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Determinants of Regional Unemployment Rates in West Java : Geographically Weighted Panel Regression (GWPR) Model

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ABSTRACT

This study aims to analyze the determinants of the regional unemployment rates in West Java Province in the period 2010-2019. Due to the diversity of characteristics between regions, this study uses Geographically Weighted Panel Regression (GWPR) analysis. The results showed that all the independent variables used had a significant effect on the regional unemployment rate in West Java. It is recommended that the government encourage efforts to reduce unemployment in their regions by investing more in real sector development, attracting investors in the manufacturing and service sectors, and improving education and skills.

Keywords: Regional Unemployment, Labor Supply Demand, GWR Panel

I. INTRODUCTION

Development is a process of change that improves a community's social system towards a better and sustainable direction. The most important goal of the development process is to improve people's living standards and welfare, reduce poverty, and expand economic and social choices that free people from dependency (Todaro and Smith, 2011). However, in its application, the development process will face several very complex problems, one of which is unemployment.

According to the Central Statistics Agency (BPS, 2019), the condition of the unemployment rate in West Java Province continues to decline. In 2010, the unemployment rate was 10.33 percent, but in 2019, it was 7.99 percent. Although it continues to decline, the achieved unemployment reduction target is still above the target of the 2013-2018 Regional Medium-Term Development Plan (RPJMD) of West Java Province, which targeted the reduction of unemployment in 2018 of 6.0-6.5 percent, but in reality, the open unemployment rate in 2018 was 8.17%. In addition, the pattern of poverty reduction tends to slow down by an average of 0.28 percent per annum, lower than the provinces of DKI Jakarta and Banten which collectively are able to reduce the unemployment rate to 0.60 percent per annum.

Further, from 2016 to 2019, West Java province ranked first in the highest unemployment rate nationally. Of course, this is a burden for the government's economy, which is very different when compared to the unemployment rates in several developed countries, which are already in full employment conditions (Sukirno 2008). The high unemployment rates in West Java Province, of course, in aggregate is due to the unemployment rate of each regency/city.

The Central Statistics Agency (BPS) recorded in 2019, a wide gap in unemployment rates between regions, where the area with the highest unemployment rate was Cirebon Regency at 10.28 percent, and the lowest area was Majalengka Regency at 4.37 percent. The condition of the inter-regional unemployment rate gap in 2019 was not much different from 2010. This means that in the period 2010-2019, there were still problems regarding unemployment in West Java. Local governments with social participation and utilization of existing resources must be able to estimate the potential resources needed to reduce regional unemployment rates. Where the economic development of a region is based on the utilization of its resources, and the regional economic potential, which becomes the wealth of the region, is the regional development capital (Getis 2007).

In its development, many studies that strengthen the linkage of labor supply-demand with the unemployment rates, including: Elhorst (2003), Cracolici et al. (2007), Chuang YC Lai (2007), Filitzekin (2008), Uk Kim and Lim (2018), Sari NA et al. (2011); Tiani Wahyu Utami et al. (2016); Guclu (2017), Khaerandy et al. (2019). Studies that analyze the phenomenon of unemployment based on the labor supply demand of by looking at it from the perspective of geographical and regional spatial dimensions in Indonesia are still limited in number. In addition, West Java province has characteristics that are not uniform between regions. Therefore, extracting these factors requires consideration of geographical (spatial) space due to the diversity of characteristics and regional potential. The use of Geographically Weighted Panel Regression (GWPR) analysis is deemed the right choice since producing estimates for each region.

According to Maulani et al. (2016), Geographically Weighted Regression (GWR) model is the development of the global regression model. The global regression equation is assumed to be generally valid at each observation location. The GWR model, according to Lewandowska and Gwarda (2018), has a much better fit with empirical data than the global model. Yu (2010) conducted research on the development of methods for spatial temporal analysis by combining the GWR model and the panel regression model for the first time. This model is Geographically Weighted Panel Regression (GWPR) with Fixed Effect Model. This study is applied to the regional economic development in Beijing. The results conclude that the GWPR model is better than the cross-sectional GWR and panel data models.

In order to conduct a study on regional unemployment in West Java, this study considers several possible factors related to unemployment based on labor supply demand such as labor force participation rate, human capital, dependency ratio, industrial structure and wage mechanism (Blanchard and Katz, 1992). Based on the background and description above, the purpose of this study is to analyze the factors that influence the unemployment rates in the regencies/cities of West Java Province in the period 2010-2019.

