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## REGIONAL SPILLOVER EFFECT TO GROSS REGIONAL DEVELOPMENT PRODUCT (GRDP) IN THE SPECIAL REGION OF YOGYAKARTA, INDONESIA

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**Abstract.** This study aims at investigating the relationship between investment, employment, electricity consumption, GRDP of Purworejo Regency, GRDP of Magelang Regency, and GRDP of Klaten Regency to GRDP of the Special Region of Yogyakarta (DIY Province). For this purpose, this research uses time series model for the period of 2000-2016. The results show that Foreign Direct Investment (FDI), Domestic Investment (DI), Electricity Consumption (EC), GRDP of Purworejo Regency, and GRDP of Klaten Regency have significant and positive effects on GRDP of DIY Province. Also Employment has significant negative on GRDP of DIY Province. On the other hand, GRDP of Magelang Regency has no significant effect on GRDP of DIY Province. Conducive climate preparation policies for increased regional investment, productive sector mapping of the economy for labor usage, as well as good supply and distribution of electricity consumption to communities and business units are of major concerns to GRDP of DIY Province development.

**Keywords:** GRDP; Foreign Direct Investment; Domestic Investment; Employment; Electricity; Consumption

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### 1. Introduction

Regional economic development is an integral part of national economic development. This paper investigates the factors that can influence the development of a region, which is the Special Region of Yogyakarta (DIY Province) in this research. It is measured using the Gross Regional Domestic Product (GRDP) and the presence or absence of regional spillover effect.

The GRDP of DIY Province's grew from the year 2000-2016. In the year 2000, the province's GRDP was 41,828,092 million IDR, then rised up to 59,049,656 million IDR in 2008, a quite significant rise happened in

2016, it became 87,687,927 million IDR. The region's economic performance which reflected by the value of DIY.

Province's GRDP is considered good. Analyzing the growth of GRDP of DIY Province and the factors that could affect it, is an intriguing thing to do.

Mamuti & Ganic (2016) test the relationship of foreign investment toward Gross Domestic Product (GDP) by looking at the important role of foreign investment in financing economic activity in Macedonia. The research result concludes that foreign investment has positive and significant effect toward GDP and economic growth.

Besides foreign investment, domestic investment also has an important role in pushing up GDP of a country. Aziri (2017) in his research that was conducted in Macedonia in 2003-2014 specifically highlighted the role of domestic investment as a form of internal capacity of a country. The result of his research proves that domestic investment is able to give positive and significant effect for the growth of GDP in Macedonia country.

The economic development of DIY Province so far also depends on foreign and domestic investment. Because investment is one of the factors that drives the economy. The growth of foreign investment in the province are as follows: in the year 2000 a foreign investment in the form of Foreign Direct Investment (FDI) amounting 848,511,749,488 IDR, in the year 2008 increased to 961,273,289,857 IDR and in the year of 2016 foreign direct investment sky rocketed to 7,554,801,971,335 IDR. Meanwhile, Domestic Investment's (DI) growth are as follows: in the year 2000 with the amount of 1,815,182,865,869 IDR, risen up significantly in 2008 to 1,806,426,455,845 IDR and became 4,522,819,695,483 IDR in 2016.

The economic development in DIY so far is also depends on foreign and domestic investment, and labor, because investment and labor are the driving factors of the economy. The research from McFarlane et al. (2014) specifically examines the effect of labor and real wages toward the output (GDP) in Canada. The research result shows that labor has positive and significant causality relationship with GDP, and vice versa.

The amount of labor in DIY Province in the year of 2000-2016 experienced a growth. In the year 2000, the amount of labor absorbed were 1,663,503 people. But with the increase of the province's economic activity, the need for labor in the province also increased. Hence in 2008, the absorption of labor significantly risen to 1,892,205 people and became 2,042,400 people in 2016.

The increasingly advanced economic activity has occupied an important role of electrical energy consumption as an influential factor toward regional development. Al Mulali (2014), and Al Mulali & Mohammed (2015) have investigated the relationship between electricity consumption and Gross Domestic Product (GDP) in emerging countries. The result revealed that GDP and electricity consumption are co-integrated, and electricity consumption discovered having a long run positive relationship with the economic sectors.

