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# Gender Equality in Indonesian Employment: Multivariate Adaptive Regression Spline (Mars) Analysis

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**ABSTRACT**

Based on data from the Central Bureau of Statistics, laborers in Indonesia, men are still more dominant for a career in the world of work. This contradicts the prevailing regulations, where gender equality is also a government development priority in realizing equitable development. This study aims to identify the factors that influence the percentage of women who work in Indonesia. The Multivariate Adaptive Regression Spline (MARS) Method is suitable for extensive data and can model relationships of interactions between various variables. The variables analyzed were the average wage of female workers, gross regional domestic product at constant prices, female workers with at least a high school education, life expectancy, provincial minimum wage, and female workers who are heads of households. Based on the research results, the best model was obtained with a coefficient of determination of 90.8%. Some influential variables in the base function are Minimum Wage for Female Workers, Female Workers with at least a high school education, Life Expectancy, and Female Workers who are Heads of Families. Based on the significant basis functions, the function that appears the most is Basis Function 5, which contains the predictor variable Average Wage of Female Workers, which shows a positive relationship with the Percentage of Female Workers with Labor Status in Indonesia. Meanwhile, based on the importance of the predictor variables, the top two are Female Workers with at least a high school education and Female Workers who are Heads of Households.

## 1. INTRODUCTION

In the current era of globalization and rapid economic development, women in Indonesia have the opportunity to play the same role as men and participate in the country's development. The increasingly important role of the female workforce is a transformation in the labor sector that requires special attention in the implementation of this evolution. Human resources, natural resources, and capital are just some of the many factors that influence a country's economic development. If there are qualified human resources, management will be more efficient and the country's growth will continue to develop (Cantika, 2019). Based on data from the Central Statistics Agency (BPS), the number of female workers with labor status in Indonesia in 2023 reached 54.61 million workers, while the number of male workers with labor status reached 85.23 million workers. The number of female workers is equivalent to 39.05% of the total labor workers in Indonesia. This shows that laborers are still dominated by male workers.

Gender equality arises from injustice and discrimination that sees gender as a measure of one's role in society. Women's participation in societal systems does not mean that they lose their place in society. This situation provides an opportunity for women to liberate themselves and leave the patriarchal social system. The emancipation movement allows women to gradually change social and cultural systems without compromising male dignity (Taufik et al., 2022). The United Nations (UN) designed the concept of Sustainable Development Goals (SDGs) number 5 related to gender equality. The goal is to end all forms of oppression and cruelty against women and girls in both the public and private spheres, eliminate harmful women's opportunities such as early marriage, early circumcision, and female circumcision, and ensure that all women are fully empowered (United Nations, 2021).

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Regulations have been implemented by the government to address gender inequality, including Presidential Instruction No. 9 of 2000 on Gender Mainstreaming (PUG) in National Development, which regulates the increased role of women in all areas of society and state life and efforts to achieve gender equality, and Labor Law No. 13 of 2003 on employment, which regulates the rights of female workers. In the 2020-2024 National Medium-Term Development Plan (RPJMN), gender equality is one of the government's development priorities, and PUG is one of the main lines to be implemented in development. One way to implement PUG strategies in development, especially at the planning and budgeting stages, is Gender Responsive Planning and Budgeting (PPRG). The goal of GRPB is to reduce inequality and promote economic growth and equitable development (Chakraborty et al., 2018).

The Global Gender Gap Index (GGGI) published by the World Economic Forum in 2023 analyzes the global gender gap between men and women in four main sub-indices: political participation, health and survival, economic (employment) opportunities and participation, and educational attainment. Three main aspects make up the gender inequality in employment sub-index: differences in labor force participation, wage inequality and differences in career progression. Differences in labor force participation can be measured by comparing the labor force participation rates of women and men. In contrast, data on the income levels of men and women, expressed in terms of equal pay for the same or similar work, are used to determine wage inequality. Based on the World Economic Forum (WEF) report in the Global Gender Gap Report 2023, Indonesia ranks 87th out of 146 countries with a score of 0.697 points in the Global Gender Gap Index (GGI). Unfortunately, this figure does not show a significant increase from previous years, even stagnating since 2020. Meanwhile, in ASEAN, Indonesia ranks sixth behind the Philippines, Singapore, Laos, Vietnam, and Thailand.

The economic aspect is directly related to population issues. One of the main indicators in assessing the economic aspects of a region's population is per capita income. Income is influenced by the salary/wage received by workers. The limited contribution of women in various economic sectors is a manifestation in the economic field. Women work more in the domestic or household sector, which is not income-oriented. Meanwhile, men have more freedom to choose various kinds of work. In addition, patriarchal culture also implies a tendency to pay higher wages to men and lower wages to women. Although women have the opportunity to contribute in more diverse sectors of the economy, they still often experience discrimination. Historically, patriarchal cultures have led to wage inequality between men and women. Cultures that are considered patriarchal tend to demand men to be superior. In contrast, women are often marginalized as a result of this culture. This patriarchal culture impacts various aspects of development, such as education, health, and the economy (Iskandar & Hamid, 2019).

Education is very important for the development of a country to improve the quality of human resources. Many women work in the informal sector, but they tend to occupy higher positions than women who work in the formal sector (Wasista, 2020). This shows how important education is for women to participate in employment. The government has implemented training and education programs to increase employment that aim to improve women's skills and competencies in the workplace. On the health side, there is Life Expectancy, which is an indicator of the government's performance in improving the welfare of the population. The higher a person's life expectancy, the higher their welfare in terms of health, education and economy.

Based on previous research by Andriani and Usman (2023), research on labor equality using the Geographically Weighted Regression (GWR) method resulted in the minimum high school education variable and the average female labor wage variable having the most influence. Also, three variables that significantly affect the percentage of female laborers in Indonesia locally are gross regional domestic product (GRDP), life expectancy (AHH) of women, and the percentage of women who have attended training. Research by Wasista (2020) used the panel data analysis method to determine the effect of average years of schooling, life expectancy, and per capita expenditure on female labor absorption in the formal sector in Indonesia. The results showed that the variables of average years of schooling, life expectancy, and per capita expenditure had a significant positive effect on the absorption of female labor in the formal sector in Indonesia. In addition, the results of research conducted by Ahmaddien and Sa'dia (2020) on the effect of minimum wage policy on female labor absorption in Indonesia with panel data methods, prove that minimum wages have a positive and significant effect on the absorption of female workers.

Based on previous studies, there are many factors that influence female labor absorption in Indonesia. However, there is still a weakness in previous studies that cannot show the interaction between predictor variables. In fact, these variables are interrelated with each other. Gender equality will result in women who are healthier, better educated and economically productive, and children who receive a balanced education and care from both parents. A productive, flexible and competitive workforce will increase productivity, leading to higher wages. Gender equality will result in higher and fairer wages for women workers. Workers' wages will drive investment and consumption, leading to more inclusive

economic growth. Women, children, families and communities will benefit from improved gender equality (Kementerian Keuangan, 2022).