II. METHODS AND MATERIALS

The type of data used in this study was secondary data in the form of panel data, namely cross-sectional data from 26 regencies/cities in West Java Province and time series data for 10 years from 2010 to 2019. Data processing used software RStudio, Q-gis, and Excel. Yu (2010) conducted research on the development of methods for spatial temporal analysis by combining the GWR model and the panel regression model for the first time. This model is Geographically Weighted Panel Regression (GWPR) with Fixed Effect Model. This research is applied to the regional economic development in Beijing. The results conclude that the GWPR model is better than the cross-sectional GWR and panel data models. In the GWPR model, the time element is included in the GWR model.

Many regional unemployment models have been suggested, but one of the most influential originated from Blanchard and Katz (1992). The model is based on four relationships (short-run labor demand, wage setting, labor supply, and long-run labor demand), but its minimal form only links unemployment to factors that affect labor demand, labor supply, and wages. This study used GWPR modeling by combining GWR and panel regression FEM (Fixed Effect Model) as Yu did (2010). With model specifications as follows:

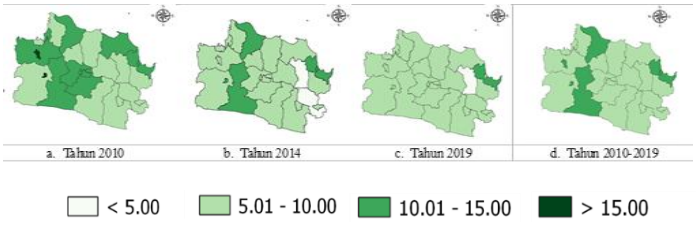
$$\begin{aligned} UR_{it} = {} & \alpha(\mu_{it},\vartheta_{it}) + \beta_1(\mu_{it},\vartheta_{it})TPAK_{it} \\ & + \beta_2(\mu_{it},\vartheta_{it})DEPEND_{it} \\ & + \beta_3(\mu_{it},\vartheta_{it})RLS_{it} \\ & + \beta_4(\mu_{it},\vartheta_{it})MANU_{it} \\ & + \beta_5(\mu_{it},\vartheta_{it})JASA_{it} \\ & + \beta_6(\mu_{it},\vartheta_{it})lnUMR_{it} + \varepsilon_{it} \end{aligned}$$

Where : UR is Open unemployment rate (percent); TPAK is Labor force participation rate (percent); DEPEND is Dependency Ratio (percent); RLS is Average length of schooling (years); MANU is Number of workers in the manufacturing sector (percent); JASA is the number of workers in the service sector (percent); LnUMR is the Natural Logarithm of the Regional Minimum Wage, and (μ, ϑ) is the geographic coordinates (longitude and latitude).

III. RESULTS AND DISCUSSION

A. Overview of the unemployment rate

The condition of the open unemployment rate in West Java Province from 2010 to 2019 is still very fluctuating, with an average of 8.74 percent. Figure 1 shows that the highest unemployment rate was in 2010, namely in Sukabumi City and Bogor City. Meanwhile, on average, Cirebon Regency, Cianjur Regency, Karawang Regency, Bogor City, Cirebon City, and Sukabumi City are the regions with the highest open unemployment rates in West Java Province. In addition, from Figure 1 below, it can also be seen that from 2010 to 2019, some regencies/cities have an increased open unemployment rate, namely Kuningan Regency (1.74), Ciamis Regency (1.26), Banjar City (0.23), and Purwakarta Regency (0.11) while the other 24 regencies/cities experienced a downward trend, where the largest decrease in the open unemployment rate was in Sukabumi City (7.21).



Source: BPS 2021, processed

Figure 1. Comparison map of the open unemployment rates by regencies/cities in West Java Province from 2010 to 2019

B. Selection of the Best Model

The selection of the best model to analyze the factors that influence the unemployment rates in the districts/cities of West Java Province was carried out using the Chow test and Hausman test. The results of the Chow test decided to reject H_0 with a value (p-value) of $< 2{,}2\times10^{-16} < \alpha$ (0.05), so it can be concluded that the FEM model is better than the CEM model at a significance level of 5%. Meanwhile, the results of the Hausman test decided to reject H_0 with a value (p-value) of 0,001851 < α (0.05), so it can be concluded that the FEM model is better than the REM model at a significance level of 5%. From the results of the Chow test and Hausman test, it can be concluded that the FEM model is the best model.