Electricity consumption in DIY Province during 2010-2016 has increased significantly from year to year. Aside from showing the increase of household needs and efforts to support social and economic activity, it also shows that the increasing electricity consumption are always being supplied enough by the local government. In the year 2000 the electricity consumption in DIY Province was still 945,188,646 KWH, increased to 1,583,666,546 KWH in 2008, and became 2,698,238,827 KWH in 2016.

Another factor that can also affect the GDP of a country of GRDP of a region is spillover effect of the regional GRDP's influence. This research took the GRDP of Purworejo Regency which is located on the western border of DIY Province, Magelang Regency which is located in the north of DIY Province, and Klaten Regency which is

located in the east of DIY Province. The southern area of DIY is not examined because it is limited by the Indian Ocean.

This research has a difference compared to previous studies. The research result from Tamilselvan & Manikandan (2015) in India proved that Foreign Direct Investment (FDI) have a significant positive influence toward Gross Domestic Product (GDP). The weakness of the research result from Tamilselvan & Manikandan (2015) is that it only uses one independent variable, which is FDI to prove its effect on the GDP of India. The research from Baig et al. (2016) also tested the effect of FDI to GDP for South ASIAN countries (Pakistan, Nepal, Bhutan, India, and Maldivas) during 1991-2012. The results of Baig et al. research is that FDI has a positive influence on the GDP for South ASIAN countries. Likewise, research from Seyoum et al. (2015), and Sothan (2017) which only used FDI as an independent variable produced findings which stated that there is positive significant influence between FDI on GDP. The difference with this research is the previous one only used the FDI variable, there are no domestic investment, employment, electricity consumption, and spillover effect on GDP.

The following previous studies also only use one independent variable to be tested for its effect on GDP, not comprehensively as this study. Of course the following results and research contributions are limited. Fosu et al. (2016) conducted research about domestic investment in the public sector and its relationship to GDP growth in Africa. The research model used is the GMM Estimation System. The results shows that public sector investment can have a positive and significant influence on GDP growth in African countries. The better value of this study compared to Fosu et al. (2016) is the use of independent variables for domestic investment not only from the public sector but also the private sector. Research on the relationship between employment and GDP has been carried out by Malec et al. (2016). Research location was in Egypt during 2000-2013. Analysis in Malec et al. (2016) using Person correlation coefficient model. The result of his research shows that labor has a positive and significant correlation to the growth of Egyptian GDP.

GRDP of a region needs to be continuously encouraged to be improved in order to achieve high and sustainable regional economic growth. Using resources owned by the region optimally becomes an important task to achieve the desired economic growth goals. Therefore, the renewal of this research will close the gap generated in previous research by examining the influence of factors of foreign direct investment, domestic investment, electricity consumption, employment and the spillover effect of GRDP DIY, Indonesia, during the period 2000-2016.

## **2. Literature Review**

### **2.1. Foreign Direct Investment (FDI)**

The amount of investment becomes an important factor in increasing economic growth. This model was introduced by Romer (1986). Besides, another research has been done by Abu & Mohd Zaini (2016) during the period of 1981-2011. The result found that foreign investment in the long term has a significant and positive effect toward GDP.

Ali and Mingque (2018) also researched the impact of foreign direct investment (FDI) on real GDP growth of Asian developing countries. This study took Sri Lanka, Pakistan, Philippines and Thailand as the representative of Asian developing countries during 1990-2014. This study is analyzed by Vector Error Correction Model (VECM) and Johansen Cointegration test. The results shows that foreign direct investment in long term had significant positive effect on real GDP growth of the countries studied. FDI flows in economic sectors have succeeded to accelerate the output of economic sectors, so that it contributed in increasing real GDP growth continuously. In addition, the study also found Granger causality between foreign direct investment, gross capital formation,

government consumption, trade openness and labor to real GDP growth. This is an evidence that the government policy is appropriate in regulating the entry of FDI flows, infrastructure readiness and labour that has accelerated the effectiveness of FDI's role in economic sectors. The researchers provide recommendations to the governments of Asian developing countries to apply incentive policies to attract more foreign investment. Additionally, it is also needed for having regulations that control capital flows between Asian countries so that investment conditions can support the entry of foreign capital because FDI is proven to have significant positive effect on real GDP growth of each countries studied.