Therefore, the novelty of this research is the use of the MARS method which is very suitable for high-dimensional data and has the ability to model the most relationships involving interactions between several variables. Research using the MARS method is expected to be able to obtain information about the factors that affect the percentage of female workers with labor status in Indonesia. These results can be used as a basis for policy making and evaluation to eliminate the patriarchal culture that is still inherent in realizing gender equality in Indonesia.

## 2. METHODS

### Data and Data Sources

The data used in this study are data related to female workers with labor status in Indonesia in 2023 and the factors that are thought to influence it. The data source in this study is secondary data sourced from the August 2023 National Labor Force Survey or Survei Angkatan Kerja Nasional (SAKERNAS) published by the Central Statistics Agency or Badan Pusat Statistik (BPS) on the State of the Labor Force in Indonesia August 2023 and the State of Workers in Indonesia August 2023. Data on female workers with labor status and the factors that influence it use data on 34 provinces in Indonesia.

### Research Variables

The variables used consist of the response variable $(Y)$ Female Workers with Labor Status with six predictor variables, namely Average Female Labor Wage $(X_1)$, Gross Regional Domestic Product at Constant Price (GRDP CP) $(X_2)$, Female Workers with at least high school education $(X_3)$, Life Expectancy $(X_4)$, Provincial Minimum Wage $(X_5)$, and Female Workers who are Heads of Households $(X_6)$ in 2023. The details of the variables used are as follows:

**Table 1.** Research Variables

| Variables | Variable Name | Unit | Data Scale |
|---|---|---|---|
| $Y$ | Female Workers with Labor Status | Percent (%) | Ratio |
| $X_1$ | Average Wage of Female Workers | Rupiah (IDR) | Ratio |
| $X_2$ | GRDP CP | Billion rupiah (IDR) | Ratio |
| $X_3$ | Female Workers with at Least High School Education | Percent (%) | Ratio |
| $X_4$ | Life Expectancy Age | Year | Ratio |
| $X_5$ | Provincial Minimum Wage | Rupiah (IDR) | Ratio |
| $X_6$ | Female Workers who are Heads of Household | Percent (%) | Ratio |

### Data Analysis Steps

The analysis steps in this study are described as follows:

1. Presents the percentage of female laborers and the factors assumed to be influential in Indonesia by presenting a table containing the minimum, average, standard deviation, and maximum. Then create scatterplots and bar charts for each predictor variable and response variable.
2. Modeling the predictor variables that allegedly affect the percentage of female workers with labor status with the MARS approach with the following steps:
   1) Test the presence or absence of multicollinearity by looking at the Variance Inflation Factor (VIF) value of each predictor variable against the response variable. The multicollinearity test is used to determine whether two or more predictor variables are strongly correlated (Suyono, 2015). The way to determine the presence of multicollinearity, namely by calculating the correlation coefficient and VIF as follows:

$$VIF = \frac{1}{1 - R_j^2} \tag{1}$$

   where $R_j^2$ is the coefficient of determination obtained by regressing the i-th predictor variable as the response with other variables as predictors. If the VIF value obtained is greater than 10, then multicollinearity occurs.
   2) Estimating the model of the percentage of female workers with labor status and its influencing factors by trial and error using the values of BF, MI, and MO until the best model is obtained by looking at the smallest GCV. To determine the GCV value, Friedman (1991) used the following equation:

$$GCV(M) = \frac{\frac{1}{N}\sum_{i=1}^{N}\left[y_i - \hat{f}_M(\boldsymbol{x}_i)\right]^2}{\left[1 - \frac{\tilde{C}(M)}{N}\right]^2} = \frac{MSE}{\left[1 - \frac{\tilde{C}(M)}{N}\right]^2} \quad (2)$$

with,
$y_i$ is the response variable of the $i$-th observation
$N$ is the number of observations
$M$ is the number of BFs of MARS
$\hat{f}_M(\boldsymbol{x}_i)$ is the estimated value of the response variable on M basis functions, which is generally written as follows:

$$\hat{f}(\boldsymbol{x}) = \alpha_0 + \sum_{m=1}^{M} \alpha_m \prod_{k=1}^{K_m}\left[S_{km} \cdot \left(X_{v(k.m)} - t_{km}\right)\right]_+ \quad (3)$$

where,
$\alpha_0$ is a constant
$\alpha_m$ is the coefficient of the constant of the $m^{th}$ basis function
$M$ is the number of basis functions (nonconstant basis function)
$K_m$ is the degree of interaction
$S_{km}$ is the sign of the knot point which is $\pm 1$
$X_{v(k.m)}$ is the predictor variable
$t_{km}$ is the knot value of the predictor variable $X_{v(k.m)}$
$\tilde{C}(M) = trace(\boldsymbol{B}(\boldsymbol{B^T B})^{-1}\boldsymbol{B^T}) + 1$
$d$ states the value of each optimal BF, the greater the value of $dd$ indicates fewer knots and smoothing the function. The best value of $d$ is within the range of $2 \leq d \leq 4$
$\boldsymbol{B}$ is an $N \times (M+1)$ matrix of nonconstant basis functions organized as follows:

$$\boldsymbol{B} = \begin{pmatrix} 1 & \prod_{k=1}^{K_1}\left[S_{k1} \cdot \left(X_{1(k.1)} - t_{k1}\right)\right] & \dots & \prod_{k=1}^{K_m}\left[S_{kM} \cdot \left(X_{1(k.M)} - t_{kM}\right)\right] \\ 1 & \prod_{k=1}^{K_1}\left[S_{k1} \cdot \left(X_{2(k.1)} - t_{k1}\right)\right] & \dots & \prod_{k=1}^{K_m}\left[S_{kM} \cdot \left(X_{2(k.M)} - t_{kM}\right)\right] \\ \vdots & \vdots & \ddots & \vdots \\ 1 & \prod_{k=1}^{K_1}\left[S_{k1} \cdot \left(X_{n(k.1)} - t_{k1}\right)\right] & \dots & \prod_{k=1}^{K_m}\left[S_{kM} \cdot \left(X_{n(k.M)} - t_{kM}\right)\right] \end{pmatrix} \quad (4)$$

3) After getting the best model, test the regression coefficient simultaneously using the test $F$. The simultaneous regression coefficient test is used to determine the significance of the basis function simultaneously with the following hypothesis:
$H_0 : \alpha_1 = \alpha_2 = \alpha_3 = \cdots = \alpha_M = 0$
$H_1$ : there is at least one $\alpha_m \neq 0$ ; $m = 1, 2, 3, \dots, M$
With a significance level of $\alpha = 0{,}05$, $H_0$ is rejected if the value $F_{test} > F_{\alpha(M;\, N-M-1)}$ or value $P - Value < \alpha$.

$$F_{test} = \frac{\sum_{i=1}^{n}(\hat{y}_i - \bar{y})^2 / M}{\sum_{i=1}^{n}(y_i - \hat{y}_i)^2 / N - M - 1} \quad (5)$$

The degrees of freedom of $v_1$ is $M$ which is the number of basis functions in the model. Degree of freedom $v_2$ is $N - M - 1$. Where $N$ is the number of objects that have been observed. If $H_0$ rejected, the decision is that there is at least one $\alpha_m$ is not equal to 0, it can be concluded that the model obtained is appropriate and significant, which shows the relationship between the predictor variable and the response variable simultaneously.