TABLE 1. PARAMETER ESTIMATION OF FIXED EFFECTS MODEL (FEM) PANEL DATA REGRESSION

Variable	Coefficient	Standard Error	P-Value
TPAK	-0,024	0,041	0,566
DEPEND	0,725	0,297	0,015**

RLS	-0,743	0,649	0,253
MANU	0,064	0,029	0,032**
JASA	0,050	0,033	0,132
Ln UMR	0,311	0,750	0,678
R-Squared: 0.254		F-statistic: 12.979 on 6 and 228 DF,	
		p-value: 1.287e-12	
Residual Sum of Squares: 399,78			

Remarks: significant at the level of significance ** 5%, *10%

Source: RStudio processing results

Table 1 shows that only are the DEPEND and MANU variables significant in the model at the significance level of 5%. Meanwhile, the variables TPAK, RLS, JASA, and lnUMR are not significant in the model. When viewed from the regression coefficient formed, two variables have a negative effect, namely the TPAK and RLS variables, while other variables have a positive one. Based on the results of calculations, the coefficient of determination generated from the FEM model with within estimator is 0.25461, meaning that the model's ability to explain the variability of the open unemployment rate data in West Java Province is 25.46%, while the rest is explained by other variables not included in the model. From the attachment, the output R shows the F-statistics value of 12.9799 with a p-value of 1.287×10-12. The p-value of the F test < α (0.05) indicates that at least one independent variable affects the unemployment rate variable at the Regency/City level. This shows that overall, this regression model is feasible to use. After selecting the best panel data regression model, the next step is to detect spatial dependence between cross-sectional units.

TABLE 2. RESULTS OF THE SPATIAL DEPENDENCE TEST BETWEEN CROSS-SECTIONAL UNITS

Spatial Dependence Test	Results p-value
Breusch-Pagan LM Tests	8.109 x 10-15
Pesaran's CD Tests	1.059 x10-07

Remarks: significant at the level of significance ** 5%, *10%

Source: RStudio processing results

Further, the spatial dependence test between cross-sectional units is as shown in Table 2. The test results showed the value (p-value) of < 0.05, thus rejecting H_0 at a significance level of 5%. This means that there is spatial diversity in the resulting panel regression model. This proves that the characteristics of the unemployment rates in the regencies/cities of West Java Province from 2010 to 2019 have a spatial effect in terms of spatial dependence and heterogeneity, which is in line with the research hypothesis. This problem is to be overcome by making local modeling that considers the spatial aspect, namely the diversity between observation locations. With the fulfillment of heterogeneity and spatial dependence conditions, the analysis can be continued to the GWPR model. Because the panel regression used in GWPR modeling is a fixed effect model with within estimator, it is necessary to transform data according to within estimator. Data transformation is performed by subtracting each research variable with the time-series average in each regency/city.

The selection of the best model in the GWR Panel estimation begins with determining the optimum bandwidth between the Adaptive Bisquare, Adaptive Gaussian, and Adaptive Exponential weighting functions. The following is a table of CV, AIC, and R-Square values from each kernel.

TABLE 3. KARNEL WEIGHTING FUNCTIONS

Karnel Weighting Functions	CV	AIC	R-Square
Adaptive Bisquare	387,2091	818,5744	0,3813
Adaptive Gaussian	388,4205	812,8890	0,4019
Adaptive Exponential	381,9520	785,2868	0,4905

Source: RStudio processing results

Table 3 shows the selected model is the GWR Panel model with the Karnel weighting function which has the smallest AIC and CV values and the largest R-Square value, namely the selected model is the Adaptive Exponential model.

TABLE 4. COMPARISON OF GLOBAL REGRESSION AND GWPR

Model	RSS	AIC	R-Square
Global FEM Model	399,78	863,7115	0,25461
GWPR Model	273.48	785,2868	0,49050

Source: Rstudio processing results

The goodness of fit test from the results of the GWR model shows the R-square, RMSE, and AIC values indicating that the GWPR model is better than the global regression model. The GWPR model is able to explain the UR diversity of 49.05%, while the FEM model is only able to explain the UR diversity of 25.46%. Further, the AIC and residual sum of square (RSS) values of the GWR Panel model residuals are smaller than the global model, indicating that the GWPR model is better than the global regression model.

