Estimating the Effect of Human Capital Spending on Unemployment in East Kalimantan Using the Chain Rule Method in Differentials

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Abstract

Unemployment is one of the development issues that arise as a result of the labor force growing faster than employment. Although the number of unemployed people in East Kalimantan Province has decreased, it is still quite high. The purpose of this study is to estimate the direction and magnitude of the impact of human capital spending or expenditure on the Open Unemployment Rate in East Kalimantan Province from 2018 to 2020 using panel data regression with the Random Effects Model (REM) approach and the chain rule method. According to the findings of this study, education expenditure has a positive effect on average length of schooling (RLS), and health expenditure has a positive effect on life expectancy (UHH). The average length of schooling has a positive effect on the open unemployment rate in East Kalimantan province, while life expectancy has no effect. Thus, mathematically, education expenditure has a positive effect on the open unemployment rate, proving the existence of a chain rule. Meanwhile, health expenditure has no effect on the Open Unemployment Rate, indicating that the chain rule is invalid. The government is expected to be able to evaluate how the education and health expenditure budgets are being used in order to create superior human resources that are tailored to the needs of each region in East Kalimantan Province.

Keywords: education expenditure; health expenditure; average length of schooling; life expectancy; open unemployment rate; panel data; chain rule

1 Introduction

The position and role of labor in economic development is crucial. The most crucial aspect of labor is how quantity impacts quality. Production will increase with better labor. In terms of age, gender, job abilities, health, education, and other factors, the workforce is diverse. Hence, in order to assist Indonesia's national growth, personnel planning is required. (Indriani, 2016).

The most fundamental issue in Indonesian employment is the availability of job opportunities. Unemployment will result from an imbalance between the increase in the working-age population and the availability of job opportunities. (Pangastuti, 2015). Unemployment arises as a result of the government's inability to provide sufficient employment opportunities as the population grows (Soleh, 2017).

Table 1. Total Working Population, Total Unemployment, and Open Unemployment Rate (TPT) in East Kalimantan Province 2016-2020

Year	Total Working Population (Soul)	Total Unemployement	TPT (%)
2016	1.581.239	136.653	7,95
2017	1.540.675	114.289	6,91
2018	1.618.285	114.313	6,41
2019	1.704.808	110.574	5,94
2020	1.692.796	124.884	6,87

Source: Central Bureau of Statistics

Table 1 shows that the working population, unemployed population, and TPT tend to rise between 2016 and 2020. However, there was a decrease in the number of working people in 2020, as well as an increase in unemployment due to the Covid-19 pandemic. To mitigate the impact of the Covid-19 pandemic, Large-Scale Social Restrictions (PSBB) regulations were enacted, which are expected to slow the virus's spread. As a result of the decline in economic activity, the production of goods and services is reduced, and many workers lose their jobs.

Human capital is a factor that is closely associated with unemployment. Human capital is generally measured through education and health (Nugroho, 2016). This is due to the fact that expertise, skills, and knowledge can only be acquired if the community is educated and healthy. A person's high level of education will also increase their chances of finding work and earning competitive wages (Yanti et al. 2020). Furthermore, humans require physical, psychological, social, and spiritual health to live a comfortable life and carry out daily activities (Artana, 2014).

Table 2. Average Length of Study (RLS) and Life Expectancy (UHH) of East Kalimantan Province 2016-2021 (Year)

Year	RLS	UHH
2016	9,24	73,68
2017	9,36	73,70
2018	9,48	73,96
2019	9,70	74,22
2020	9,77	74,33
2021	9,84	74,61

Source: Central Bureau of Statistics

According to Table 2, the East Kalimantan RLS has consistently increased from 2016 to 2021. This is due to increased development and public understanding of the value of education. According to the BPS East Kalimantan, the most recent education completed was junior high school, a significant increase from the previous 11 years, when only elementary school graduates were recorded. Meanwhile, East Kalimantan's UHH rises year after year. In 2020, UHH was 74.61 years, the highest on the island of Kalimantan and higher than Indonesia's national UHH of 71.57 years.

