Gender Equality and Women's Participation in Indonesian Employment: An Empirical Study from A Spatial Perspective

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Abstract. Gender inequality in Indonesia, especially in the field of employment, is an issue and a problem marked by the lower access of women to the labor market compared to men. The importance of women's participation in the labor market will have a positive effect on increasing incomes and automatically improving economic status. The female labor force participation rate (FLFPR) is a measure that shows the involvement of women in the labor force. The objectives of this study include describing the characteristics of the female labor force, modeling the female LFPR using a spatial study approach in the form of the Geographically Weighted Regression (GWR) method, and knowing the description of estimation results and factors that significantly affect female LFPR in Indonesia using datasets from the Statistics Indonesia database. The results of the descriptive statistics show that the highest values of female LFPR are found in the provinces of Papua, Bali, and East Nusa Tenggara, while the region with the lowest participation of women in the labor market is the province of North Sulawesi. The results of the global regression estimation show that the variables that have a significant effect on the LFPR in general in Indonesia are the average hourly wages of workers (X_2), literacy rates (X_3), and the mean years of schooling (X_4). While the modeling results using the GWR method with a model quality of 53% indicate that the predictor variables that have a significant effect on the LFPR in each province in Indonesia are influenced by different factors so that the increasing strategy of women's access to the labor market can be applied spatially according to the factors involved in the influence of LFPR in each province of Indonesia.

Keywords: *Employment, Gender Inequality, Geographically Weighted Regression, Spatial Analysis.*

INTRODUCTION

As part of a process of economic development, population growth which will have implications for the working age population and the growth of the labor force is an inseparable unit [1]. An indicator that describes the ratio of the number of the labor force to the population of working age is the labor force participation rate (LFPR). The guarantee of getting a job is the right of every citizen and is not limited by anything, even by gender. However, gender inequality in employment remains a frequent problem in Indonesia. Differences between men and women in the use of time at home, differences in education and skill levels, and socio-cultural restrictions, all of which lead to gender inequality in participation in decent work [2]. Based on data from Statistics Indonesia, seen by gender, the LFPR remains dominated by men with a participation of 83.18%. Meanwhile, the female LFPR is only 55.5%. On an annual basis, the LFPR for men increased by 0.17% while women only increased by 0.06%. Each province in Indonesia has different conditions of gender inequality or involvement of women in the employment sector. These differences make these regions have their characteristics so that the focus on gender equality issues in the labor sector cannot be generalized to all regions. Some regions that have low levels of female participation in employment tend to be geographically close to each other. This shows that there is a spatial or regional influence on the level of female participation in the labor market in Indonesia. This is in line with Waldo Tobler who established the first law of geography (1979), "everything is related to everything else, but near things are more related than far things" [3] who explains that everything is related to each other, but something closer will have more influence than something farther away [4].

Research on the factors influencing women's participation in the labor market has been repeatedly conducted by experts. One of the studies on women's decisions in Indonesia to work uses data from the national labor force survey conducted by Wijayanto (2019) using the multinomial logistic regression method [5]. The results of this study revealed that in addition to economic factors, the factor that the variables of demographic and social characteristics influence the work decisions of female workers in Indonesia, and the tertiary sector is the choice sector that tends to be chosen by the workers [5]. From another point of view looking at cases in several countries, for example in Assam which is a state in northeastern India in a study conducted by Boruah (2022) using a probit regression model, the results show that the factor that hinders the participation of women in the labor market in the region is the status caste and land ownership [6]. Another study in America by Perez-Arce and Prados (2021) found a decrease in female LFPR related to technological innovation and business factors [7]. Meanwhile, research that takes a case study in Bangladesh by Mahmud (2018), shows that the participation of women in the labor market in Bangladesh has increased, especially in the relatively conservative community [8].