This research is also in accordance with the research result from Gaikwad & Fathipour (2013) in India, Kosztowniak (2014) in Poland, Sarfraz & Liu (2015) in Pakistan, Khan & Jehan (2015) in Pakistan, Kisswani et al. (2015) in Estonia, and Mahembe & Odhiambo (2016) in SADC countries.

## **2.2. Domestic Investment (DI)**

The classics of economic development claims that the domestic investment contribute to economic growth, e.g recently the research that was conducted by Sánchez-Juárez & García-Almanda (2016) in Mexico during the period of 1993–2012 examines about debt, investment, and economic growth. The research concluded that domestic investment along with debt is also able to give positive and significant effect toward GDP growth of the country.

Hlotywa and Ndaguba (2017) have researched the influence of domestic investment to GDP in South Africa during 1990–2014. This study used Vector Error Correction Model and econometric cointegration models. The domestic investment in this study is measured by the amount road transport infrastructure investment. The result proved that the domestic investment gave a positive impact on real GDP growth in South Africa. Investment of infrastructure development has important role in economic development of a country. The researchers offered several recommendations on policy implication for the government. The government needs to make investment cooperation in infrastructure development, especially road infrastructure. He also needs stimulate savings that will increase the investment and creates eco-friendly investment for environment so that the investment will be increase significantly. The result of this research is strengthened by Mohamed et al. (2013) in Malaysia, Bayar (2014) in Turkey, Tan & Tang (2016) in ASEAN-5 countries, and Osabuohien et al. (2017) in Nigeria.

## **2.3. Electricity Consumption (EC)**

Alam (2013) has conducted research on the relationship between electrical energy and GDP growth in India during the period of 1975-2008. The result shows that the consumption of electrical energy is able to give a positive and significant influence to GDP growth.

Sanchez-Lor and Zambrano-Monserrate (2015) have examined the relationship between electricity consumption (EC), gross domestic product (GDP), foreign direct investment (FDI), human development index (HDI) and remittance (RMT) in Colombia, Ecuador and Mexico. The data of this research is taken from 1980-2012. The research method used cointegration and Granger causality test. The results shows that only in Ecuador, the electricity consumption (EC) had a positive significant effect on GDP while Colombia and Mexico did not affected. It is because energy in Ecuador including electricity has a vital role. It becomes the main factors of production process beside capital and labor. In Colombia, there are two unidirectional causalities running from HDI to EC and GDP to FDI generating a positive effect. It also has bidirectional causality between HDI and RMT reflecting enhancing feedback in the long-run. However in Mexico, EC causes FDI in the short-run within a positive interaction, and FDI and HDI sustain short-run unidirectional causalities affect the RMT negatively exerted from FDI and positively from HDI.

Long et al. (2018) also have conducted research to examine the effect of electricity consumption and foreign investment on real GDP growth in Vietnam during 1990-2015 by using the Toda-Yamamoto approach and the distributed lag autoregressive approach (ARDL). One of the prerequisites for the successful implementation of industrialization and national modernization is the synchronous development of fundamental industries.

Electricity is a key industry that determines the success of other industries. The results of his study explained that there is a strong and significant positive relationship between electricity consumption and foreign direct investment in Vietnam's economic growth both in the short and long term period. If the development of electricity consumption and foreign investment can be increased, it will have a positive impact on Vietnam's real GDP growth. The same finding is obtained from the research of Akpan & Akpan (2012) in Nigeria, and Tewathia (2014) in Delhi.

#### 2.4. Employment (EM)

The theory about the relationship of labor toward GDP is introduced by Solow (1956). According to the theory, factors that have positive influence toward the GDP value of a country or GRDP for a region is the amount of investment and labor with the model of  $Y = F(K, L)$ .

Kaseeram and Mahadea (2017) have investigated study of relationship between labor and real GDP growth in South Africa. The study used annual data during the period 1946-2015. It is analyzed by VAR/VECM time series method with Johansen co-integration test. The results show that there is a significant long-run co-integrating relationship between labor and real GDP growth in South Africa. That relationship is positive. It means that the more countries in South Africa have labors, it will increase real GDP growth (economic growth) in the country. Then the researchers provided recommendations to improve the quality of workers and to provide more labor markets. It is required because a broad labor market and enhancement of quality workforce are needed to have a positive effect on real GDP growth (economic growth).