4) After testing the simultaneous regression coefficients and finding that there are differences among the basis functions, the regression coefficients should be tested partially to determine which basis functions are relevant to the model. The hypothesis and test statistics of the partial test are as follows:
$H_0 : \alpha_m = 0$
$H_1 : \alpha_m \neq 0$ ; $m = 1, 2, 3, \dots, M$
With a significance level of $\alpha = 0{,}05$, $H_0$ is rejected if the value $|t_{test}| > t_{(\alpha/2;N-M-1)}$ or when the value of $P - Value < \alpha$.

$$t_{test} = \frac{\hat{\alpha}_m}{\sqrt{var(\hat{\alpha}_m)}} = \frac{\hat{\alpha}_m}{se(\hat{\alpha}_m)} \quad (6)$$

5) Testing the assumption of errors that are assumed to be identically independent normally distributed with mean 0 and variance $\sigma^2$. Normality test and Glejser test are used to verify the assumptions of the errors. Data normality can be measured using the Kolmogorov-Smirnov normality test. The Kolmogorov-Smirnov test is a nonparametric method for continuous equations that can be used to compare one sample or two samples (Quraisy, 2022). The following is the hypothesis for the Kolmogorov-Smirnov test:
$H_0$ : Error is normally distributed
$H_1$ : Error is not normally distributed
With a significance level of $\alpha = 0{,}05$, $H_0$ is rejected if the value $D_{test} > D_{(\alpha,n)}$ or when the value of $P - Value < \alpha$.

$$D_{test} = \max|F_0(x) - S(x)| \quad (7)$$

with,
$F_0(x)$ is the theoretical cumulative frequency distribution
$S(x)$ is the cumulative frequency distribution of observation scores
Heteroscedasticity can be detected using the Glejser test. Janie (2012) states that to perform the Glejser test, absolute regression of residuals as the response variable on the predictor variable is used. If the regression results are significant, this may indicate that the model has heteroscedasticity.
$H_0 : \sigma_1^2 = \sigma_2^2 = \cdots = \sigma_n^2 = \sigma^2$
$H_1$ : There is at least one $\sigma_i^2 \neq \sigma^2 ; i = 1, 2, \ldots, n$
With a significance level of $\alpha = 0{,}05$, $H_0$ is rejected if the value $F_{test} > F_{(\alpha,v_1,v_2)}$ with $v_1 = p - 1$ and $v_2 = n - p - 1$ or when the value of $P - Value < \alpha$.

$$F_{test} = \frac{\sum_{i=1}^{n}(|\hat{\varepsilon}_i| - |\bar{\varepsilon}_i|)^2 \Big/ p - 1}{\sum_{i=1}^{n}(|\varepsilon_i| - |\hat{\varepsilon}_i|)^2 \Big/ n - p - 1} \quad (8)$$

3. Interpret the best and optimal model obtained from the previous test stages that have a significant influence on the percentage of female workers with labor status. Then proceed to explain and conclude the meaning of the MARS model obtained.

## 3. RESULT AND DISCUSSION

### Descriptive Statistics of Research Variables

Descriptive statistics are used to determine the data distribution pattern of the percentage of female workers with labor status in Indonesia and the predictor variables that are assumed to affect it. Descriptive statistics provide information about all research variables in a table containing the minimum, maximum, average, and standard deviation values followed by a scatterplot presentation.

**Table 2.** Descriptive Statistics of Research Variables

| Variables | Minimum | Maximum | Mean | Standard Deviation |
|---|---|---|---|---|
| Female Workers with Labor Status ($Y$) | 3,92 | 22,93 | 13,12 | 3,37 |
| Average Wage of Female Workers ($X_1$) | 1842501 | 4983371 | 2612195,47 | 655863,72 |
| GRDP CP ($X_2$) | 8050,25 | 511371 | 92416,36 | 131107,28 |
| Female Workers with at Least High School Education ($X_3$) | 7,89 | 27,87 | 18,45 | 3,79 |
| Life Expectancy Age ($X_4$) | 66,01 | 75,12 | 70,69 | 2,41 |
| Provincial Minimum Wage ($X_5$) | 1958169 | 4900798 | 2923308,18 | 602039,43 |
| Female Workers who are Heads of Household ($X_6$) | 0,66 | 3,79 | 1,85 | 0,67 |

Based on Table 2, it can be seen that the percentage of female workers with labor status has an average value of 13.12%. When viewed at this figure, there are 21 provinces that are below the average. Meanwhile, the average percentage of male workers with labor status has an average value of 23.95%. This

shows that most of the laborers in Indonesia are still dominated by men. The average wage of female labor in Indonesia is IDR 2,612,195. When compared to the average wage of male labor in Indonesia, which is IDR 3,469,760, the wage of female labor is quite far from the wage of men. The average value of female workers with at least a high school education is 18.45%. Meanwhile, the average size of male workers with at least a high school education is 30.39%. This shows that the level of education for male workers is higher than that for female workers. Based on this description, there are still significant differences in the variables that influence the percentage of female workers with labor status compared to male workers. Thus, it can be concluded that there is still a gender gap in the labor force in Indonesia.

The identification of the relationship pattern between the response variable and the predictor variable aims to visually determine the specific pattern formed to determine the appropriate method of modeling. If the pattern on the scatterplot shows a certain pattern such as linear, quadratic, or other patterns, then modeling is used with a parametric approach. Meanwhile, if the pattern on the scatterplot that is formed does not show a certain pattern, a nonparametric approach is used.