TABLE 5. THE ESTIMATION RESULTS OF THE GWPR MODEL PARAMETERS IN EACH REGENCY/CITY IN WEST JAVA

Reg./City	Coefficient						R2 Local
	TPAK	DEPEND	RLS	MANU	JASA	lnUMR	
Cekungan Bandung							
Bandung	-0.0307	0.8204**	-12.409	0.1376**	-0.0082	-0.5070	0.57 69
Bandung City	-0.0035	1.6517**	-11.791	0.1893**	0.0877	12.031	0.56 28
Cimahi City	-0.0044	1.5316**	-13.391	0.1915**	0.0939*	12.702	0.56 54
Bandung Barat	-0.0044	1.4598**	-1.4826*	0.1775**	0.0925*	14.372	0.55 79
Priangan Timur							
Garut	-0.0427	0.1958	-0.2546	0.0711**	0.0008	-1.4659*	0.44 24
Tasikmalaya	-0.1190*	0.1440	0.5250	0.0318	-0.0068	-13.452	0.33 98
Ciamis	-0.1270**	0.3074	13.474	0.0587	0.0204	-17.445	0.41 11
Tasikmalaya City	-0.1104*	0.4424	17.036	0.0682	0.0270	-17.441	0.42 55
Banjar City	-0.1138*	0.0133	0.9496	0.0315	-0.0013	-18.688	0.32 37
Ciayumajakuning							
Kuningan	-0.1545**	0.4504	12.707	0.0194	0.0016	-0.9934	0.34 98
Cirebon	-0.1987**	0.3473	11.423	-0.0475	-0.0456	-11.634	0.41 05
Majalengka	-0.1697**	0.5073	11.582	-0.0158	-0.0316	-0.9421	0.45 61
Sumedang	-0.0417	0.8939**	-0.3959	0.0850**	0.0402	0.2631	0.47 89
Indramayu	-0.0790	1.0704**	0.5364	0.0103	0.0068	0.6953	0.42 76
Cirebon City	-0.2182**	0.3206	17.352	-0.0516	-0.0414	-16.499	0.41 13
Purwasuka							
Subang	-0.0132	1.2709**	-0.7882	0.0961**	0.0827**	1.5049*	0.41 57
Purwakarta	0.0047	1.5768**	-1.4104*	0.1556**	0.1159**	2.2865**	0.46 49

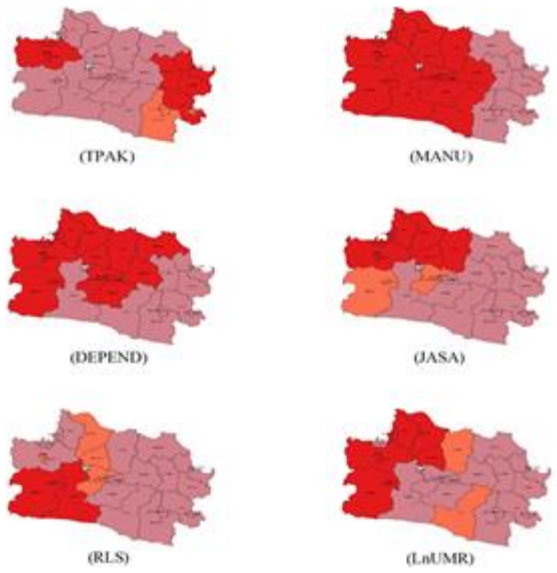
Karawang	0.0085	1.6977***	-1.5142*	0.1271**	0.1126**	2.7659**	0.4352
Bodebek							
Bekasi	0.0198	2.0336***	-0.5992	0.1433**	0.1868**	2.8054**	0.4137
Bogor	0.1543**	1.6204***	-13.393	0.1468**	0.2090**	2.1401**	0.4924
Bogor City	0.2435**	2.0546***	-1.5128*	0.1747**	0.2354**	2.9459**	0.5180
Bekasi City	0.0838	2.0915***	-0.8064	0.1479**	0.2096**	2.9589**	0.4733
Depok City	0.2022**	1.7117***	-0.9726	0.1830**	0.2897**	18.302	0.5107
Sukabumi and the Surroundings							
Sukabumi City	0.0565	1.0952***	-2.2775**	0.0945**	0.0781*	1.8908**	0.5348
Sukabumi	0.0637	1.1475***	-2.1871**	0.0926**	0.0800*	1.9708**	0.5201
Cianjur	0.0488	0.4460	-1.7935**	0.0759**	0.0135	0.0476	0.4140