Table 3. Health Expenditure and Education Expenditure in East Kalimantan Province 2017-2021 (Billion Rupiah)

Year	Education Expenditure	Health Expenditure
2017	1.671,26	1.113,46
2018	1.069,95	1.684,70
2019	1.273,65	2.350,86
2020	1.241,71	1.855,30
2021	1.265,97	2.299,31

Source: Directorate General of Fiscal Balance (DJPK), Ministry of Finance

According to Table 3, the Province of East Kalimantan's education and health expenditure budgets fluctuate year after year. Education spending must account for 20% of the state budget. According to the 2018 APBD, the budget for education and health is 20.33% and 10%, respectively. This figure increased in 2019 to 21.28% and 11.43%, respectively (Meiliana, 2018). However, the health expenditure budget has been reduced in 2020 because 3.3% of the APBD is allocated for Covid-19 management (East Kalimantan Provincial Government, 2020). Even though the education budget in East Kalimantan has surpassed 20%, education in the province is still far from satisfactory because many school buildings are unfit for learning (Basran, 2017).

The East Kalimantan Province's Open Unemployment Rate (TPT) tends to decrease, but in 2020, TPT increased due to the Covid-19 Pandemic, which caused many workers to lose their jobs. Human capital is thought to play an important role in reducing unemployment, as measured by the Average Length of Study (RLS) and Life Expectancy (UHH), so spending on education and health is also important. Based on the above description, the purpose of this study is to estimate the effect of education spending on average length of schooling (RLS), health spending on life expectancy (UHH), and the effect of RLS and UHH on TPT in East Kalimantan Province during the 2018-2020 school year.

2 Literature Review

Handayani et al., (2015) used the Ordinary Least Squares (OLS) approach to examine the effect of government spending on the education and health sectors on the Human DevelopmentIndex in Riau Province from 2003 to 2012. They discovered that government spending on education and health had a positive effect on the Human Development Index. Meanwhile, Chalirafi et al., (2020) discovered in 2007-2018, using the same model, that Life Expectancy Rate (AHH) and per capita consumption had no effect on unemployment in Aceh Province.

Furthermore, according to Filiasari and Setiawan's research (2021), the workforce, wages,and GRDP had a negative effect on unemployment, whereas education had a positive effect on the unemployment rate in Banten Province from 2002 to 2019.

Syahputra et al. (2019) used panel data regression with the Pooled Least Squares (PLS) approach to examine the effect of economic growth, government spending, minimum wages, and education level on the open unemployment rate in 10 provinces on Sumatra Island from 2015 to 2017. It was discovered that economic growth has a negative impact on the open unemployment rate, whereas education level has a positive impact on the open unemployment rate. In the meantime, government spending and minimum wages have no effect on the overallunemployment rate.

Muslim (2014) estimates the determinants of open unemployment in five regencies/cities in the Special Region of Yogyakarta (DIY) in 2007-2012 using panel data but the Fixed EffectsModel (FEM). It was discovered that the rate of economic growth, education, and government spending all had a negative impact on DIY open unemployment, whereas labor had a positive impact.

Ramiayu (2016) used the FEM approach to discover that the average length of schooling had a positive effect on the open unemployment rate, while the minimum wage and economic growth had a negative effect in East Java Province from 2009 to 2013. Meanwhile, using the same model, Cahyo (2016) discovered that economic growth and minimum wages had a negative effect on the open unemployment rate in East Java Province, while average length of schooling had a positive effect.

Using the FEM approach, Harjunadhi and Rahmawati (2020) discovered that spending on education, health care, and the minimum wage had a positive effect on the Human DevelopmentIndex in Indonesia from 2014 to 2018. Muin (2020) used the FEM approach to examine the determinants of the unemployment rate in 34 Indonesian provinces from 2015 to 2018, and discovered that economic growth had a positive effect on unemployment, while information technology competence and average length of schooling had a negative effect. Meanwhile, Simanjuntak and Setiawan (2022) discovered that GRDP, education, and the Consumer Price Index have a negative impact on open unemployment, whereas government spending, population, and minimum wages have a positive impact.