Gohman et al. (2016) also have researched the labor and the real GDP growth. Labor variables are divided into two, there are productive and unproductive labor. The study was conducted in the United States during 1990–2012 and had different conclusions for different cases. First, the labor has a positive significant effect on real GDP growth (economic growth). It is because the research workforces are productive labors. Second, the labor has a negative significant impact on economic growth, it happens because the researchers took unproductive labor as the variable. Therefore labor productivity is able to give different direction impact on real GDP growth (economic growth). Researchers explained that the industrial sector can not directly influence economic growth but it is more affects on relationship of the labor and the industry, if relationship between industrial and labor are better, it will increase the labor productivity too.

Ismail & Yuliyusman (2014) have done a research about the relationship between foreign workers toward the economic growth in Malaysia. The research result explains that skilled that owned by foreign workers can give a positive and significant effect toward GDP. This result is in accordance with the findings from Nayyar (2014), McFarlane et al. (2014) in Canada, Maitah et al. (2015) in Belgium, and Asad et al. (2016) in Pakistan.

#### 2.5. Spillover Effect of GRDP

This study about regional development is based on the theory initiated by Romer (1986), which states that science is the most important production factor for increasing the output of a region and have spillover effect on another region. Rho & Moon (2014) in their study in China conclude their finding that the impact of connection and interaction of inter-regional economy (spillover effect) is an important factor for the increase of economic capability in the region. The same finding is obtained from the research of Kleynhans (2016).

Based on the above literature review, the hypotheses of this research are:

H1: Foreign Direct Investment has a positive and significant effect on the GRDP of DIY Province H2: Domestic Investment has a positive and significant effect on the GRDP of DIY Province

H3: Employment has a positive and significant effect on the GRDP of DIY Province

H4: Electricity consumption has a positive and significant effect on the GRDP of DIY Province H5: GRDP Purworejo Regency has a positive and significant effect on the GRDP of DIY Province H6: GRDP Magelang Regency has a positive and significant effect on the GRDP of DIY Province H7: GRDP Klaten Regency has a positive and significant effect on the GRDP of DIY Province

### 3. Research Methodology

#### 3.1. Instrument

This study uses time series data across ranging from 2000 to 2016 from DIY Province, Purworejo, Magelang, and Klaten Regencies. The dependent variable is GRDP of DIY Province and the independent variable includes foreign direct investment, domestic investment, employment, electricity consumption, GRDP of Purworejo Regency, GRDP of Magelang Regency and GRDP of Klaten Regency.

#### 3.2. Data Analysis

The data is analyzed using the logarithm regression model:

$$\text{LogGRDPDIY}_t = \beta_0 + \beta_1 \text{LogFDI}_t + \beta_2 \text{LogDI}_t + \beta_3 \text{LogEM}_t + \beta_4 \text{LogEC}_t + \beta_5 \text{LogGRDP Purworejo}_t + \beta_6 \text{LogGRDP Magelang}_t + \beta_7 \text{LogGRDP Klaten}_t + e_t \quad (1)$$

Where:

GRDP= Gross Regional Domestic Product (in millions IDR); FDI = Foreign Direct Investment (in IDR); DI = Domestic Investment (in IDR); EM=Employment (in people); EC = Electricity Consumption (in KWH);  $\beta_0$ = constant;  $\beta_i$  = coefficient;  $i = 1, 2, 3, 4, 5, 6, 7$ ;  $t$  = the period 2000-2016; and  $e$  = error term. All variables are stated in logarithm.

### 4. Result and Discussion

The analysis of this study began with the MacKinnon, White and Davidson (MWD) test that found the best model. It was the logarithmic regression model. This model is chosen because the probability value of Z1 is significant. It is 0.0020, smaller than alpha 0.05, so that the best model is the logarithmic regression model. While the probability value of Z2 is not significant because it is 0.2916, greater than alpha 0.05, so the best model is the logarithmic model. The form of regression results in logarithmic regression models are shown in Table 1 below.