Remarks: significant at the level of significance, ** 5%, *10%

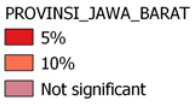
Source: Rstudio processing results

Based on the analysis of Geographically Weighted Panel Regression (Model Local), the analysis produces differences in each regency/city, the results of the study reveal that the overall independent variables used significantly affect the regional unemployment rates in West Java Province. Based on development area. Cekungan Bandung area; UR is affected by depend(+), manufaktur(+), jasa(+), and RLS(-). Priangan Timur area; UR is affected by TPAK(-), manufaktur (+), and lnUMR(-). Ciayumajakuning area; UR is affected by TPAK depend(+) and manufaktur (+) . Purwasuka region, only does TPAK not affect the UR. Bodebek are, all variables in the model affect the unemployment rates. Sukabumi area and its surroundings, only does TPAK not affect the unemployment rate.

Further, Figure 2 constitutes the distribution of the significance level of the independent variables on unemployment resulting from the analysis of the GWPR model, the results of the study show that all of the independent variables used significantly affect the regional unemployment rate in West Java Province, visualized as follows



Remarks: Unscaled map



Source: QGis processing results

Figure 2. Map of the distribution of the significance of the independent variables on the regional unemployment rates in West Java Province

The following is an example of modeling the unemployment rate using the GWR Panel in Bandung City.

$$\boldsymbol{UR} = -0{,}0217 - 0{,}0035\,TPAK + 1{,}6517DEPEND - 1{,}1791RLS + 0{,}1893MANU + 0{,}0877JASA + 1{,}2031lnUMR$$

The Bandung City GWPR model above shows that the TPAK variable has a negative relationship of 0.0035 to the unemployment rate in Bandung city, which means that a high TPAK rate will tend to reduce the unemployment rate, which conforms most studies that have been conducted in the literature (Elhorst 2003).

The dependency ratio significantly affects the unemployment rate in Bandung City at a significance level of 5% with a positive coefficient of 1.6517. According to Central Statistics Agency (2019), the higher the percentage of the dependency ratio indicates the higher the burden that must be borne by the productive population to finance the lives of the unproductive and unproductive population.

The RLS variable has a negative effect of 1.1791 on the unemployment rate in Bandung city. This conforms the research hypothesis as well as research by Guclu (2017), Filitzekin (2008), Khaerandy et al. (2019). Investment in education is proven not only to improve the quality of human resources in the form of knowledge and skills but also to be able to raise one's socio-economic position.

The MANU variable shows a positive coefficient of 0.1893 and JASA shows a positive coefficient of 0.0877, which means it can be said that an increase in the percentage of workers working in the manufacturing and service sectors in Bandung will help increase the unemployment rate. This is in line with the results of research by Guclu (2017), Chuang YC Lai (2007) and Elhorst (1995).

The estimation results in the model also show that the regional minimum wage has a positive effect of 1.2031. This is in line with the results of research by Uk Kim and Lim (2018), which states that an average wage increase of 10 percent will increase unemployment by 0.64 percent.

IV. CONCLUSION

Result descriptive analysis, it can be seen that the regions that have the highest unemployment rates on average are Cirebon Regency, Cianjur Regency, Karawang Regency, Bogor City, Cirebon City, and Sukabumi City. The unemployment rate in West Java Province is still high and shows a gap between regions, which is proven that there are still some regions that experience an upward trend in the unemployment rate.

