this research involves gathering, documenting, and analyzing existing data from the official website of the East Java Central Bureau of Statistics. The data in this study used secondary data with a panel structure, with 38 districts/cities and a time span from 2010 to 2020. The study employs panel data multiplier linear regression as the data analysis technique. With several testing stages, starting from the best regression model estimation test, classical assumption test, and statistical test. The following is a form of panel data multiple linear regression equation model in this study:

$$PE = \alpha + \beta_1 RK_{it} + \beta_2 IPM_{it} + \beta_3 PP_{it} + e$$

Description:

PE : Economic Growth (Y)
α : Constant
RK : Dependency Ratio (X1)
IPM : Human Development Index (X2)

PP : Population Growth (X3)
$\beta_1, \beta_2\ \beta_3$: Regression coefficient of independent variable
i : Regency and city (*cross section*)
t : Year (*time series*)
e : Error term

RESULT AND DISCUSSION

A. Research Results

1. Regression Model Estimation Test

a) Chow Test

Table 1. Chow Test Results

Source	SS	df	MS	Number of obs	=	418
				F(40, 377)	=	6.37
Model	1647.67152	40	41.1917881	Prob > F	=	0.0000
Residual	2436.55613	377	6.4630136	R-squared	=	0.4034
				Adj R-squared	=	0.3401
Total	4084.22765	417	9.79431091	Root MSE	=	2.5422

Source: Stata17, 2024

Based on the Chow Test Results table, the Prob> F value is 0,0000 (<0,05). So that the model chosen is the Fixed Effect Model (FEM).

b) Hausman Test

Table 2. Hausman Test Results

```
    chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
            = 122.07
Prob > chi2 = 0.0000
(V_b-V_B is not positive definite)
```

Source: Stata17, 2024

Based on the Hausman Test Results table, the Prob > F value is 0,0000 (<0,05). Thus, the model chosen is the Fixed Effect Model (FEM).

c) Lagrange Multiplier Test

The Lagrange Multiplier estimation is deemed unnecessary in this study, as the Chow Test and Hausman Test have determined that the Fixed Effect Model (FEM) is the most suitable model among the options to be tested in the Lagrange Multiplier Test.

2. Classical Assumption Test

After carrying out the best model selection tes, it was found that the best model was the Fixed Effect Model (FEM). Therefore, the Classical assumption Test must be carried out. According to Basuki and Nano, (2019), if the FEM Model is selected, the classical assumption tests required are Multicollinearity Test and heteroscedasticity Test.

a) Uji Multicollinearity Test

Table 3. Classical Assumption Test

	RK	IPM	PP
RK	**1.0000**		
IPM	**-0.5459**	**1.0000**	
PP	**0.0661**	**0.0563**	**1.0000**

Source: Stata17, 2024

The correlation coefficient between RK (X1) and HDI (X2) is -0,54 < 0,85, the correlation coefficient between RK (X1) and PP (X3) is 0,06 < 0,05, and the correlation coefficient between HDI (X2) and PP (X3) is 0,05 < 0,85. Therefore, it can be declared free from multicollinearity or pass the multicollinearity test.

b) Heteroscedasticity Test

Table 4. Heteroscedasticity Test Result

```
Breusch-Pagan/Cook-Weisberg test for heteroskedasticity
Assumption: Normal error terms
Variable: Fitted values of PE

H0: Constant variance

    chi2(1) =  18.65
Prob > chi2 = 0.0000
```

Source: Stata17, 2024

The Prob > chi2 value is 0,00 < 0.05, so there are symptoms of heteroscedasticity. Therefore, it is necessary to solve it by correcting the standard error value using White's Robust Standard Error, (Rizki et al., 2022).

3. Panel Data Multiple Linear Regression

The outcomes of panel data testing utilizing the Fixed Effect Model (FEM) approach, which has been adjusted with White's Robust Standard Error, are presented below.