The results of previous research reviews that have been obtained show that the analysis used is a general model, but a more specific approach has not been found, such as taking into account geographical aspects. Therefore, the novelty of this study will be the first to examine the level of female participation in the labor market in each province of Indonesia. This study examines the level of female labor force participation in each province of Indonesia using a method that considers spatial aspects, namely Geographically Weighted Regression (GWR) to analyze the contribution of factors that affect the level of participation of women in the labor market in each province of Indonesia. so that the results obtained should be an alternative for the government in the development of policies related to gender equality in the employment sector.

LITERATURE REVIEW

Economic growth increases job opportunities but does not in itself reduce gender inequality. Gender inequality in employment is still a problem and a problem that often arises. The existence of gender inequalities in Indonesia, especially in the field of employment, can be demonstrated by the low access of women to the labor market compared to men and the tendency of women to work for lower wages. to those of men. At the macro level, the involvement of women in the economy indicates an additional supply of labor in the labor market [9]. From this, it can be seen that the competition for employment opportunities becomes more difficult. According to Assaad (2020), among the job opportunities available, fewer women than men can enter the labor market, but women are more likely to participate in the labor force [10].

A previous study related to female participation in employment was conducted by Endow and Dutta (2022) with the conclusion that social norms were a driver of female labor force participation in rural Jharkhand by geographical factors [11]. Another finding is that cultural norms are a barrier to accessing employment opportunities. Another study by Tong & Gong (2020) related to female labor force participation in China, the results of this study obtained information that the number of children to a married woman's labor force participation Labor has a “U” shaped non-linear relationship where this condition is due to the substitution effect and the income effect [12]. Another perspective from the findings of research by Yeboah (2022) found that female labor force participation in Sub-Saharan Africa positively affects the added value of the service sector and is accompanied by well-developed infrastructure. From another point of view looking at cases in several countries, for example in Assam which is a state in northeastern India in a study conducted by Boruah (2022) using a probit regression model, the results show that the factor that hinders the participation of women in the labor market in the region is the status caste and land ownership [6]. Another study in America by Perez-Arce and Prados (2021) found a decrease in female LFPR related to technological innovation and business factors [7]. Meanwhile, research that takes a case study in Bangladesh by Mahmud (2018), shows that the participation of women in the labor market in Bangladesh has increased, especially in the relatively conservative community [8].

Previous research with case studies in Indonesia was conducted by Sasongko (2020) using the panel data regression method. The results of this study indicate that the factors that significantly influence and affect the female labor force participation rate are the provincial minimum wage and level of education [13]. Another study by Wijayanto (2019) used the multinomial logistic regression method. The results of this study revealed that in addition to economic factors, the factor that the variables of demographic and social characteristics influence the work decisions of female workers in Indonesia, and the tertiary sector is the sector of choice that tends to be chosen by the workers [5].

Research related to the spatial approach to the case of women's participation in employment is very scarce, while the research that has been conducted by Sakanishi (2020) who examined the participation of women in Japan in employment using the spatial autocorrelation method, with the conclusion that there is a significant spatial cluster of low FLP in a large densely populated metropolitan area [14]. Therefore, the novelty of this study will be the first to examine the level of female participation in the labor market in each province of Indonesia. This study examines the

level of female labor force participation in each province of Indonesia using a method that considers spatial aspects, namely Geographically Weighted Regression (GWR) to analyze the contribution of factors that affect the level of participation of women in the labor market in each province of Indonesia. so that the results obtained should be an alternative for the government in the development of policies related to gender equality in the employment sector.

METHOD, DATA, AND ANALYSIS

1. Methods and Steps of Analysis

Based on the research objectives, the analytical method used in this study is inferential analysis. Data processing in this study uses tools such as the software RStudio and Arc-view. The analysis steps carried out to see the effect of the predictive variables on the level of participation of women in the labor market is as follows.