Based on Panel Data Regression analysis (Global Model) to see the factors that affect the unemployment rates in the regencie/cities of West Java Province. The results of the study revealed that only the dependency ratio and labor absorption variables in the manufacturing sector were significant in the model at a significance level of 5%. Meanwhile, based on the analysis of Geographically Weighted Panel Regression (Model Local). The analysis produces differences in each regency/city, the results of the study reveal that the overall independent variables used significantly affect the regional unemployment rate in West Java Province. Based on the development area, Bandung Basin Area, the unemployment rate is influenced by the dependency ratio, labor absorption in the manufacturing sector, labor absorption in the service sector, and the average length of schooling. In the Priangan Timur area, the unemployment rate is influenced by the labor force participation rate, labor absorption in the manufacturing sector, and the regional minimum wage. In the Ciayumajakuning area, the unemployment rate is influenced by the labor force participation rate, the dependency ratio, and labor absorption in the manufacturing sector. In the Purwasuka area, only does the labor force participation rate not affect the unemployment rate. In the Bodebek area, all variables in the model affect the unemployment rate. In the Sukabumi area and its surroundings, only does the labor force participation rate not affect the unemployment rate.

Based on the results of previous research and conclusions, the authors can provide several suggestions, including: Efforts to reduce the unemployment rate need serious attention from various parties. For example, investments made by local governments are expected to be more in the development of the real sector in order to address the

need for employment, which in turn is expected to be able to reduce unemployment, as well as to reactivate job training programs for the productive age workforce and entrepreneurship training for the general public.

Attracting investors in the manufacturing and service sectors to the region by providing easy licensing and access, so it is expected to be able to increase employment in the hope of reducing the regional unemployment rate. And Improving education as a regional investment is one of the important factors that plays a role in alleviating the unemployment rate at the regional level. Therefore, it is hoped that local policy makers encourage capacity building at the level of human resources that is evenly distributed in the regions, which are able to prepare higher education facilities and infrastructure easily accessible by the whole community and supported by good regulations.

V. REFERENCES

[1] [Bappeda] Badan Perencanaan Pembangunan Daerah Provinsi Jawa Barat. 2018. Rencana Pembangunan Jangka Menengah Daerah Provinsi Jawa Barat Tahun 2013-2018. Bandung (ID): Bappeda Provinsi Jawa Barat.

[2] [Bappeda] Badan Perencanaan Pembangunan Daerah Provinsi Jawa Barat. 2018b. Rencana Kerja Pemerintah Daerah Provinsi Jawa Barat Tahun 2018. Bandung (ID): Bappeda Provinsi Jawa Barat

[3] [BPS] Badan Pusat Statistik. 2019. Keadaan Angkatan Kerja Provinsi Jawa Barat Agustus. Bandung (ID): BPS

[4] [BPS] Badan Pusat Statistik. Berbagai Tahun. Provinsi Jawa Barat Dalam Angka. Bandung (ID): BPS

[5] Blanchard O, Katz L. 1992. Regional Evolution. Brookings Papers on Economic Policy. January 2006. Pp: 5-59.

[6] Bruna F, Yu D. 2016. Geographically Weigthed Panel Regression and Development Accounting for European Regions. International Conference on Regional Science. 2016 Nov 17-18: hlm 1-20.

[7] Caraka RE, Yasin H. 2017. Geographically Weighted Regression (GWR); Sebuah Pendekatan Regresi Geografis. Yogyakarta (ID): Mobius.

[8] Chuang YC, Lai WW. 2007. The Sources of Taiwan's Regional Unemployment: A Cross-Region Panel Analysis. Hitotsubashi Journal of Economics, No. 49, pp: 47-65.

[9] Cracolici MF, Cuffaro M, Nijkamp P. 2007 Geographical distribution of unemployment: An analysis of provincial differences in Italy. Growth Change 38(4): 642–665.

[10] [Disnakertrans]. 2019. Upah minimum kabupaten/kota di Provinsi Jawa Barat Tahun 2010-2019. Bandung (ID): Disnakertrans Provinsi Jawa Barat.

[11] Djuraidah A, Syafitri UD, Handayani LMW. 2019. Estimation of factors affecting gross regional domestic product using geographically weighted regression (case study: gross regional domestic product in Central Java 2011-2015). International Journal of Ecological Economics and Statistic. 40(1): 1-15

[12] Eka A, Liza KS. 2019. Analisis Spasial Untuk Mengidentifikasi Pengangguran Terbuka Berdasarkan Kabupaten/kota di Pulau Jawa tahun 2017. Indonesian Journal of Statistics and Its Applications, vol 3 No 3 (2019): 202 – 215.