Table 5. Panel Data Multiple Linear Results

Fixed-effects (within) regression — Number of obs = 418
Group variable: id — Number of groups = 38

R-squared:
Within = 0.3463
Between = 0.0069
Overall = 0.0282

Obs per group:
min = 11
avg = 11.0
max = 11

F(3,37) = 78.36
corr(u_i, Xb) = -0.9571 — Prob > F = 0.0000

(Std. err. adjusted for 38 clusters in id)

PE	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
RK	-1.81818	.4956803	-3.67	0.001	-2.822524	-.8138363
IPM	-1.305799	.214206	-6.10	0.000	-1.739821	-.8717761
PP	-.5059686	.1759622	-2.88	0.007	-.8625018	-.1494353
_cons	177.0166	36.62164	4.83	0.000	102.8141	251.2191

Source: Stata17, 2024

The regression equation is derived from the information provided in the table above.

$$PE = Y = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + e$$
$$= 177.0166 - 1.81818(X1) - 1.305799(X2) - 0{,}5059686\ (X3) + e$$

The regression equation results indicate that variables X1, X2, and X3 impact the dependent variable (Y), based on the specified assumptions:

a) The constant value of 177.0166 can be interpreted without the RK (X1), HDI (X2), and PP (X3) variables, the PE (Y) variable will increase by 177.0166%.
b) The regression coefficient value of the RK variable (X1) is -1.81818, if the value of other variables is constant and variable X1 increases by 1%, the PE variable (Y) will decrease by 1.81818%. And vice versa.
c) The regression coefficient value of the HDI variable (X2) is -1.305799, if the value of other variables is constant and variable X2 increases by 1%, the PE variable (Y) will decrease by 1.305799%. And vice versa.
d) The regression coefficient value of the PP (X3) variable is -0.5059686, if the value of the other variables is constant and variable X3 increases by 1%, the PE (Y) variable will decrease by 0.5059686%. And vice versa

4. Statistical Test Result
   a) Statistical Test (Partial)

      Intending to see the effect partially, it is done by comparing the t value on each variable against the t-table with the provisions:

      - If the t count value is > than the t-table value, then the impact is considered significant.
      - If the t count value is < than the t-table value, the impact is deemed insignificant.

      The t-table value is established as 1.64852, consequently yielding the following outcomes:

      - Variable X1 = 3,67 > 1,64852, significant.
      - Variable X2 = 6,10 > 1,64852, significant.
      - Variable X3 = 2,88 > 1,64852, significant.

      In addition, it can be seen from the comparison between the probability and the t-count in the regression results. With the provision of the t value must be less than the probability (0,05). Then the results are as follows:

      - t (X1) = 0,001 < 0,05, significant.
      - t (X2) = 0,000 < 0,05, significant.
      - t (X3) = 0,007 < 0,05, significant.

   b) F Statistical Test (Simultaneous)

      Intends to see the effect of the independent variable on the dependent variable simultaneously by comparing the F value and the F-table. Based on the results above, it is known that F (3,37) = 78,36 and a significance value of 0,0000 < 0,05. So the independent variables jointly affect the dependent variable.

   c) Determination Test (R^2)

      According to the analysis conducted using multiple linear regression, the R-squared value obtained is 0.3463. These results indicate that the independent variables consisting of dependency ratio, HDI, and population growth are able to explain the dependent variable, namely district/city economic growth in East Java in 2010-2020 by 34,63%. Other variables not included in this study account for the remaining 65.38%.

B. Discussion

1. The Effect of Demographic Dividend (with Dependency Ratio Variable) on Regency/City Economic Growth in East Java.

   Based on the results of the analysis in this study, the dependency ratio variable (X1) has a significant negative effect on the economic

growth of districts / cities in East Java. The regression analysis coefficient β1, which is calculated at -1.81818, indicates that a 1% increase in the dependency ratio variable, while holding other variables constant, is projected to lead to a 1.81818% decrease in the economic growth of districts/cities in East Java These results are in line with the research of Endang Rostiana & Anggia Rodesbi (2020) who examined the impact of the demographic transition period with the dependency ratio as a variable on Indonesia's economic growth from 1961 to 2017. According to this study, it was indicated that the dependency ratio had an adverse impact on the economic growth of Indonesia. This implies that a reduction in the dependency ratio would result in a rise in the rate of economic growth in the country.