a. Modeling female labor force participation rate in each province of Indonesia using the Global Linear Regression method or Ordinary Least Square (OLS) method which includes testing of model assumptions classic regression.
b. Checking the spatial diversity using the Breusch-Pagan (BP) test [15] with the following hypothesis:
   H_0: $\sigma_1^2 = \sigma_2^2 = \ldots = \sigma_n^2 = \sigma^2$ residual variance (error) in a homogeneous model (no heterogeneity between regions)
   H_1: there is at least one $\sigma_i^2 \neq \sigma^2$ with i= 1, 2, …, n residual variance (error) in the inhomogeneous model (there is heterogeneity between regions). Decision will reject H_0if p-value α < (10%) or BP > $\chi^2_{(p)}$
c. Spatial modeling using Geographically Weighted Regression (GWR). The GWR method was first introduced by Fotheringham in 1967 and is a development of the global regression method [16]. The concept of GWR modeling is to estimate the parameter values at each observation point such that each observation point has a different parameter value [17]. The steps of GWR analysis in this study include:
   1. Determine the optimal bandwidth value based on the cross-validation (CV) criteria. The calculation of the CV is carried out until the minimum value of the CV is obtained.
   2. Determine the weight matrix using the Gaussian kernel function.
   3. Estimation of the GWR model parameters using the optimal bandwidth.
   4. Comparison of the results between the OLS and GWR regressions using the criteria of the coefficient of determination (R^2) and the sum squared error (SSE).
d. Identifying variables that have a significant effect on the level of female labor force participation in every province in Indonesia.

2. Data Source and Research Variables

In this study, secondary cross-sectional data from Statistics Indonesia in 2021 was used. Observations for this study were from 34 provinces of Indonesia in 2021. The research variables used in this study are described in Table 1 below.

Table 1. Research Variables.

Variable Type	Variable Operations	Unit	Scale
Response Variable (Y)	Female's LFPR	Percent	Ratio
Predictor Variable (X)	Expenditures per Capita for Female Workers (X_1)	Thousand Rupiah/Person/Year	Ratio
	Average Hourly Wages for Female Workers (X_2)	Rupiah/Hour	Ratio
	Literacy Rate for Female Workers (X_3)	Percent	Ratio
	Mean years of schooling for Female Workers (X_4)	Years	Ratio

RESULT AND DISCUSSION

1. An Overview of Gender Inequality in Employment in Indonesia

Based on data from the Statistics Indonesia, the number of workers in February 2019 increased by 2.24 million people compared to February 2018 to reach 136.18 million people. Along with the increase in the number of the working population, the labor force participation rate also increased by 0.12% to 69.32% compared to the same period last year. This indicates that there is economic potential in terms of increasing labor supply. Seen by gender, the LFPR remains dominated by men with a participation of 83.18% (Figure 1). Meanwhile, the female LFPR is only 55.5%. Annually, the male LFPR increased by 0.17% while the female LFPR only increased by 0.06%.

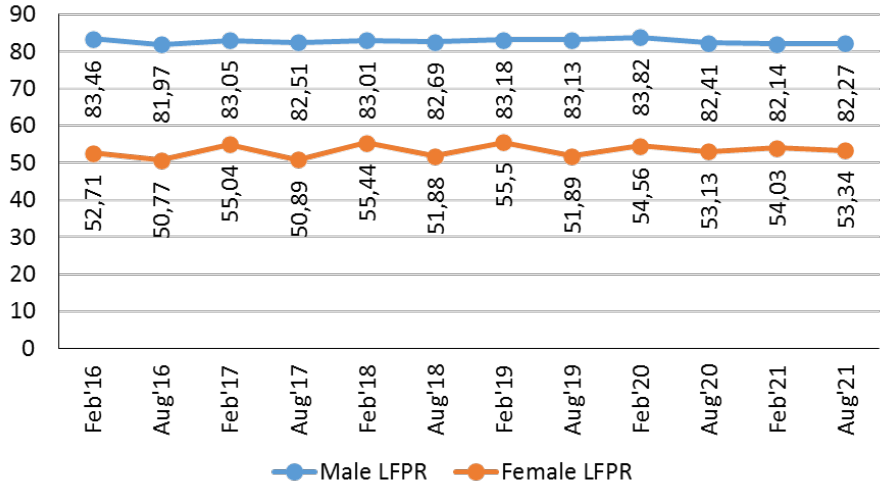

Fig. 1. The Development of the LFPR Gap in Indonesia by Gender (February 2016-August 2021).