Furthermore, Tumilaar et al., (2022) discovered that minimum wages and population havea negative effect on open unemployment, whereas education has a positive effect on open unemployment in each district/city in East Kalimantan Province from 2011 to 2021.

Hartanto and Masjkuri (2017) used panel data regression with the Random Effects Model (REM) approach to examine the effect of population, education, minimum wage, and GRDP onthe number of unemployed in East Java from 2010 to 2014. According to the regression results, population, education, and GRDP all have a positive effect on the number of unemployed, whereas the minimum wage has a negative effect. Meanwhile, using the same model, Salsabella et al., (2020) discovered that population has a negative effect on the unemployment rate, whereas GRDP and education level have a positive effect in Indonesia from 2013 to 2017.

Adzim and Prajanti (2021) examined the open unemployment rate in Bali from 2014 to 2018 using the REM approach and discovered that FDI, PMDN, economic growth, and wages all had a negative effect on the open unemployment rate. Meanwhile, population size and education affect the open unemployment rate positively. In Central Java Province from 2015 to2019, education level was found to have a negative effect on open unemployment, whereas PMDN had a positive effect on open unemployment (Anggraini, 2021).

In contrast to earlier studies, this one use the chain rule method to calculate the influence of human capital expenditure, which is presumed to be indirect on TPT. The average length of schooling (RLS) and life expectancy are used to quantify human capital performance, and the first regression calculates the impact of human capital investment on that performance (UHH).The second regression then calculates the impact of TPT on human capital performance.

3 Research Method

This study's variables include education expenditure, health expenditure, education performance indicators, health performance indicators, and the East Kalimantan Province's Open Unemployment Rate (TPT). Table 4 shows the details of the data on the variables in this study.

Table 4. Research Variable

Variable	Data/Unit	Source
Education Expenditure	Expenditure on education function (million rupiah)	DJPK Kemenkeu
Health Expenditure	Expenditure on health functions (million rupiah)	DJPK Kemenkeu
Education Indicators	Average Length of Study (years)	
Health Indicators	Life Expectancy (years)	
Unemployement	Open Unemployment Rate (percent)	

The chain rule will be used in differential mathematics in this study. Differential and integral arithmetic (calculus), according to Johannes and Handoko (1991), is arithmetic concerning changes and marginal changes in speed in various fields of economics, physics, and mathematics. Meanwhile, according to Chiang (1996), differentiation can be used to differentiate two or more functions, each with a different independent variable, such as the following:

$$y = (z) \tag{1}$$

Based on Equation (1), the magnitude of the y value depends on the z value. Then, in the next step, z is a function of the variable x which can be written as follows:

$$z = g(x) \tag{2}$$

Through Equations (1) and (2), it can be concluded that the effect of x on y is equal to the effect of x on z multiplied by the effect of z on y which can be expressed as follows:

$$\frac{dy}{dx} = \frac{dy}{dz}\frac{dz}{dx} \tag{3}$$

In Equation (3), changes in y (dy) depend on changes in z (dz), and changes in z (dz) depend on changes in x (dx). Based on Equations (1) to (3), the results of the two functions f and g are obtained which indicate a plural function (function of a function). Thus, the chain rule is also referred to as the rule of multiple functions or the rule of a function.

Jaya (2015) used the chain rule to investigate the effect of education and health spending on district/city labor productivity in Central Java Province from 2007 to 2013, using regression to estimate the effect of education spending on average length of life Schools (RLS), the effect of health spending on life expectancy (AHH), and the effect of RLS and AHH on worker productivity.