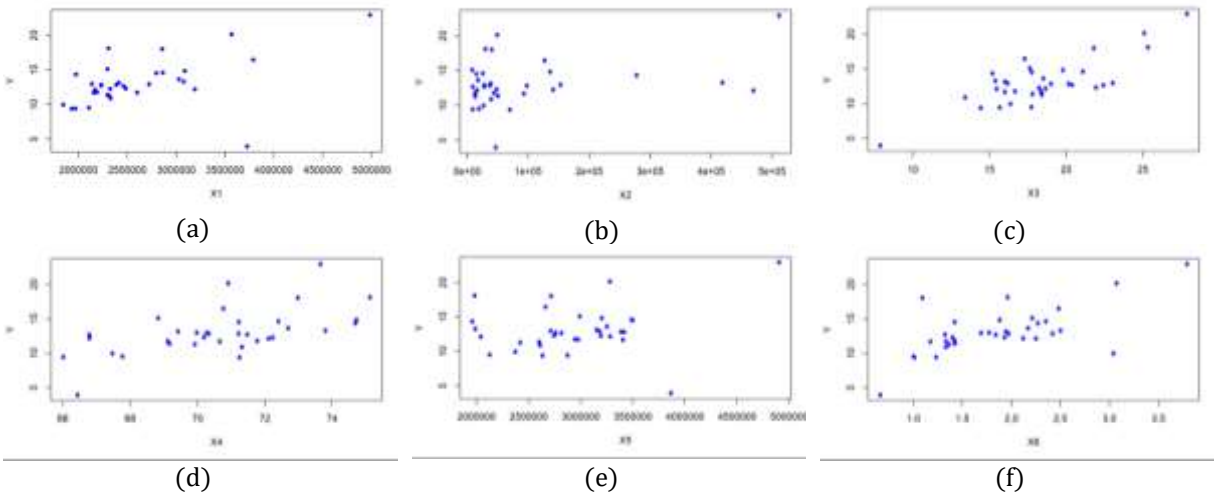


**Figure 1.** Scatterplot of Response Variable (Female Laborer) with Variables (a) Average Female Labor Wage ($X_1$), (b) GRDP CP ($X_2$), (c) Female Workers with at least a high school education ($X_3$), (d) Life Expectancy ($X_4$), (e) Provincial Minimum Wage ($X_5$), and (f) Female Workers who are Heads of Households. ($X_6$).

Based on Figure 1, it can be seen that there is no functional relationship because it does not form a certain line / trend. The absence of a certain pattern of response variables with predictor variables is aconsideration for using a nonparametric regression approach to model the percentage of female workers with labor status using the Multivariate Adaptive Regression Spline (MARS) method.

**Multicollinearity Test**

Uji The multicollinearity test is a test of the assumption that the independent variables must be free from symptoms of multicollinearity or there is no correlation between predictor variables by looking at the Variance Inflation Factor (VIF) value as follows:

**Table 3.** Multicollinearity Test

| Variables | VIF | Conclusion |
|---|---|---|
| Female Workers with Labor Status ($Y$) | 2.275 | No multicollinearity |
| Average Wage of Female Workers ($X_1$) | 1.916 | No multicollinearity |
| GRDP CP ($X_2$) | 1.615 | No multicollinearity |
| Female Workers with at Least High School Education ($X_3$) | 1.527 | No multicollinearity |
| Life Expectancy Age ($X_4$) | 1.886 | No multicollinearity |
| Provincial Minimum Wage ($X_5$) | 1.962 | No multicollinearity |

Based on Table 3, it can be seen that the VIF value for each predictor variable is less than 10, meaning that there is no correlation between predictor variables, so it can be said that there is no multicollinearity.

### Multivariate Adaptive Regression Spline (MARS) Modeling

To create a MARS model, Basis Function (BF), Maximum Interaction (MI) and Minimum Observation (MO) can be used in combination. The basis function shows the relationship between the response variable and the predictor variables. This study used six predictor variables. This indicates that the basis functions used are 12, 18, and 24. Maximum Interaction (MI) shows the number of interactions that occur in the model. The Maximum Number of Interactions (MI) used in this study are 1, 2, and 3. Minimum Observation (MO) is the minimum distance between knots. MARS modeling is done by trial and error by combining the Base Function (BF), Maximum Interaction (MI) and Minimum Observation (MO) values so that the best value is obtained based on the minimum value of Generalized Cross Validation (GCV). The MARS modeling results obtained in this study are shown in the table below.

**Table 4.** MARS Modeling Results

| Model | BF | MI | MO | GCV | MSE | $R^2$ | Loaded Variables |
|---|---|---|---|---|---|---|---|
| 1 | | 1 | 1 | 3.392 | 1.652 | 0.876 | $X_1, X_3, X_4$ |
| 2 | 12 | 2 | 1 | 3.237 | 2.064 | 0.835 | $X_3, X_6$ |
| 3 | | 3 | 3 | 2.976 | 1.228 | 0.908 | $X_1, X_3, X_4, X_6$ |
| 4 | | 1 | 0 | 3.434 | 1.417 | 0.894 | $X_1, X_3, X_4$ |
| 5 | 18 | 2 | 1 | 3.237 | 2.064 | 0.835 | $X_3, X_6$ |
| 6 | | 3 | 3 | 2.976 | 1.228 | 0.908 | $X_1, X_3, X_4, X_6$ |
| 7 | | 1 | 0 | 3.434 | 1.417 | 0.894 | $X_1, X_3, X_4$ |
| 8 | 24 | 2 | 1 | 3.237 | 2.064 | 0.835 | $X_3, X_6$ |
| 9 | | 3 | 3 | 2.976 | 1.228 | 0.908 | $X_1, X_3, X_4, X_6$ |

The best MARS model is determined from the combination of BF, MI, and MO that has the smallest (minimum) Generalizd Cross Validation (GCV) value. Based on Table 4, it is found that the minimum GCV value of the combination of BF 12, 18, and 24, MI = 3, and MO = 3 is the same. Therefore, the principle of parsimony is used. Principle of parsimony states that a statistical model will be better if fewer variables are influenced to explain the model (Handayani et al., 2018). Therefore, the best model was selected from the combination of BF = 12, MI = 3, and MO = 3 with a GCV value of 2.976, MSE of 1.228 and $R^2$ of 0.908. The value of $R^2$states the diversity of response variable values that can be explained by the predictor variables by 90.8%. With the number of variables included in the model amounted to 4, namely the Average Wage of Female Workers ($X_1$), Female Workers with at least high school education ($X_3$), Life Expectancy ($X_4$), and Female Workers who are Heads of Households ($X_6$).

### MARS Best Model Estimation Results

After knowing the combination of BF, MI, and MO that produces the best MARS model for modeling the Percentage of Female Workers with Labor Status in Indonesia in 2023, the model along with the basis functions and parameter estimates can be known as follows:

**Table 5.** Parameter Estimation of MARS Best Model

| Basis Function (BF) | Parameter Estimation |
|---|---|
| Constant | 12.357 |
| $BF_1 = max(0;\ X_3 - 21.805)$ | 0.999 |
| $BF_4 = max(0;\ 2.249\ -\ X_6) \times BF_2$ | $-0.356$ |
| $BF_5 = max(0;\ X_1\ -\ 1842501)$ | $0.186787 \times 10^{-5}$ |
| $BF_7 = max(0;\ 71.220\ -\ X_4) \times BF_5$ | $-0.435513 \times 10^{-6}$ |
| $BF_9 = max(0;\ 1.876\ -\ X_6) \times BF_6$ | $0.264003 \times 10^{-5}$ |

Description:
$BF_2 = max(0;\ 21.805\ -\ \mathrm{X}_3)$
$BF_6 = max(0;\ X_4\ -\ 71.220) \times BF_5$