[13] Elhorst JP. 2003. The Mystery of Regional Unemployment Differentials: Theoretical and Empirical Explanation. Journal of Economics Survey. 17(5): 709-748.

[14] Fliesher BM, Rhodes G. 1976. Unemployment and the Labor Force Participation of Married Men and Woman: A Simultaneous Model. The Reviuw of Economics and Statistics. 58(4): 398-406

[15] Filiztekin A. 2008. Regional Unemployment in Turkey. Papers in Regional Science. 88(4): 863-873.

[16] Getis A. 2007. Reflections on spatial autocorrelation. Journal of Regional Science and Urban Economics. 37(4):491-496.

[17] Guclu M. 2017. Regional Unemployment Disparities in Turkey. Romanian Journal for Economic Forecasting. 20(2): 94-108.

[18] Khaerandi, NA Achsani, T Irawan. 2019. Determinan of Regional Unemployment in Indonesia : A Spatial Durbin Model. Signifikan: Jurnal Ilmu Ekonomi, vol 8(2): 179–194.

[19] Latif A. 2018. Faktor-Faktor yang Memengaruhi IndeksPembangunan Manusia di Provinsi Kalimantan Tengah. Jurnal Ekonomi dan Kebijakan Pembangunan, Vol 7(2): 140-158.

[20] Lewandowska K, Gwarda. 2018. Geographically weighted regression in the analysis of unemployment in Poland. International Journal of Geo-Information. 7(17):1-16.

[21] Mankiw NG. 2003. Teori Makroekonomi. Nurmawan, Imam [penerjemah]. Jakarta: Erlangga.

[22] Maulani A, Herrhyanto N, Suherman M. 2016. Aplikasi model geographic weighted regression (GWR) untuk menentukan faktor-faktor yang memengaruhi kasus gizi buruk anak balita di Jawa Barat. Jurnal EurekaMatika. 4(1):46-63.

[23] Meutuah SM, Yasin H, Maruddani DAI. 2017. Permodelan fixed effect geographically weighted panel regression untuk indeks pembangunan manusia di Jawa Tengah. Jurnal Gaussian. 6(2): 241-250.

[24] O'Sullivan D, Unwin DJ. 2010. Geographic Information Analysis. New Jersey (US): John Wiley and Sons Inc.

[25] Pravitasari AE, Saizen I, Tsutsumida N, Rustiadi E, Pribadi DO. 2015. Local spatially dependent driving forces of urban expansion in an emerging Asian megacity: the case of greater Jakarta (Jabodetabek). Journal of Sustainable Development. 8(1):108-119.

[26] Rahayu NS. 2017. Geographically weihgted panel regression untuk permodelan persentase penduduk miskin di Provinsi Jawa Tengah [tesis]. Surabaya (ID): Instutut Teknologi Sepuluh Nopember.

[27] Sari NA, Priyarno DS, Hartono D. 2011. Pengangguran di Indonesia Tahun 1984-2008. [Tesis]. Bogor (ID): Institut Pertanian Bogor.

[28] Sukirno, Sadono. 2008. Teori Pengantar Makroekonomi edisi 3. PT.Raja grafindo persada. Jakarta.

[29] Tiani WU, A Rohman, A Prahutama. 2016. Pemodelan Regresi Berganda dan Geographically Weighted Regression pada Tingkat Pengangguran Terbuka di Jawa Tengah. Media Statistika 9(2) 2016: 133-147.

[30] Todaro MP, Smith SC. 2011. Pembangunan Ekonomi. Jilid I. Edisi kesebelas. Jakarta (ID): Erlangga. terjemahan dari: Economic Development.

[31] Uk Kim, Lim. 2018. Minimum Wage and Unemployment: An Empirical Study on OECD Countries. Journal of Reviews on Global Economics, 2018, vol 7: 1-9

[32] Qur'ani AY. 2014. Permodelan geographically weighted regression panel (GWRpanel) sebagai pendekatan model geographically weighted regression (GWR) dengan menggunakan fixed effect model time trend. Jurnal Mahasiswa Statistik. 2(3): 181-184.

[33] Yu D. 2010. Exploring spatiotemporally varying regressed relationships: the geographically weighted panel regression analysis. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences. 38(2):134-139.

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