This study uses panel data which is a combination of cross section and time series data. In this study, cross sectional data are 10 regencies/cities in East Kalimantan Province, and time series data are 2018-2020, so the number of samples in this study is 10 x 3 = 30.

$$RLS_{it} = \alpha 0 + \alpha 1 BP_{it} + e_{it} \tag{4}$$

$$UHH_{it} = \gamma 0 + \gamma 1 BK_{it} + v_{it} \tag{5}$$

$$TPT_{it} = \delta 0 + \delta 1 RLS_{it} + \delta 2 UHH_{it} + \mu_{it} \tag{6}$$

$$TPT_{it} = \beta 0 + \beta 1 BP_{it} + \beta 2 BK_{it} + \varepsilon_{it} \tag{7}$$

Where

RLS	:	Average Length of Study (years)
BP	:	Education Expenditure (million rupiah)
UHH	:	Life Expectancy (years)
BK	:	Health expenditures (million rupiah)
TPT	:	Open Unemployment Rate (percent)
α_0	:	Equation Constants (4)
α_1	:	Coefficient of education expenditure in Equation (4)
γ_0	:	Equation Constants (5)
γ_1	:	Coefficient of health expenditure in Equation (5)
δ_0	:	Equation Constants (6)
δ_1	:	Coefficient of Average Length of School (RLS) in Equation (6)
δ_2	:	Coefficient of Life Expectancy (UHH) in Equation (6)
β_0	:	The constant of Equation (7), which is the result of $\delta_0 + \delta_1\alpha_0 + \delta_2\gamma_0$
β_1	:	The coefficient of education spending in Equation (7), which is the result of

$\delta_1\alpha_1$

β_2	:	The health expenditure coefficient in Equation (7), which is the result of $\delta_2\gamma_1$
e	:	Residuals in Equation (4)
ν	:	Residuals in Equation (5)
μ	:	Residuals in Equation (6)
ε	:	The residual in Equation (7), which is the result of $\delta_1 e_{it} + \delta_2 v_{it} + \mu_{it}$
i	:	1-10 (cross-section data for districts/cities of East Kalimantan Province)
t	:	1-3 (2018-2020 time-series data)

To ensure the existence of the model, an F test was carried out to determine whether there was an effect of the independent variables jointly on the dependent variable. In this study, the Ftest was only carried out for Model 3 because Model 1 and Model 2 only had one independent variable. The H0 in the F test is that RLS and UHH together have no effect on TPT. H0 will berejected if the F-statistical probability $< \alpha$.

Then, the t test needs to be carried out on all models to find out whether the individual independent variables have a significant effect on the dependent variable with the assumption that the other independent variables are constant. H0 t test for each model states that $\alpha1 = 0$ (education spending has no effect on RLS), $\gamma1 = 0$ (health spending has no effect on UHH), $\delta i = 0$; $i = 1 \& 2$ (RLS and UHH each have no effect on TPT), $\beta i = 0$; $i = 1 \& 2$ (education spending and health spending have no effect on TPT, respectively). The HA states that $\alpha1 > 0$, which means that education spending has a positive effect on RLS; $\gamma1 > 0$, which means that health spending has a positive effect on life expectancy; $\delta i < 0$; $i = 1 \& 2$, which means RLS and UHHeach have a negative effect on TPT; $\beta i < 0$; $i = 1 \& 2$, which means that education spending andhealth spending each have a negative effect on TPT.

4 Result and Discussion

This study estimates the effect of education expenditure on average length of schooling, the effect of health expenditure on life expectancy, and the effect of average length of schooling and life expectancy on the open unemployment rate in East Kalimantan province in 2018-2020using panel data regression as shown in equations (4) to (7). Table 5 displays the regression results for the Common Effects Model (CEM), Fixed Effects Model (FEM), and Random Effects Model (REM).

Table 5. Results of Panel Data RegressionModel 1: Dependent Variable RLS

Variable	CEM	FEM	REM
		Coefficient Regression	
C	8,7292	8,391 7	8,4 3 6 5
$B K$	9,58E-13	1,63E-12	1,5 4 E -1 2
R^2	0,07	0,99	0,32
Prob F-statistic	0,13	0,00	0,00Uji Chow

Cross-section F (9, 19) = 225,1813; Prob.F = 0,00
Uji Hausman
Cross-section random $\chi^2(1) = 0,2991$; Prob $\chi^2 = 0,5844$