Based on Table 5, a MARS model was obtained to estimate the percentage of female workers with labor status in Indonesia with the following equation:

$$\hat{Y} = 12{,}357 + 0{,}999\ BF_1 - 0{,}356\ BF_4 + 0{,}186787 \times 10^{-5}\ BF_5 - 0{,}435513 \times 10^{-6}\ BF_7 + 0{,}264003 \times 10^{-5}\ BF_9 \quad (9)$$

Based on the estimation model above, we can obtain the value of $\hat{Y}$ Percentage of Female Workers with Labor Status in Indonesia and can be visualized as follows:

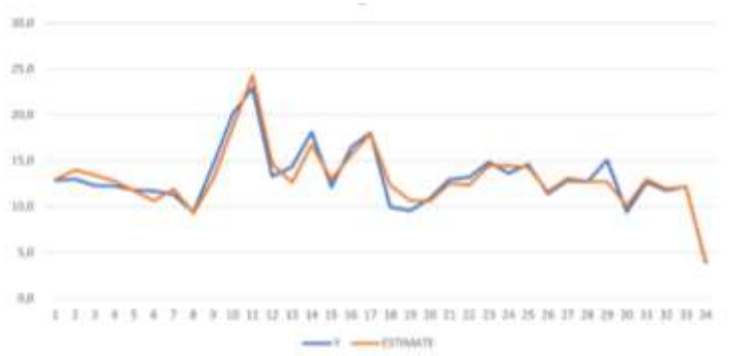

**Figure 2.** Plot $Y$ with $Y$ Estimate

**Significance Testing of MARS Model Basis Function**

After getting the best model with BF = 12, MI = 3, and MO = 3, it is necessary to test the significance of the model base function both simultaneously (simultaneously) and partially (individually). Testing regression coefficients simultaneously aims to determine whether the selected MARS model is a suitable model and shows the right relationship between predictor variables and response variables. With the use of $\alpha = 0{,}05$, $M = 1, 4, 5, 7, 9, and\ N = 34$, the hypothesis and interpretation are obtained as follows:

$H_0 : \alpha_1 = \alpha_4 = \alpha_5 = \alpha_7 = \alpha_9 = 0$

$H_1$ : there is at least one $\alpha_m \neq 0$ ; $m = 1, 4, 5, 7, 9$

The results of the simultaneous significance test resulted in a value $F_{test}$ of 55,401 and the $P - Value$ of $0{,}118239 \times 10^{-12}$. With $v_1$ by 5 and $v_2$ by 28, the value of $F_{table}$ of 2.56. The decision taken is to reject $H_0$ because the value $F_{test} > F_{table}$ and seen from the value of $P - Value < \alpha$. This indicates that the model obtained is suitable and significant and shows the relationship between the predictor variables and the response variable simultaneously.

Partial basis function coefficient testing aims to determine whether each basis function formed has a significant effect on the model. In addition, partial regression coefficient testing is used to determine whether the model containing these parameters is able to describe the actual data. With the use of $\alpha = 0{,}05$, $M = 1, 4, 5, 7, 9$, and $N = 34$, the hypothesis and interpretation are obtained as follows:

$H_0 : \alpha_m = 0$

$H_1 : \alpha_m \neq 0 ; m = 1, 4, 5, 7, 9$

**Table 6.** Significance Test of Partial Regression Coefficient

| Parameter | Estimation | $t_{test}$ | $P - Value$ | Decision |
|---|---|---|---|---|
| Constant | 12.357 | 37.678 | $0.999201 \times 10^{-15}$ | Reject $H_0$ |
| $BF_1$ | 0.999 | 5.094 | $0.214714 \times 10^{-4}$ | Reject $H_0$ |
| $BF_4$ | −0.356 | −6.184 | $0.111763 \times 10^{-5}$ | Reject $H_0$ |
| $BF_5$ | $0.186787 \times 10^{-5}$ | 4.590 | $0.849879 \times 10^{-4}$ | Reject $H_0$ |
| $BF_7$ | $-0.435513 \times 10^{-6}$ | −2.953 | 0.006 | Reject $H_0$ |
| $BF_9$ | $0.264003 \times 10^{-5}$ | 3.231 | 0.003 | Reject $H_0$ |

Based on Table 6, the test statistic values $t_{test}$ and $P - Value$ with values $t_{table} = 2{,}37$ and $\alpha = 0{,}05$. If $t_{test} < -t_{table}$ or $t_{test} > t_{table}$ or $P - Value < \alpha$, then $H_0$ rejected. Based on Table 6, the decision taken from the partial regression coefficient test results is to reject $H_0$. It can be concluded that each predictor variable affects the response variable in the basis function. The predictor variables included in the model are Average Female Labor Wage ($X_1$), Female Workers with at least a high school education ($X_3$), Life Expectancy ($X_4$), and Female Workers who are Heads of Households. ($X_6$).

**Variable Importance Level**

The MARS model formed includes several influential variables contained in the basis function, namely Average Female Labor Wage ($X_1$), Female Workers with at least high school education ($X_3$), Life Expectancy ($X_4$) and Female Workers who are Heads of Households. ($X_6$). The most influential or most important variables are ranked by the level of variable importance given in the following table:

**Table 7.** Level of Importance of Predictor Variables

| Variables | Level of Importance | −GCV |
|---|---|---|
| Female Workers with at Least High School Education ($X_3$) | 100.000 | 6.400 |
| Female Workers who are Heads of Household ($X_6$) | 80.191 | 5.178 |
| Average Wage of Female Workers ($X_1$) | 43.930 | 3.637 |
| Life Expectancy ($X_4$) | 31.213 | 3.310 |
| GRDP CP ($X_2$) | 0.000 | 2.976 |
| Provincial Minimum Wage ($X_5$) | 0.000 | 2.976 |

Based on Table 7, it can be seen that the predictor variable that has the greatest influence on the response variable of the Percentage of Female Workers with Labor Status in Indonesia in 2023 is the predictor variable of Female Workers with At Least High School Education ($X_3$) with an importance level of 100%, followed by the predictor variable Female Worker with Head of Household Status ($X_6$) as the second order of 80.191 as the second order at 80.191%. The third order is the predictor variable Average Wage of Female Workers ($X_1$) at 43.930%, followed by the predictor variable of Life Expectancy Age ($X_4$) at 31.213%. Predictor variables of GRDP CP ($X_2$) and Provincial Minimum Wage ($X_5$) in the last order with the level of importance given is 0%, which means that it does not have sufficient influence on the model.

Based on the contribution of the predictor variables in reducing GCV, if the predictor variable Female Workers with at least a high school education ($X_3$) is included in the model, it can reduce GCV by 6.400. Then, if the predictor variable Female Worker with Head of Household Status ($X_6$) is included in the model, it can reduce the GCV value by 5.178, if the predictor variable Average Female Labor ($X_1$) is included in the model, it can reduce the GCV value by 3.637. If the predictor variable Life Expectancy ($X_4$) is included in the model, it can contribute to reducing the GCV value by 3.310, if it includes the GRDP CP ($X_2$) and the Provincial Minimum Wage ($X_5$) each can contribute to the model, namely lowering the same GCV value, which is equal to 2,976.