The involvement of women as workers in Papua will be the highest in the country in 2021. Statistics Indonesia indicates that up to 69.1% of the workforce in Papua is occupied by women. Bali comes next with a percentage of 67.61%, then NTT 65.34%, DI Yogyakarta 64.59% and NTB 59.18%. Meanwhile, based on the World Economic Forum (WEF) Gender Gap Report 2020, Indonesia is ranked 85th in terms of a gender gap. The largest gap is in the economic opportunity and participation indicators at 58%, followed by political empowerment at 25%.

2. Results of Linear Regression Modeling (Global Regression) Women's Participation in Employment

The results and discussion of the linear regression model can be used to see the relationship between the level of female labor force participation in each province of Indonesia and the factors thought to have an effect (predictor variables). The predictor variables used in the regression model must not be multicollinear with each other. This study uses the value of the variance inflation factors (VIF) as a criterion to determine the existence of multicollinearity between the predictor variables [18]. A VIF value greater than 10 indicates the existence of collinearity between the predictor variables.

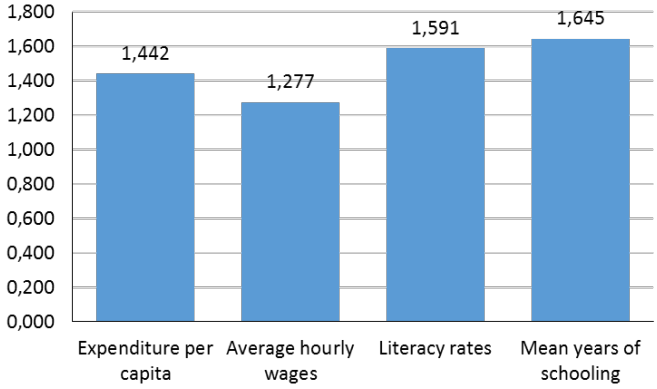

Fig. 2. Value of Variance Inflation Factors (VIF) of each Predictor Variable.

Figure 2 is the result of detecting multicollinearity between the predictor variables, the detection results show that there is no indication of multicollinearity between the predictor variables because the VIF value is low (VIF value is not more than 10), so all predictor variables are assumed to affect the level of female labor force participation in Indonesia. Based on the results of multicollinearity detection, global regression modeling can be continued on the parameter test. Parameter testing is done by regressing the response variable of the female labor force participation rate on the predictor variable, the results of the parameter test for the overall regression model can be seen in Table 2 below.

Table 2. Estimated results of global regression model parameters**.

Predictor Variable	Coefficient	Standard Error	t-statistics	Significant
Intercept	-0.000	0.135	0.000	1
Expenditure per capita	0.136	0.164	0.842	0.416
Average hourly wages	-0.315	0.155	-2.033	0.051*
Literacy rates	-0.477	0.173	-2.756	0.010*
Mean years of schooling	-0.410	0.176	-2.330	0.027*

*) Significant at the level of significance (α) = 10%
**) Coefficient of Determination Value (R^2) = 0.4552

Based on the summary of the model obtained in Table 2, three variables have a significant effect on the level of female participation in the labor market in Indonesia with a significance level (α) of 10%. These variables include average hourly wages, literacy rates, and average years of schooling. Meanwhile, another factor, namely per capita expenditure, does not have a significant effect on the level of female labor force participation in Indonesia. The next step is to test the classical hypotheses which include the hypotheses of normality, homoscedasticity and non-autocorrelation. Normality test to determine whether or not the residuals of the global regression results follow a normal distribution. By testing the normality hypothesis in this study using the Jarque-Bera test [19], the results obtained a significance value (sig) of 0.496, this value is above the significance level (10%). In addition, the Jarque-Bera test value is 1.402, which is lower than the table's chi-square value for the second degree of freedom, which is 4.605, so the decision is obtained that the residual data follows a normal distribution. The determination of the fulfillment of the normal distribution assumption can also be done visually via the QQ-Plot as follows.