**Table 1.** Regression Result

Dependent Variable: LOG (GRDP DIY) Method: Least Squares

Sample: 2000 2016

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.554799	0.243175	10.50601	0.0000
LOG(FDI)	0.001811	0.000478	3.791515	0.0043 <sup>a)</sup>
LOG(DI)	0.014401	0.007041	2.045428	0.0711 <sup>c)</sup>
LOG(EM)	-0.059215	0.018739	-3.159916	0.0116 <sup>b)</sup>
LOG(EC)	0.154895	0.032778	4.725591	0.0011 <sup>a)</sup>
LOG(GRDP PURWOREJO)	0.467483	0.089149	5.243821	0.0005 <sup>a)</sup>
LOG(GRDP MAGELANG)	0.034943	0.096308	0.362821	0.7251
LOG(GRDP KLATEN)	0.269377	0.079313	3.396382	0.0079 <sup>a)</sup>
R-squared	0.999935	Mean dependent var		17.90365
Adjusted R-squared	0.999884	S.D. dependent var		0.235640
F-statistic	19731.53	Durbin-Watson stat		3.087877

Note: <sup>a)</sup>= significant at 0.01; <sup>b)</sup>= significant at 0.05; <sup>c)</sup>= significant at 0.10 level respectively

After completing the MWD test and getting the best model, the next steps make the Classical Assumption test, including normality test, multicollinearitytest, heteroscedasticity test and autocorrelation test. The result shows that the best model passed for all assumptions on the Classical test.

#### 4.1. Foreign Direct Investment (FDI)

Based on the result of t test, it can be concluded that FDI has a positive and significant effect toward GRDP of DIY Province with the coefficient value of 0.001811, which means that if the FDI rises 1 percent, then the GRDP of DIY Province will rise by 0.001811 percent. Finding of this study shows that the driver of main economic activity sectors in DIY Province especially industry and service, are supported by FDI. Beside that, the presence of FDI also shows that the province uses an open economic policy.

Jimborean and Kelber (2017) have studied about the effects of foreign investment on real GDP growth in Eastern European and Central European countries during 1993 to 2014. The study used a dynamic panel data analysis model and had conclusion that the foreign investment has a positive significant effect on real GDP growth. This foreign investment can be increased through the creation of macroeconomic stability, stability of labor costs, and improves adequate infrastructure access.

Meanwhile, Bose et al. (2017) has also examined the relationship of foreign investment to real GDP growth and exports in Bangladesh during 1996–2013 by using the three simple linear regression model. The result of his research is foreign investment had a positive and significant effect on real GDP growth and Bangladesh exports. The problem that inhibits foreign investors from entering Bangladesh are an unstable political condition, the lack of infrastructure development and limited land for investment.

This finding is also accordance with the findings from Mamuti & Ganic (2016), Ouhibi et al. (2017), and Reza et al. (2018) and Caesar et al. (2018) which prove foreign investment is important to increase GDP growth in a

country. But this result is contrary to the results of research conducted by Shakar & Aslam (2015) in Malaysia, and Nguyen & Zhu (2017) in Vietnam, which found that FDI had no significant effect on GDP.

Shakar and Aslam (2015) also found the same thing in their research in Malaysia, there is no significant relationship between foreign direct investment and real GDP growth. This is due to economic growth in Malaysia during the study period between 1980-2010 influenced by other factors besides foreign investment. The researcher admitted that the research findings were different from the previous studies, according to him, Malaysia has begun to experience a shift in the determinants of economic growth factors from foreign direct investment to human resource investment.

Nguyen and Zhu (2017) has conducted research in Hanoi (Vietnam). The study examined the impact of foreign direct investment on economic growth in Hanoi. They got conclusion that the foreign investment is unable to contribute on Vietnam's real GDP growth in the short term, whereas in the long run, the influence of foreign investment on real GDP growth is still smaller than domestic investment in the public sector. Foreign investment does not contribute on Vietnam's real GDP growth because foreign investors often have difficulty investing as a result of complicated administrative procedures.

#### **4.2. Domestic Investment (DI)**

Based on the result of t test, it can be concluded that domestic investment has a positive and significant effect toward GRDP of DIY Province with the coefficient value of 0.014401. This means that if the DI rises 1 percent, then the GRDP of DIY Province will rise by 0.014401 percent. This proves that the role of domestic investment is important, even more dominant compared to the role of FDI in increasing the GRDP of DIY Province (Feriyanto, 2016). DI's role shows that besides FDI, the use of DI has encouraged increase in output and in turn DIY Province GRDP.