Solow's economic growth theory posits that population growth is a significant determinant of economic growth. The Solow model presents research indicating either a positive or negative correlation between population growth and economic growth. Therefore, it is necessary to control population growth in order to maximize the potential of the population itself in providing positive stimuli to economic growth. This can be seen from the impact of the "Keluarga Berencana" (KB) program, which is a program of the State of Indonesia to control population growth. Where the impact can be reflected in the result of this study which shows a decreasing population dependency ratio, will increase economic growth.

In this study, the data shows that the region with the highest dependency ratio is Bangkalan Regency, with a dependency ratio value of 55,61 in 2010. During this period of time, Bangkalan Regency cannot be categorized as an area experiencing a demographic dividend, if referring to the concept of demographic dividend stated by Adioetomo (2005) in (Zebua, 2023). The dependency ratio data for Bangkalan Regency is still relatively high, which negatively affects the economic growth of Bangkalan Regency. Where the economic growth rate of Bangkalan Regency is classified as very fluctuating. The decline from 2011 to minus in 2012. Had risen in 2014 and immediately minus in 2015.

The high level of dependency ratio in Bangkalan Regency means that the fertility rate in the area is still high. This is in accordance with the findings of Bagus Pratama Suwardono, that there are several factors that influence the low participation of family planning program in the Bangkalan Regency community, namely the relatively low level of education, there are still many poor families, the low number of Family Planning Field Instructors (PLKB) in each village, and village officials in Bangkalan Regency still have a relatively low level of education (Suwardono et al., 2020).

In this study, the data shows that the region with a dependency ratio value of 35,91 in 2020. In the period 2010-2020, the dependency ratio in Surabaya City always moved down from 2010 with a dependency

ratio of 38,04. During this period, Surabaya City can be categorized as an area experiencing a demographic dividend, if referring to the concept of demographic dividend stated by Adioetomo (2005) in (Zebua, 2023). Surabaya City's dependency ratio data is relatively low, it has a negative effect on Surabaya City's economic growth. Where Surabaya City's economic growth data continues to provide growing numbers from previous years, although it had dropped in 2014 and 2015.

The low dependency ratio of Surabaya City is one illustration of the region's success in regulating fertility rates. In this case, Muslimatul Khoiriyah has conducted research on how the government runs the family planning program in Surabaya in 2011-2015. By stating that Bapemas and KB Surabaya city were successful in implementing family planning programs in various ways, such as educational counseling programs in sustainable family planning, male family planning, and the provision of free contraceptive facilities for underprivileged resident (Khoiriyah, 2022).

2. The effect of Human Development Index (HDI) on Economic growth of Regency / City Economic Growth in East Java.

Based on the result of the analysis in this study, it shows that the Human Development Index variable (X2) has a significant negative effect on district/city economic growth in East Java. The regression analysis coefficient β2, which is calculated as -1.305799, indicates that a 1% increase in the Human Development Index (HDI) variable, while keeping all other variables constant, is associated with a 1.305799% decrease in the economic growth of districts/cities in East Jawa. These results are in line with research by Saumana (2020), who conducted research on the effect of the Human Development Index (HDI) on economic growth in Southeast Minahasa Regency from 2008 to 2019. The results suggest that the Human Development Index has a negative influence on the economic growth of Southeast Minahasa regency. "Physical capital and natural resources are passive factors of production, while humans are active agents who will manage capital, utilize natural resources, form various types of social, economic and political organizations, and carry out national development", (Saumana et al., 2020).

In this study, the data shows that Sampang Regency is the Region with the lowest Human Development Index (HDI) value, with a value of 54,49 in 2010. Until 2020, Sampang regency was still at the bottom of the Human Development Index (HDI) values of the districts/cities in east Java, with a value 62,7. By referring to the human development criteria based on standards of the Central statistics Agency (2022), the Human Development Index (HDI) of Sampang Regency in 2010 was still in the low category, while in 2020 it had begun to rise to the medium category. In 2019, Indah Purnama Sari conducted a study on the Human Development Index (HDI) in Madura. The findings indicate that

Sampang Regency is an area that lacks development, characterized by low HDI parameters and growth rates. (Sari et al., 2019). Furthermore, Indah Purnama Sari also wrote that sampang regency is the most underdeveloped regency on Madura Island and this is in line with the perception of the Madurese community.