Model 2: Dependent Variable UHH

Variable	CEM	FEM	REM
		Coefficient Regression	
C	72,6522	71,71 07	7 1, 7

				625
B K	4,76E-13	3,57E-12		3,40E-12
R^2		0,00	0,99	0,54
Prob F-statistic		0,72	0,00	0,00 Uji Chow

Cross-section F (9, 19) = 265,6212; Prob.F = 0,00
Uji Hausman
Cross-section random χ^2 (1) = 1,5904; Prob χ^2 = 0,2073

Model 3: Dependent Variable TPT

Variable	Coefficient Regression		
CEM		FEM	REM
C	-3,4274	-29,9503	-4,4496
R LS	1,4803	-0,6228	1,3875
U H H	-0,0582	0,5721	-0,0324
R^2	0,72	0,90	0,51
Prob F-statistic	0,00	0,00	0,00

(1)   Uji Chow
Cross-section F (9, 18) = 3,7654; Prob.F = 0,01
(2)   Uji Hausman
Cross-section random χ^2(2) = 2,1370; Prob χ^2 = 0,3435

After obtaining the results of the CEM, FEM, and REM regressions, two tests must be performed to determine the best panel data estimation model. First, the Chow test was used to determine which model was superior between CEM and FEM. Second, the Hausman test was used to determine which of the REM and FEM was superior.

The Chow test is a test to determine which model between the Common Effects Model (CEM) and the Fixed Effect Model (FEM) is more appropriate to use in estimating panel data. The condition is that if the F-statistical probability > α (0.05), then H0 is not rejected, which means that CEM is a more appropriate model to use. However, if the F-statistical probability <α (0.05), then H0 is rejected, which means that FEM is a more appropriate model to use to estimate panel data. The Chow test results in Table 5 show a cross-section F probability of 0.00for Models 1 and 2, and 0.01 for Model 3. Thus, H0 is rejected, which means that the more appropriate model to use is the Fixed Effects Model.

The Hausman test is a statistical test to determine which model is more appropriate to use in estimating panel data between the Random Effects Model (REM) and the Fixed Effects Model (FEM). If the probability χ^2 > α (0.05); then H_0 is not rejected, meaning that REM isthe most appropriate to use to estimate the data. However, if the probability value χ^2 < α (0.05);then H_0 is rejected, which means the right FEM is used to estimate the panel data. Based on Table 5, the probability value χ^2 for each of the three models is 0.5844; 0.2073; and 0.3435 (>0.05), so that H0 is not rejected, which means that the selected model is the Random Effects Model.

Based on the results of the Chow and Hausman tests, it is possible to conclude that the Random Effects Model (REM) is the best model for estimating panel data in this study. Table 6 displays the

REM Regression Results.

Table 6. Regression Results of Random Effects Model (REM)

Model 1
$RLS_{it} = 8,4365 + 1,54E\text{-}12BP_{it}$
$(0,001)^*$
$R^2 = 0,32$; F-stat = 13,47804; Prob. F-stat = 0,00
Model 2
$UHH_{it} = 71,7625 + 3,40E\text{-}12BK_{it}$
$(0,000)^*$
$R^2 = 0,54$; F-stat = 33,94513; Prob. F-stat = 0,00
Model 3
$TPT_{it} = -4,4496 + 1,3876RLS_{it} + -0,0324UHH_{it}$
$(0,012)^*$ $(0,949)^*$
$R^2 = 0,51$; F-stat = 14,14712; Prob. F-stat = 0,00

The F test is conducted to determine whether there is an influence of the independent variables on the dependent variable simultaneously or together. The F test is not necessary for Models 1 and 2 because Models 1 and 2 are simple regression models or only have one independent variable. Table 6 shows the probability of the F-statistic in Model 3 of $0.000 < \alpha$ (0.05) which means H_0 is rejected, so it can be concluded that the average length of schoolingand life expectancy.

Table 6 shows the probability of the t-statistic $\alpha 1$ Model 1 which is less than α (0.05), so itcan be concluded that education spending has a significant effect on the average length of schooling. It is also known from Model 2 that health spending has a significant effect on Life Expectancy because the probability t-statistic $\gamma 1$ is less than α (0.05). Then, Model 3 shows theprobability of the t-statistic $\delta 1$ less than α (0.05), so it can be concluded that the average lengthof schooling has a significant effect on the open unemployment rate. Meanwhile, Life Expectancy has no effect on the Open Unemployment Rate because the probability t-statistic $\delta 2$is more than α (0.05).