This result study supports the research findings from Makuyuna & Odhiambo (2017) in Zimbabwe. Their study revealed that the domestic investment had a positive effect on real GDP. According to them, it happens because the public sector investment has a greater impact on economic growth in short term. Meanwhile in long term, investment in the private sector has more significant impact on real GDP growth. Therefore, the government needs to give development priorities from the use of short-term investments to the public sector, on the other hand, long-term development priorities can be left to the private sector.

Shvets S. (2018) also examined domestic public sector investment and its relationship to economic growth in Ukraine. The study used VECM model and gave conclusions that public domestic investment has positive influence on real GDP growth. In short run, public investment becomes a significant driver on real GDP growth, while in the long run, the increase of public investment can also raise real GDP growth. In addition, researchers give recommendations to the government to create a good investment climate through pro-investment policies both in the short and long term. It is required because of considering that domestic investment has proven to have a positive significant impact on Ukraine's economic growth.

This result is also strengthened by the findings from Sánchez-Juárez & García-Almenda (2016), Osabuochien et al. (2017), and Aziri (2017). Alas this result is contrary to the results of research conducted by Zhang (2014) in China, and Omoregie & Ikpesu (2017) in Nigeria, which found that domestic investment (DI) did not have a significant relationship to Gross Domestic Product (GDP). It happens because DI is used in less productive sectors in the country so that it does not have a significant impact on the country's GDP.

#### 4.3. Employment (EM)

Based on the result of t test, it can be concluded that employment has a negative and significant effect toward GRDP of DIY Province with the coefficient value of -0.059215. This means that if the Employment rises 1 percent, then the GRDP of DIY Province will down by 0.059215 percent. This indicates that market labor in DIY has experienced saturation and inefficiency, so when there is an addition of labor absorption, it will have an impact to the decrease of GRDP of DIY Province. The use of labors in agriculture and forestry sectors in DIY Province isn't effective because of the declining productivity. It happens because the proper support irrigation and productive of agricultural land are decreasing. The increase of labor usage which cant produce increased output, made the GRDP of agriculture and forestry sectors continues to decrease.

The research of Kaushik et al. (2015) in Philipina, Bonga-bonga & Ahiakpor (2016) in Ghana, and Turkovic (2017) in Iran had examined the effect of employment toward GDP riil, and found employment usage had a negative relationship with GDP riil growth.

Kaushik et al. (2015) in his research in several ASEAN countries, proved that labor has a negative effect on real GDP growth. The study used a standard model of real GDP growth that is a function of size government, labor force, and capital. Related to the labor, this study made conclusion that employment has a negative and significant relationship with real GDP growth in Philippines. It is caused by excess labor supply.

Bonga-bonga & Ahiakpor (2016) have studied about what factors affect on real GDP growth in Ghana. The research conducted in the period 2001–2014 and applied the BMA analysis method. The measured variables are GDP as dependent variable and population density, crop production, inflation rate, amount of labor, current account balance and population growth as the independent variables. The results of study indicate that one independent variable, amount of labor, has a negative significant effect on real GDP growth in Ghana because there are still more workers who work in the public sector. The public sector has not given much influence to the country's economy. Therefore, the researchers then give recommendations to the government to improve and to facilitate policies that support the entry of investment in the private sector. The private sector investment will increase the demand of private sector labor so that it can give positive effect on real GDP growth in Ghana.

Research on labor and growth in real GDP (economic growth) has also been carried out by Turkovic (2017) in the Islamic Republic of Iran during 1974–2014, used the ARDL and ADF test methods. The results show that labor has a negative and significant effect on real GDP growth in Iran. In addition, other variables, capital and technology give opposite significance. The negative effect of labor on real GDP growth happens because labor productivity is still relatively low and there is limited capital, so that the impact of the increase in labor on output growth (real GDP) will be decreasing.

#### 4.4. Electricity Consumption (EC)

Based on the result of t test, it can be concluded that the variable of electricity consumption (EC) has a positive and significant effect toward GRDP of DIY Province with the coefficient value of 0.154895. This means that if the electricity consumption rises 1 percent, then the GRDP of DIY Province will rise by 0.154895 percent. Many economic activities in DIY Province use electricity, especially for Small, and Medium Enterprises (SMEs) and other trade activities that have a positive impact on the GRDP of DIY Province. A lot of SMEs in DIY Province depend on the use of electricity to produce their output. DIY is a province with lots of schools, universities, hotels and restaurants, so it requires a lot of electricity in each of its activities.