Based on Figure 3, the residual data is normally distributed because the plot is close to the blue linear straight line. It can be concluded that the same as the Jarque-Bera test, the residual data on the factors that affect the female labor force participation rate in Indonesia are normally distributed, or the normality assumption residual in the global regression model that was trained was filled. Next comes the test of the non-autocorrelation hypothesis using the Durbin Watson test [20], the results obtained by testing this non-autocorrelation hypothesis are the Durbin Watson value of 2.302. This value is in the zone of DWp (2.302) > (DL=1.09), which means that there is no violation of the non-autocorrelation assumption in the global regression model, namely that there is a positive autocorrelation.

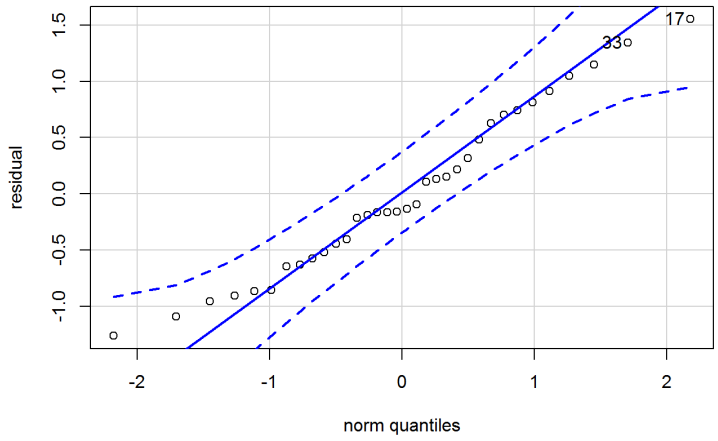

Fig. 3. QQ-Plot Normality Test.

In addition, the heteroscedasticity test is performed to determine the homogeneity of the variance in the residuals with the test method used is Breush-Pagan [21], the results of the Breusch Pagan test with the equation yield a p-value of 0.089 which is below the 10% significance level, so it can be concluded that there is a violation of the homoscedasticity assumption in the overall regression model. Violation of this assumption indicates that the error variances in the model are not identical, so it is necessary to conduct an analysis that considers spatial or regional aspects. This shows that the analysis using the global regression model is no longer feasible. Violation of the assumption of homoscedasticity indicates the existence of spatial diversity, so it is necessary to handle the spatial effects on the model. The Geographically Weighted Regression (GWR) model is said to be good if there is heteroscedasticity [22].

3. Results of The Geographically Weighted Regression Modeling (Spatial Approach) of The Participation of Women in Employment

Based on the results of the classical hypothesis test and the effect of spatial dependence, there are differences in characteristics between the observation areas, whereas the global regression model only produces global estimates. Therefore, we need a model that can account for spatial effects and diversity, one of which is to use Geographically Weighted Regression (GWR) that produces local parameters for each observation area. The steps for preparing the Geographically Weighted Regression (GWR) model are as follows.

3.1. Optimum Weight Selection

The GWR model uses a weighting based on the geographic location of each province. The first step is to choose the optimal bandwidth for each province in Indonesia with the kernel function. To choose the best kernel method, a model is created for each weight to obtain the cross-validation (CV) value of the weights. The weight with the smallest CV value is used as the best weight to build the model.

Table 3. Results of Selection of Weights.

Weight Type	Bandwidth	Cross-Validation (CV) score
Fixed Gaussian Kernel	15.835	94.744*
Adaptive Gaussian Kernel	0.294	99.198

*) Lowest Cross-Validation (CV)

The weighting can be said to be optimal if it has a low CV value. Table 3 shows that the fixed Gaussian kernel type of weighting is the optimal weighting for GWR modeling because it has a smaller CV value compared to other weighting methods. The analysis using the fixed Gaussian kernel obtained an optimal bandwidth value of 15.835 from a minimum CV of 94.744, which means that a point with a radius of 15.835 is considered to have an optimal effect on formatting localization template settings. With the weights used in the model, the parameter estimators are applied locally, resulting in different parameter values for each province. The next GWR modeling will use a weighting matrix with a fixed Gaussian kernel weighting function.