Based on Table 6, the value of R2 in Model 1 is 0.32. This means that 32% of the change in average length of schooling is caused by education spending, while the remaining 68% is influenced by other factors outside the regression model. Meanwhile, R2 in Model 2 of 0.55 means that 55% of the change in Life Expectancy is caused by changes in health spending. Then, Model 3 produces an R2 of 0.51 which means that 51% of the change in the Open Unemployment Rate is caused by the Average Length of School and Life Expectancy, while theremaining 49% is influenced by other factors outside the regression.

The t test was used to determine whether the independent variables had a significant individual or partial effect on the dependent variables. It is possible to determine whether each independent variable has an effect on the dependent variable by comparing the probability t- statistic with. In the t test, H0 indicates that the i-th independent variable has no effect on the dependent variable. Table 7 summarizes the results of the REM t test.

Table 7. Results of *t-test*

Model 1			
Variable	Coefficient	Prob.	Conclusion
BP	$\alpha_1 = 1,54E\text{-}12$	0,00	BP has real effect at $\alpha = 0,05$
Model 2			
Variable	Coefficient	Prob.	Conclusion
BK	$\gamma_1 = 3,40E\text{-}12$	0,00	BK has real effect at $\alpha = 0,05$
Model 3			
Variable	Coefficient	Prob.	Conclusion
RLS	$\delta_1 = 1,387598$	0,01	RLS real effect at $\alpha = 0,05$
UHH	$\delta_2 = -0,032430$	0,94	UHH has no real effect
Combination of Model 1, Model 2, dan Model 3			
Variable	Coefficient		Kesimpulan
BP	$\beta_1 = \delta_1\alpha_1 = 2,14E\text{-}12$		BP has real effect at $\alpha = 0,05$
BK	$\beta_2 = \delta_2\gamma_1 = -1,10E\text{-}13$		BK has real effect at $\alpha = 0,05$

Table 7 shows that education expenditure has a significant positive effect on the average length of schooling, health expenditure has a significant positive effect on life expectancy, the average length of schooling has a significant positive effect on the open unemployment rate, and life expectancy has no effect on the open unemployment rate.

Based on the results of calculating the constants for each region in East Kalimantan Province, it is known that Bontang City has the highest constant in Model 1 at 10.34. This means that, when it comes to the impact of education expenditure on the average length of schooling, Bontang City has the longest average length of schooling in 2018-2020. Balikpapan City has the highest constant in Model 2, which is equal to 73.43, indicating that in terms of the effect of health expenditure on Life Expectancy, Balikpapan City has the highest in 2018-2020. Furthermore, it is known that Bontang City has the highest constant in Model 3 of -3.48, which means that when the influence of Average Length of Schooling and Life Expectancy on the Open Unemployment Rate is taken into account, the Open Unemployment Rate in Bontang City is the highest in 2018-2020. The City of Bontang also owns the highest combined constant of Model 1, Model 2, and Model 3, which is 8.49, indicating that in terms of the effect of education and health spending on the Open Unemployment Rate, the Open Unemployment Rate in Bontang City is the highest in 2018-2020.

The coefficient for education expenditure is 1.54E-12, which means that a million rupiah increase in education expenditure will increase RLS by a very small amount, as will the effect of health expenditure on life expectancy, which is only 3.40E-12. Model 3 yields an average length of schooling coefficient of 1.3875, implying that a one-year increase in average length of schooling raises the open unemployment rate by 1.3875 percent. Meanwhile, the Life Expectancy coefficient of -0.0324 indicates that a one-year increase in Life Expectancy reduces the Open Unemployment Rate by -0.0324 percent. The combination of Model 1, Model 2, and Model 3 produces β_1 of 2.14E-12 and β_2 -1.10E-13; which means that the effect of education spending and health spending on the Open Unemployment Rate tends to be small if estimated through the Average Length of Schooling and Life Expectancy.