Based on the level of importance of the variables in Table 7, the variable that occupies the top level of importance is Female Workers with a Minimum High School Education ($X_3$). Education is an initial investment that can have an impact on productivity among women. The higher a person's level of education, the more knowledge and skills they have and the more productive they are. Labor productivity is influenced by education, so companies must set educational standards for their employees. This is a necessary condition for prospective employees to enter the labor market. Currently, most companies set requirements for the recruitment of new employees that include education and work experience. It can be concluded that the level of education of female workers affects the high and low absorption of labor (Novitasari, 2022).

Furthermore, in Table 7, the variable that occupies the second highest level of importance is Female Workers who are Heads of Households ($X_6$). According to data from the Central Statistics Agency (BPS), in 2023 there were 12.73% of female household heads in Indonesia. This percentage is due to reasons such as husband's death, divorce, or husband's disability. In a situation like this, women must carry out two roles: caring for the family and earning a living to make ends meet. The results of Hanum's (2017) research show that some housewives play a dual role due to economic problems that prevent them from continuing their education to a higher level.

## Error Assumption Test of MARS Model

Tests that show that the assumption of independent identical errors normally distributed with mean 0 and variance $\sigma^2$ is met must be done to draw further conclusions. Error or residual estimates are obtained by subtracting $Y$ from $Y$ estimation ($\hat{Y}$). To calculate the value of $\hat{Y}$, the predictor variables for each significant basis function were substituted, as shown in Table 5, The basis function values were substituted into the selected model.

The normality test is used to determine whether the dependent variable and independent variable in the model have a normal distribution. The P-P plot diagram, which looks at the distribution of the data, can be used to check the normality of the errors. Data is said to be normal if its distribution in the plot follows a straight line. The hypothesis of error normality test with Kolmogorov-Smirnov test is as follows:
$H_0$ : Error is normally distributed
$H_1$ : Error is not normally distributed

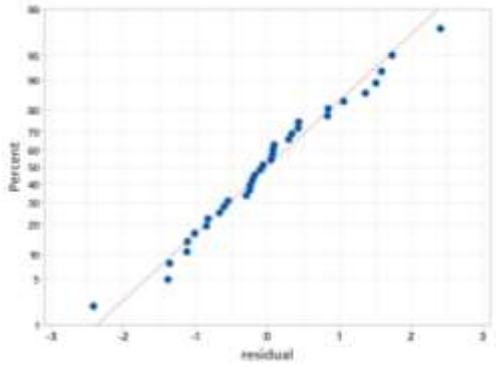


**Figure 3.** Residual Normality Plot

**Table 8.** Normality Test Results

| Test | Mean | Standard Deviation | N | Test Statistic | P-Value |
|---|---|---|---|---|---|
| Kolmogorov-Smirnov | 0,00003 | 1,02068 | 34 | 0,110 | 0,200 |

Based on Figure 3, the residual normality plot shows that the distribution of residual data follows a straight line pattern. Based on Table 8, the results show that $P - Value > 0{,}05$. Due to the value of $P - Value$ Kolmogorov-Smirnov test result is 0.200, the decision is made to fail to reject $H_0$ with the conclusion that the error is normally distributed.

The identical assumption or commonly called homoscedasticity means that the variance in the residuals is identical. The method used in testing the assumption of identical residuals is to use the Glejser test. The glejser test is performed by regressing the absolute price of the residuals on the predictor variables. All variables are transformed into the inverse natural logarithm. The hypothesis used in the glejser test is as follows.

$H_0 : \sigma_1^2 = \sigma_2^2 = \cdots = \sigma_n^2 = \sigma^2$

$H_1$ : There is at least one $\sigma_i^2 \neq \sigma^2 ; i = 1, 2, \ldots, n$

**Table 9.** ANOVA Table of Heteroscedasticity Test

| Source of Variation | Degree of Freedom | Sum of Squares | Mean Squares | $F_{test}$ | $P - Value$ |
|---|---|---|---|---|---|
| Regression | 6 | 13456,403 | 2242,734 | 1,265 | 0,306 |
| Error | 27 | 47853,792 | 1772,363 | | |
| Total | 33 | 61310,195 | | | |

Based on Table 9, the value of $F_{test}$ is 1,265 and the $P - Value$ value of 0,306. With $v_1$ by 6 and $v_2$ by 27, the value of $F_{table}$ of 2.46. The decision taken is to fail to reject $H_0$ because the value of $F_{test} < F_{table}$ and seen from the value of $P - Value > \alpha$. This indicates that there is no case of heteroscedasticity or the assumption of identical residuals has been met.

**The Effect of Basis Function 1 on the Percentage of Female Workers with Labor Status**

$BF_1 = max(0;\ X_3 - 21{,}805)$

$$BF_1 = \begin{cases} X_3 - 21{,}805, & X_3 > 21{,}805 \\ 0, & X_3\ others \end{cases}$$

In Basis Function 1 ($BF_1$), the predictor variable Female Workers with at least a high school education ($X_3$) is included. The regression coefficient on the significant $BF_1$ model is 0.999. Assuming $BF_4$, $BF_5$, $BF_7$, and $BF_9$ are constant, an increase in $BF_1$ by one unit for provinces with a variable value of $X_3$ greater than 21.805 will increase the percentage of female workers with labor status ($Y$) by 0.999 percent. The relationship between the predictor variable Female Workers with at least a high school education ($X_3$) in $BF_1$ can be interpreted that an increase in the percentage of Female Workers with at least a high school education can increase the percentage of Female Workers with Labor Status by 0.999 percent. This shows that female workers with at least a high school education have a positive effect on the percentage of female workers with labor status. This is in line with the results of research conducted by Birgitta (2021). Education on labor absorption in the informal sector shows a significant effect. When the education taken by workers increases by an average of one year, it will also increase the absorption of labor in the informal sector. This means that the education variable on labor absorption in the informal sector has a positive effect.

Education is a basic right for everyone as it is essential for success in life. In general, education is necessary for everyone, as it is basically impossible for anyone to live their life without exposure to education Charina et al. (2022). Goal number 4 of the Sustainable Development Goals (SDGs) aims to ensure inclusive and equitable quality education and increase lifelong learning opportunities for all by 2030. Education is essential for reducing poverty, improving health and promoting economic growth. A high-quality education gives everyone the opportunity to develop their full potential and make a positive contribution to society. Competent human resources will generate many innovative ideas, inventions, innovations, work techniques, and other things that can improve economic performance. Ultimately, this will result in improved economic performance. According to Fahmi and Mulyono (2015), shows that education is an important issue for society, especially for those who are looking for a better job. Education is very important in determining the employment and salary of employees. According to Wijaya et al (2014), improving the quality of education is necessary to attract a skilled and competitive workforce. Basically, education is an investment process to create "educated human beings".