3.2. The GWR Model Conformity Test Results

Testing the suitability of the GWR model was carried out to determine the suitability of the model between the global regression model and the GWR model using the ANOVA test as follows.

Table 4. A Goodness-of-Fit Test Results.

Model Estimation	Degree of Freedom (d.f)	Sum Square Error (SSE)	Mean Square Error (MSE)	F-statistics value	Coefficient of Determination (R^2)
Global Residuals	5	17.977	-	-	0.455
GWR Improvement	2.208	2.434	1.102	-	-
GWR Residuals	26.792	15.543	0.580	1.900	0.529

In the next step, a goodness-of-fit test is performed to see if the GWR model is better to use than the global regression model. The results of the fit test in Table 4 show a statistical F value of 1.900 which is less than F (0.1; 3.157; 25.843) or 2.519. This shows that H_0 is not rejected, which means there is no significant difference between the GWR model and the global linear regression model. In terms of efficiency, the GWR model is more efficient because the Sum Square Error (SSE) value generated by the GWR model is lower than that of the overall regression model. Moreover, based on the coefficient of determination (R^2), the GWR model obtains a better coefficient of determination than the global regression model. It can therefore be concluded that the GWR model is more suitable to be used than the global regression model to analyze the level of female participation in the labor market in Indonesia. The next step is to partially test the significance of the GWR parameter, which can be done using a t-test. Modeling with the GWR model can produce variable significance that varies from region to region. Partial tests of GWR parameters were performed to see which independent variables had a significant effect on the level of female labor force participation in each province of Indonesia. The partial test summary of the GWR parameters can be seen in Table 5.

Table 5. Variables that significantly affect female labor force participation rate in Indonesia by number of provinces.

Predictor Variable	Significant number of provinces
Expenditure per capita	0
Average hourly wages	27
Literacy rates	32
Mean years of schooling	23

Based on the summary of the results of the partial test of the GWR parameter in Table 5, information is obtained that the literacy rate variable is the most influential factor on women's participation in the labor market in Indonesia, this factor affects 32 provinces or almost all provinces in Indonesia except West Papua and Papua Province. On the other hand, the average hourly wage and the average length of schooling also have a significant effect on the labor force participation rate of women in several provinces of Indonesia. At the same time, per capita expenditure is a factor that does not have a significant effect on the level of female participation in the labor market in all provinces of

Indonesia. Modeling with GWR produces regression equations in each province of Indonesia, so 34 regression equations are obtained. The grouping of provinces and variables that have a significant effect on the level of female labor force participation in Indonesia are summarized in Figure 4 below. To visually see the distribution of variable significance clusters, provinces with the same significant variables were then grouped by color in the form of a thematic map in Figure 4.