The t-test results in Model 1 show that education spending has a positive effect on RLS in East Kalimantan Province during the 2018-2020 period, indicating that the findings of this study are consistent with the research hypothesis. Increased government spending on education is expected to spur the construction and repair of many schools, as well as the addition and updating of facilities and infrastructure to support teaching and learning activities and the expansion of scholarships. Thus, it is hoped that more and more students will be able to receive education, resulting in an increase in technical and non-technical skills.

Harjunadhi and Rahmawati found the same result (2020). Education, as measured by the average length of schooling, is one of the components of the Human Development Index. An increase in education spending will improve public access to information about educational facilities and infrastructure, ultimately increasing the average length of schooling.

Model 2 demonstrates that health spending has a positive effect on life expectancy in East Kalimantan Province from 2018 to 2020, which is consistent with the research hypothesis. Health is a human right that requires attention and improvement in terms of both health services and budget allocation. Health Operational Assistance (BOK) is one of the government's spending programs for health centres in each region, providing more modern health facilities that are in line with local community health problems. It is hoped that through BOK, the number of health sector experts can be distributed to each region, increasing the quality of health services. Handayani et al., (2014) discovered that government health spending has a positive effect on the Human Development Index as measured by Life Expectancy.

The average length of schooling has a positive effect on the Open Unemployment Rate in East Kalimantan Province during the 2018-2020 period, according to Model 3. These findings contradict the research hypothesis, which states that the average length of education has a negative effect on the open unemployment rate. According to Table 2, the average length of schooling in East Kalimantan Province has increased between 2016 and 2021. The average length of schooling, however, is 9.5 years, or the equivalent of graduating from junior high school. Low education makes it difficult for people to enter the labour force, which requires workers with expertise and skills that are typically obtained only through higher education (above high school).

The findings of this study contradict the findings of Muslim (2014), who claims that education has a negative effect on unemployment. The findings of this study, however, are consistent with the findings of Salsabella et al., (2020), who discovered that education has a positive effect on unemployment, because if higher education is not matched by adequate employment opportunities, unemployment will continue to rise.

Meanwhile, in Model 3, Life Expectancy has no effect on the East Kalimantan Province Open Unemployment Rate from 2018 to 2020. Life expectancy in East Kalimantan Province isknown to rise year after year. According to Table 2, the average life expectancy is 74.08. This figure is known to be sufficient or to reach the national average. Unemployment, on the other hand, is not always caused by the length of one's life, but rather by the quality and skills of jobseekers. Good health will help a person's creativity and ability to continue working, but if this is not balanced with other factors such as higher education, longevity will have no effect on one's productivity and skills.

Chalirafi et al., (2020) discovered that Life Expectancy had no effect on unemployment inAceh Province between 2007 and 2018. Even if the population's quality can be measured usingthe Life Expectancy Rate (AHH), if this is not followed by available job opportunities,unemployment will remain difficult to overcome.

5 Closing

Unemployment is one of the development issues that arise as a result of the labor force growing faster than employment. The quality of human capital remains an important factor in reducing unemployment. Using the chain rule, this study aims to estimate the direction and magnitude of the influence of human capital spending on the open unemployment rate in East Kalimantan Province.

Panel data regression using the Random Effects Model (REM) approach was used to achieve the study's objectives. According to the findings of the influence validity test, educationexpenditure has a positive effect on average length of schooling, while health expenditure has apositive effect on life expectancy. As a result, education expenditure has a positive effect on theOpen Unemployment Rate, proving the existence of a chain rule. Meanwhile, health expenditurehas no effect on the Open Unemployment Rate, indicating that the chain rule is invalid.

Based on the research findings, the government is expected to be able to improve education quality by providing various types of scholarships and other assistance, allowing more and more people to obtain an education. Higher education can raise the quality of human resources, making it easier for people to find work. Furthermore, the government is expected to be able toprovide health insurance to the community, counselling from the lowest level of society, and equal distribution of access to health facilities in all areas so that it can be enjoyed by all levelsof society, resulting in an increase in Life Expectancy (UHH).

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