Albiman et al. (2015) examined the effect of electricity consumption on GDP growth in Tanzania during the period 1975–2013. The results show that electricity consumption can give a positive influence on GDP growth in

the country. Electricity consumption has been proven to increase people's economic activities in various sectors so that it has a positive impact on GDP growth in Tanzania.

Next, Hossen and Hasan (2018) also studied about the effect of electricity consumption on real GDP growth in Bangladesh during the period 1972-2011, used time series data analysis model and ADF and Phillips-Perron data stationarity tests. The results show that there is a positive significant relationship between electricity consumption and real GDP growth. It can happen because the electricity consumption has proven to drive people's economy through the dominant sectors of the economy in Bangladesh. The socialization of efficient use of electrical energy is required, so that people can get greater economic value added.

This study finding is in accordance with the findings from Hossain & Saeki (2012) which examines the causality relationship between electricity consumption and GDP in 76 countries. But the results of this study are different from the results of Asongu et al. (2016), Alley et al. (2016), Yasar (2017), and Tamba et al. (2017) who found that electricity consumption did not have a significant effect on GDP.

The results of research that is conducted by Asongu et al. (2016) explained that the electricity consumption sector did not have a strong influence on GDP. They took 24 countries in Africa as research samples and used the Auto Regressive Distributed Lag (ARDL) panel method. The results of their research mentioned that the causality relationship between electricity consumption and GDP is not too strong. It is due to the level of responsiveness of electricity consumption to GDP is at a minimum level, therefore it is necessary to use more renewable energy based on fossils. If it can apply in Africa, it will give a stronger influence on increasing GDP in Africa countries.

Alley et al. (2016) conducted a study to examine the effect of electricity consumption on GDP in Nigeria. The study found a conclusion that the use of electrical energy can not affect significant directly on GDP. This is due to the use of electrical energy that is widely used in the industrial sector has not affected the increase of output of industrial sector maximally because the industrial sector is not developed well in Nigeria. The government needs more serious efforts until an increase of industrialization process is more intensive can occur in the country, so that it can give impact on the increase of output of industrial sector that contributes greatly to GDP growth in Nigeria.

Yasar (2017) in his research on the effect of energy consumption on GDP, took electricity energy as his research variable. From 119 countries studied, it was found that there is no significant relationship in short-term and long-term between electricity consumption and GDP in low-income countries. Likewise in the middle-lower income countries, there is no significant effect on short-term causality. It happens because the middle-lower income countries is still in early development process. It means the production proces is still based on conventional technology methods where the use of electricity energy is still limited. Therefore, the output is still low.

Meanwhile, Tamba et al. (2017) in his research in Cameroon during 1971-2013, used an econometric approach through the Johansen co-integration test, Vector Auto Regressive (VAR) method, and Granger causality test, found that electrical energy consumption did not have a significant effect on GDP growth. According to the researchers, it is caused by the lack of electricity supply in the country than its demand. Cameroon is actually a very large hydroelectric potential country, however, its potential can not be utilized optimally in order to fulfill electrical energy needs. Therefore, the government should take an intensive policy in the framework of increasing, producing, distributing electrical energy so that it can provide a good influence in the future in the state revenue sector, especially Cameroon's GDP.

#### 4.5. GRDP of Purworejo Regency

Based on the result of t test, it can be concluded that the GRDP of Purworejo Regency has a positive and significant effect toward GRDP of DIY Province with the coefficient value of 0.467483. This means that if the GRDP of Purworejo Regency rises 1 percent, then the GRDP of DIY Province will rise by 0.467483 percent. Purworejo Regency is well-known for its agricultural products. Cooperation between agro-industry and SMEs in the form of forward linkage strongly supports the GRDP development and become a positive spillover effect.

The finding of this study strongly supports Drummond & Liu (2015). According to the findings, there is a spillover effect between the rises of the Chinese economy with the other country economies such as sub-Saharan Africa. In addition, this findings result is also in accordance with the findings from Jiang et al. (2016).