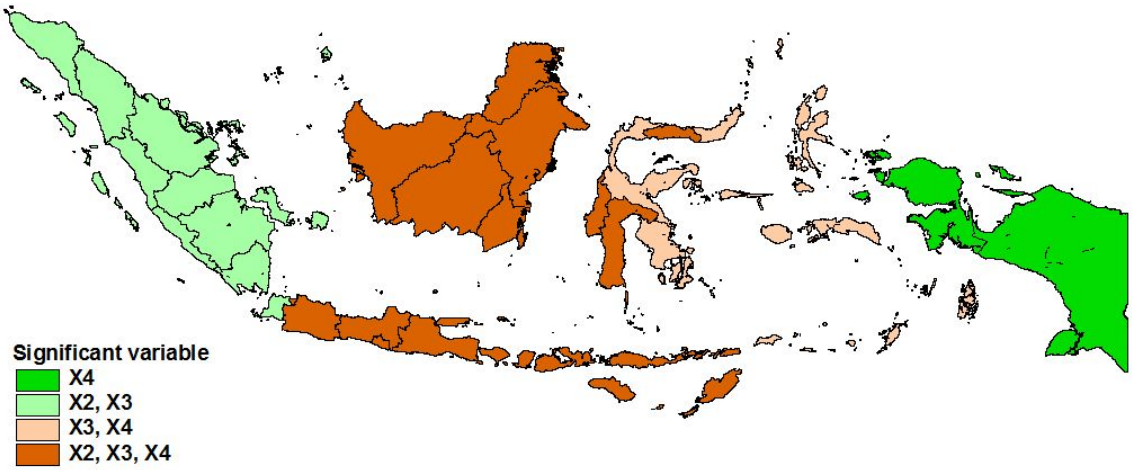

Fig. 4. Mapping the significance of factors that affect the level of women's participation in the labor market in each province of Indonesia.

Other information is that the provinces located in the Sumatra archipelago are dominated by average hourly wages and literacy rates, while the eastern regions of Indonesia (Maluku and parts of Sulawesi) are affected by literacy rates and average years of schooling. Meanwhile, three factors X_2, X_3, and X_4 are factors that affect the areas of Kalimantan, Java (except Banten province), Bali, and Nusa Tenggara. Unlike the other provinces, the provinces of West Papua and Papua are only influenced by the Average number of years of schooling factor (X_4) outside the model. The regions that share the same factors that affect the level of female labor force participation in each province of Indonesia tend to be close to each other and clustered together. This shows that policies related to women's equal participation in the labor market in one region of Indonesia can affect other adjacent regions.

4. Discussion on Women's Participation in Employment in Indonesia

Gender equality, in this case, the rate of participation of women in the labor market in each province in Indonesia has different conditions. These differences mean that these regions have their characteristics so that the orientation of the regulations and programs designed cannot be generalized to all regions. Based on the results of the modeling using a spatial approach, it is carried out to determine the conditions that occur in each region according to the factors that influence it as an alternative reference material for the government in the development of policies related to equality, in particular the involvement of women in the Indonesian labor market. Linking the results of the analysis from the previous step, if examined according to the estimates of each variable, here are the results of the importance of each variable that affects the involvement of women in work for each province in Indonesia.

4.1. The Influence of Average Hourly Wages Factors on Women's Participation in Indonesian Employment.

Wages are a person's main source of income. Therefore, wages must be sufficient to adequately meet the needs of workers and their families. Figure 5 shows that there are 27 provinces in Indonesia where female worker participation is strongly influenced by the average hourly wage factor. The average hourly wage factor has a significant negative effect on the level of female participation in the labor market. This observation is made by the conditions occurring on the ground, where the impact of minimum wage fixing continues to increase, which has an impact on the reduction in the number of workers because the increase in wages is not proportional to productivity. Another factor is the emergence of gender pay gaps. There is quite a large gap between the wages received by female and male workers, this is due to the differences in treatment between men and women in employment. This influence is in line with research conducted by Siti Rodiah (2019) which states that wages are detrimental to women's participation in the labor market, this result is because in areas with high minimum wages, women will discourage women to enter the labor market [23].