A positive impact on economic growth is expected to be observed in theory when the Human Development Index (HDI) is high. This is because most of the population can be concluded to have a good level of education and health. Nevertheless, superior education does not always correlate with increased productivity.. The condition of someone who has a high education but whose productivity is not high, will also be an obstacle to that person in finding a job. The rise in the number of individuals with higher education, without a corresponding increase in job opportunities, can lead to a surge in unemployment rates.

3. The Effect of Population Growth on Economic Growth of Districts/Municipalities in East Java.

Based on the results of the analysis in this study, the population growth variable (X3) has a significant negative effect on the economic growth of districts/cities in East Java. The regression analysis reveals that the coefficient β2, which has a value of -0.5059686, indicates that if all other variables remain constant and the population growth variable increases by 1%, the economic growth of districts/cities in east Java is projected to decrease by 0.5059686%. Radesi Bariaty, Mswar, Manovri, and Mahdi have also discovered the adverse impact of population growth on economic growth. The impact of population growth rate on economic growth in Langsa City, Aceh Province, between 2006 and 2021 was thoroughly analyzed. The findings of this research indicate that population growth negatively influenced economic growth. Nevertheless, it is worth noting that the impact of population growth on economic growth was not deemed significant in this particular study.

In this study, the region with the lowest population growth value is Sidoarjo Regency in 2020, with a population growth value -7,4% from the previous year. Meanwhile, the region with the highest population growth value is Lamongan Regency in 2020, which has a population growth value of 13% from the previous year. A rise in population growth is anticipated to lead to a higher number of economic actors, thereby potentially stimulating economic growth. However, in fact, a high population will not necessarily make it a priority in increasing economic growth. When the increase in population is not accompanied by an increase in the quality of the population and the specialization of the population, then the large number of people will instead make it a burden on development, which will ultimately have a negative effect on economic growth.

4. The Effect of Demographic Dividend (with dependency Ratio variables), Human Development Index (HDI), and Population Growth on Regency/City Economic Growth in East Java.

   Based on the results of the F test. Dependency Ratio, HDI, and population growth have a calculated F value greater than the F table and a significance value of 0,0000<0,05. This means that the dependency ratio, HDI, and population growth variables simultaneously affect the economic growth of districts/cities in East Java. While the amount of the coefficient of determination in the analysis of this study gives a value of 34,62%. This implies that the dependency ratio, HDI, and population growth collectively impact the economic growth of districts/cities in East Java by 34.62%.

   The coefficient of determination in this study is only 34,62%. This is because there are several outliers. When viewed from the descriptive statistics of this study, almost every variable in this study has outliers. The economic growth variable (X1) has an average value of 4,95, with a standard deviation of 3,1. This means that economic growth data will be good if of all the data available, the data is between 1,85 and 8,05. Meanwhile, in this variable, the data shows that the minimum value is -6,46 and the maximum number is 22,16. The existence of outleirs that are very far from the mean value and standard deviation, causes the coefficient of determination (R2) to be small, (Ohyver & Tanty, 2012).

   A region with a declining population growth rate will illustrate that the birth rate in the region is also declining. If the current condition persists over the next couple of years, it could lead to a scenario where the majority of the region's population will consist of individuals in their productive years. Consequently, the dependency ratio will decrease. If this trend is coupled with a high HDI level, it indicates that the working-age population in the region is generally well-educated and healthy. These circumstances present an opportunity for the region to boost its economic growth.

CONCLUSION

According to the findings of this study, it has been determined that the demographic dividend variable, using dependency ratio data, the Human Development Index (HDI), and population growth, has a notable negative impact on the economic growth of districts/cities in East Java. The influence of population variables on economic growth aligns with Solow's theory, suggesting that population growth can either positively or negatively affect economic development. Hence, it is crucial to manage population growth effectively to optimize the potential productivity of the population..

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