Research conducted by Fahmi and Mulyono (2015) tested the human capital theory and signaling theory proposed by Becker and Spence. Human capital theory states that education can provide skills to workers that can increase productivity and generate higher income. The quality of the labor force is believed to increase along with educational attainment. Human capital theory assumes that companies pay higher salaries to employees who have high productivity, because they assume that they can differentiate the productivity of their employees. For this reason, employees with higher productivity will receive higher salaries. On the other hand, in signaling theory, there are two types of workers: good and bad. Bad workers are less productive, while good workers are more productive. However, even if one worker is more productive than the other, companies pay the same or equal wages if they have the same level of education. To signal to the company that they will receive a wage that matches their education level, the most productive employees choose to continue their education at a higher level than before. Therefore, nowadays, education is one of the requirements to get a job.

**The Effect of Basis Function 4 on the Percentage of Female Workers with Labor Status**

$$BF_4 = max(0;\ 2{,}249\ -\ X_6) \times BF_2$$

$$BF_4 = max(0;\ 2{,}249\ -\ X_6) \times max(0;\ 21{,}805\ -\ X_3)$$

$$BF_4 = \begin{cases} (21{,}805\ -\ X_3)(2{,}249\ -\ X_6), & X_3 < 21{,}805\ and\ X_6 < 2{,}249 \\ 0, & X_3\ or\ X_6\ others \end{cases}$$

Basis Function 4 ($BF_4$) includes the predictor variables Female Workers with at least a high school education ($X_3$) and Female Workers who are Heads of Households ($X_6$). The significant regression coefficient in the $BF_4$ model is $-0.356$. Assuming $BF_1, BF_5, BF_7$, and $BF_9$ are constant, an increase in $BF_4$ by one unit for provinces with variable values of $X_3$ smaller than 21.805 and $X_6$ smaller than 2.249 will decrease the percentage of female workers with labor status ($Y$) by 0.356 percent. The relationship between the predictor variables of Female Workers with at least a high school education and Female Workers who are Heads of Households in $BF_4$ can be interpreted that a low percentage of Female Workers with at least a high school education and Female Workers who are Heads of Households can reduce the Percentage of Female Workers with Labor Status by 0.356 percent. This shows that the variables of Female Workers and Minimum High School Education with Female Workers who are Heads of Households negatively affect the Percentage of Female Workers with Labor Status. Hidayat et al., (2017) in his research entitled The Labor Force Participation Rate (TPAK) of Women Between Regencies in Riau Province shows that the female population who take care of the household has a significant and negative effect on employment.

In today's world, women don't just work and earn money by staying at home and engaging in domestic activities. There are several factors that lead to women entering the public sector: their access to higher education, which allows them to compete with men in the public sector, the demands of changing times, and due to increased self-confidence, they earn income to fulfill household needs. There is no linear correlation between women's high job awareness and the challenges they face, especially a culture that may not support them. This implies that the cultural structure of society still expects working women to play two roles: as housewives (domestic-productive) and as employees (public-productive) (Hidayati, 2015).

Women have natural traits that set them apart from men from birth. Indonesian women are of oriental descent and value their position in the family. A woman is always the spouse of her husband and the mother of her children in the family and the full responsibility falls on the shoulders of the mother and father to nurture their children. Indonesian women now have the same opportunities and responsibilities as men to contribute to the progress of the country. Programs to strengthen the role of women in development are receiving increasing attention. Women have the opportunity to participate in higher education. As a result, many women have roles in various fields in the community, state, nation and

economy. In society, many women now work to fulfill household needs or even become the head of the household. One of the household members who is responsible for fulfilling the daily needs of the household or the head of the household who is the elder/considered/appointed as the head of the household is referred to as the head of the household. The strong patriarchal culture in society leads to a general tendency to state that the head of the household is male, even though the definition does not specifically mention that the head of the household must be male (Satriawan, 2022).

**The Effect of Basis Function 5 on the Percentage of Female Workers with Labor Status**

$$BF_5 = max(0;\ X_1\ -\ 1842501)$$

$$BF_5 = \begin{cases} X_1\ -\ 1842501, & X_1 > 1842501 \\ 0, & X_1\ others \end{cases}$$

In Basis Function 5 ($BF_5$), the predictor variable Average Female Labor Wage ($X_1$) is included. The regression coefficient on the significant $BF_5$ model is $0.186787 \times 10^{-5}$. Assuming $BF_1, BF_4, BF_7$, and $BF_9$ are constant, an increase in $BF_5$ by one unit for provinces with variable $X_1$ values greater than 1842501 will increase the Percentage of Female Workers with Labor Status ($Y$) by $0.186787 \times 10^{-5}$ percent. The relationship between the predictor variable Average Wage of Female Labor in $BF_5$ can be interpreted that an increase in Average Wage of Female Labor can increase the Percentage of Female Workers with Labor Status by $0.186787 \times 10^{-5}$ percent. This shows that female labor wages have a positive influence on the percentage of female workers with labor status. In line with research conducted by Ananda et al., (2023), shows that the minimum wage has a significant and positive effect on employment in Riau Province. This means that if the minimum wage increases, labor absorption will increase and if the minimum wage is higher, labor absorption will increase.

Labor recruitment is strongly influenced by wages. Wages, according to Law of the Republic of Indonesia Number 13 of 2003 concerning Manpower, are the rights of workers / employees received and expressed in the form of money as compensation from employers or employers to workers / employees who are determined and paid according to a work agreement, agreement, or laws and regulations, including benefits for workers/employees and their families for work or services that have been or will be performed. If the wages paid by the company are high or in accordance with the services provided or sacrifices made, then candidates will try to work in the company (Ganie, 2017). Since the issuance of Law No. 13 of 2003, the government has been actively involved in wage regulation, because wages are an indicator of various forms of welfare. Local governments have set city/regional minimum wages (UMK) to protect workers' wages and ensure a decent life. According to Keynes' efficiency wage theory, wage levels cannot fall, as this would reduce workers' income. This will result in a decrease in workers' purchasing power, which in turn will affect the marginal value of workers' productivity (Rahmah & Juliannisa, 2022).

Wage costs have a significant impact on labor recruitment: If a company's wages are perceived to be high or in line with the benefits or sacrifices provided, job seekers will want to work in that company. The law of labor demand states that the demand for labor increases as workers' wages increase. Many factors influence this, such as population size, wages, and the quality of the labor force. In addition, the structure of labor demand in an economy is also strongly influenced by external factors, such as the currency crisis (Kawet et al., 2021). According to Ningsih and Indrajaya (2015), the wage level is very important for the smooth running of a business because an effective wage system is one of the factors that support optimal productivity. According to Dwirainaningsih (2017), wages are basically the rewards paid by producers to workers for their performance in production. Wages depend on the cost of minimum living needs of workers and their families, binding legal regulations on minimum wages for workers, marginal productivity of labor, pressure that can be exerted by labor unions and employers' unions, and differences in types of work.