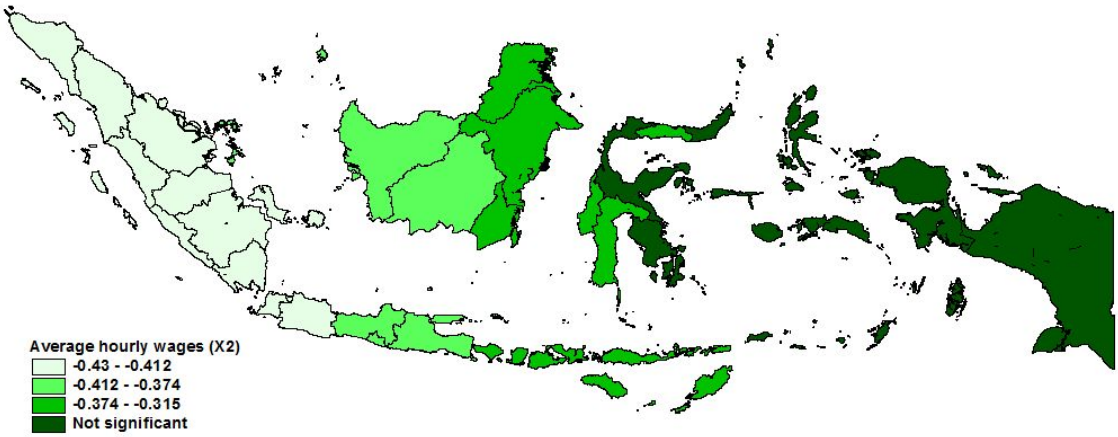

Fig. 5. Mapping of provinces based on the local variable coefficient estimates average hourly wages.

4.2. The Influence of Literacy Rates Factors on Women's Participation in Indonesian Employment.

The literacy rate is an important indicator to see how open the population of an area is to knowledge, the higher the literacy rate or literacy rate, the higher the quality and quality of human resources high. The significant influence of the literacy rate factor on female employment participation in Figure 6 occurs in 32 provinces of Indonesia. The literacy rate factor has a significant negative effect in almost all provinces of Indonesia except West Papua and Papua Province.

Fig. 6. Mapping of provinces based on the local variable coefficient estimates literacy rates.

This finding is due to the conditions occurring in the field and the research results of Khotimah (2018), this is because areas with high literacy rates are areas with high GRDP, as shown in Figure 6, with reduced levels of women's participation in the labor market [24]. Indeed, the high literacy rate occurs in areas of the islands of Java, Bali, Kalimantan, and parts of western Indonesia. Areas with high GDPR indicate that the community has a high income, so even if the female population is not working, their needs will still be met. These results are also in line with research conducted by Fitriah (2020) regarding the determinants of female labor force participation rate in Indonesia, the results of this study indicate that the literacy rate variable shows a negative coefficient and has a significant effect on female LFPR in Indonesia [25].

4.3. The Influence of Mean Years of Schooling Factors on Women's Participation in Indonesian Employment.

One of the indicators of improving the quality of the workforce is education, especially for women, to create equality in the quality of human resources. The higher the education of a person, the more the value of his time becomes expensive and tends to replace his free time for work. This influence is exercised mainly among women, women with higher education generally entering the labor market. The significant effect of mean years of schooling (MYS) on female employment participation in Figure 7 occurs in 23 provinces of Indonesia. The MYS factor has a significant negative effect in almost all provinces except for all provinces in the Sumatran archipelago and Banten Province.

Fig. 7. Mapping of provinces based on the local variable coefficient estimates mean years of schooling.

This finding is in accordance with the conditions that occur in the field and the results of research by Alinta (2021) [26]. This is due to the occurrence of MYS disparities between genders, female MYS in the last five years are still below male MYS. In 2015 MYS for women was 7.35 years and MYS for men was 8.35 years, while in 2019 they were 7.89 and 8.81 years, respectively. This finding is from a related study by Alinta (2021) about the gender gap in education will reduce the average number of women's labor force participation rates against men [26].

CONCLUSION AND SUGGESTIONS

The ratio of working women is still lower than that of men, and the economic opportunity and participation gap that women often experience, such as doing the same workload as men but not getting the same job placement opportunities and career. The results of the global regression modeling and with a spatial approach, namely the GWR method, show the same three factors that affect women's participation in employment. Based on a spatial approach, the Indonesian region is divided into four groups according to the diversity of influencing factors, the GWR model is more efficient than the global regression model, the results of the GWR model show that three factors are average hourly wages for female workers, literacy rate for female workers, and mean years of schooling for Female Workers have a significant effect with a difference in the level of significance of 10 percent on the female LFPR in provinces in Indonesia. The factor of literacy rates is the most important factor affecting the female LFPR in the provinces of Indonesia, which is significant in 32 provinces. Suggestions that can be recommended are that policy programs related to gender equality for women to participate in the labor market of the country should be implemented taking into account spatial aspects so that they can be different in each area covered.

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