#### 4.6. GRDP of Magelang Regency

The variable analysis result of the GRDP of Magelang Regency shows that this variable is insignificant effect toward the GRDP of DIY Province, because the probability is greater than  $\alpha = 10$  percent ( $0,7251 < 0,10$ ). The reason for the insignificant GRDP of Magelang Regency is because the product of the main sector in this regency is the final product that the marketing and consumption is done in this regency. It means there is economic independence in the GRDP of Magelang Regency. Besides being a producer, Magelang Regency residents also consumed the output produced as well as other regencies in the north and west of Magelang Regency, but not DIY Province residents.

The findings of this study in line with Alsharairi & Abubaker (2016) which examined the effects of spillover in the United Arab Emirates (UAE) during 2009-2013. Alsharairi & Abubaker focus on the discussion of the impact of countries movement around the Middle East on economic conditions in the UAE. They found condition of economic, political and security in Middle Eastern countries has not affected the economic conditions in the UAE. It means that there is no spillover effect, especially viewed from the financial market's condition. According to researcher, it happened because the UAE has more stable economy compared to its neighbor, this stability is not only in economic terms but also includes politics and security.

The findings of this study supported Huajun (2017) who examined regional disparity in China during 1992-2013. The model used in Huajun was DMSP/OLS with the data of 291 cities in China. Huajun found that several regions in northern China and Guangdong Province contributed an increase in disparity in China. This means that until now, the North China and Guangdong regions have not been able to provide spillover effects for the surrounding areas. The researcher argued that the absence of a spillover effect was due to the fact that the area was in the developed region category but the 'downward transition' probability was relatively small. The area is an advanced industrial area with high economic growth. In order to provide a positive spillover effect for China, it is necessary to have a government policy to balance economic growth that can be done by coordinating policies between regions in China.

#### 4.7. GRDP of Klaten Regency

Based on the result of t test, it can be concluded that the GRDP of Klaten Regency has a positive and significant effect toward GRDP of DIY Province with the coefficient value of 0.269377. This means that if the GRDP of Klaten Regency rises 1 percent, then the GRDP of DIY Province will rise by 0.269377 percent. The variable of regional spillover of GRDP of Klaten Regency has a positive and significant effect toward GRDP of DIY Province. It cannot be separated from the same type of industry between Klaten Regency and DIY Province. In producing competitive output, the industrial sectors of both Klaten Regency and DIY Province collaborates each other. This study is in accordance with the study from Kamaraj & Kathiravan (2013), and Kleyhnans (2016).

## **5. Conclusion**

This study aims at investigating the relationship between Foreign Direct Investment (FDI), Domestic Investment (DI), Employment (EM), Electricity Consumption (EC) and GRDP of Purworejo Regency, GRDP of Magelang Regency, and GRDP of Klaten Regency toward the GRDP of DIY Province, which makes this topic is very important to discuss. The result shows that while FDI, DI, EC, GRDP of Purworejo Regency and GRDP of Klaten Regency have a positive and significant effect, the employment (EM) has a significant and negative effect on GRDP in the DIY province. However, GRDP of Magelang Regency variable do not significantly affect GRDP in the DIY province.

## **6. Implication and Limitation**

The implications of the findings should help the government of DIY Province in making policy regarding to improve the GRDP of DIY Province. Economic cooperation between Purworejo and Klaten Regency is very important to be improved, because positive spillover effect has a role in the increase of the GRDP of DIY Province.

Community empowerment especially SMEs and the products in supporting forward linkage has a very important role in increasing public income. Supply of electricity that is sufficiently needed to anticipate the increase in electricity consumption due to the increased activity of SMEs. Domestic and foreign investments need to be improved through creating a conducive climate for regional investment. Besides, productive economic sectors need to get serious attention from the government through policy and budget support so that they can become the dominant sector in contributing to GRDP DIY.

The use of labor in the Province of DIY also needs to get serious attention because the condition has negative impact toward the GRDP of DIY Province. It needs an in-depth study to the less productive sectors of economic in using labor, and the preparation of labor skill that is in accordance with the needs of the economic sector is also need to be done.

The limitation in this study is that the research only focused on DIY province in the 2000-2016 period. The result certainly cannot represent the entire 34 provinces in Indonesia, because each has different characteristics. Further research can be done with a broader area of research that is nationally (Indonesia) with a longer research time so that it can produce a more complete study and more contributions.

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