**The Effect of Basis Function 7 on the Percentage of Female Workers with Labor Status**

$$BF_7 = max(0;\ 71{,}220\ -\ X_4) \times BF_5$$

$$BF_7 = max(0;\ 71{,}220\ -\ X_4) \times max(0;\ X_1\ -\ 1842501)$$

$$BF_7 = \begin{cases} (X_1\ -\ 1842501)(71{,}220\ -\ X_4), & X_1 > 1842501\ and\ X_4 < 71{,}220 \\ 0, & X_1\ or\ X_4\ others \end{cases}$$

Basis Function 7 ($BF_7$) contains the predictor variables Average Female Labor Wage ($X_1$) and Life Expectancy ($X_4$). The significant regression coefficient in the $BF_7$ model is $-0.435513 \times 10^{-6}$. Assuming $BF_1, BF_4, BF_5$, and $BF_9$ are constant, an increase in $BF_7$ by one unit for provinces with variable values of $X_1$ greater than 1842501 and $X_4$ smaller than 71,220 will decrease the Percentage of Female Workers with Labor Status ($Y$) by $0.435513 \times 10^{-6}$ percent. The relationship between the predictor variable Average Wage of Female Workers and Life Expectancy in $BF_7$ can be interpreted that an increase in Average Wage of Female Workers accompanied by a low Life Expectancy can reduce the Percentage of Female Workers

with Labor Status by $0.435513 \times 10^{-6}$ percent. Basis Function 7 shows a negative relationship between the Average Wage of Female Workers and a positive relationship between Life Expectancy and the Percentage of Female Workers with Labor Status in Indonesia.

Health indicators are used to assess the implementation of development. Health is an essential social right and one of the most important factors for human resource performance. To be able to play an active role in improving human welfare, physically and mentally healthy human resources (HR) are expected to be good human beings. One measure of population health is life expectancy. One of the measures used to assess population health and the success of government programs is life expectancy (AHH). Life expectancy is defined by the Central Bureau of Statistics as an average estimate of how long a person can live since the year of their birth. Environmental factors, food availability, education, government policies and community economics can affect life expectancy (Septianingsih, 2022). The better a person's nutrition, the higher the level of productivity. At the same time, nutrition provides an overview of a person's health at a given time. The state of nutrition and health can be a major factor affecting the level of productivity of the population. Employees who have health problems work less optimally, while those who do not have health problems can work well (Sudirman & Ahmadi, 2017).

According to the results of Wasista's research (2020), the panel data regression results show that the variable Life Expectancy or Life Expectancy Age (UHH) has a significant positive effect on the formal sector female workforce. A high Life Expectancy indicates a more prosperous society. People's lives will be more productive if the UHH is higher. This shows that they are in a competitive position in the labor market. Companies prefer prospective employees who are still in their productive age because they still have physical strength that can increase their productivity, which benefits the company because it can improve the production process. As a result, this will increase the demand for new employees. If the UHH of a region's population is low, this will have a negative impact on the region's economy, because the lack of labor will lead to a decrease in the number of jobs and vice versa (Novitasari, 2022). If a person's age has passed the productive period, it will reduce their physical strength so that their productivity will also decrease and also affect their income.

**The Effect of Basis Function 9 on the Percentage of Female Workers with Labor Status**

$$BF_9 = max(0;\ 1{,}876\ -\ X_6) \times BF_6$$
$$BF_9 = max(0;\ 1{,}876\ -\ X_6) \times max(0;\ X_4\ -\ 71{,}220) \times BF_5$$
$$BF_9 = max(0;\ 1{,}876\ -\ X_6) \times max(0;\ X_4\ -\ 71{,}220) \times max(0;\ X_1\ -\ 1842501)BF_9$$
$$= \begin{cases} (X_1 - 1842501)(X_4 - 71{,}220)(1{,}876 - X_6),\ X_1 > 1842501,\ \ X_4 > 71{,}220, and\ X_6 < 1{,}876 \\ 0,\ X_1, X_4, or\ X_6\ others \end{cases}$$

In Basis Function 9 ($BF_9$), the predictor variables Average Female Labor Wage ($X_1$), Life Expectancy ($X_4$), and Female Head of Household ($X_6$) are included. The significant regression coefficient in model $BF_9$ is $0.264003 \times 10^{-5}$. Assuming $BF_1, BF_4, BF_5$, and $BF_7$ are constant, an increase in $BF_9$ by one unit for provinces with variable values of $X_1$ greater than $1842501, X_4$ greater than 71,220, and $X_6$ smaller than 1.876 will increase the percentage of female workers with labor status ($Y$) by $0.264003 \times 10^{-5}$ percent. The relationship between the predictor variables Average Wage of Female Workers, Age of Life Expectancy, and Female Workers who are Heads of Households in $BF_9$ can be interpreted that an increase in Average Wage of Female Workers and Age of Life Expectancy accompanied by a low number of Female Workers who are Heads of Households can increase the Percentage of Female Workers with Labor Status by $0.264003 \times 10^{-5}$ percent. This means that the average wage of female workers and life expectancy have a positive effect while female workers who are heads of households have a negative effect on the percentage of female workers with labor status.

**Tabel 10.** Provinces with Significant Basis Functions

| Significant Basis Function | Province |
|---|---|
| None | Nusa Tenggara Barat |
| $BF_5$ | Jawa Barat, Jawa Tengah, Jawa Timur, Sulawesi Utara |
| $BF_1, BF_5$ | DKI Jakarta, D.I. Yogyakarta |
| $BF_4, BF_5$ | Kalimantan Timur, Kalimantan Utara, Sulawesi Selatan |
| $BF_5, BF_7$ | Aceh, Banten |
| $BF_1, BF_5, BF_7$ | Sumatera Utara, Sumatera Barat, Kepulauan Riau, Maluku |
| $BF_4, BF_5, BF_7$ | Sumatera Selatan, Bengkulu, Nusa Tenggara Timur, Kalimantan Tengah, Kalimantan Selatan, Sulawesi Tengah, Gorontalo, Sulawesi Barat, Maluku Utara, Papua Barat, Papua |
| $BF_4, BF_5, BF_9$ | Riau, Jambi, Lampung, Kepulauan Bangka Belitung, Bali, Kalimantan Barat, Sulawesi Tenggara |

Based on Table 10, Nusa Tenggara Barat Province is the only province that does not have a significant Basis Function value. According to the results of research (Irawan and Muhira, 2023), which examines the factors that influence labor absorption in Nusa Tenggara Barat in 2020-2022, it results that ADHK GRDP per capita, Average Years of Schooling, and Minimum Wage together or simultaneously have no significant effect on Labor Absorption in NTB in 2020-2022. Even partially, the ADHK GRDP per capita, Average Years of Schooling, and Minimum Wage variables each have no significant effect on labor absorption on labor absorption in NTB. In fact, the results of research conducted by Faiztsani (2023) show that simultaneously GRDP, Regency/City Minimum Wage, and Average Years of Schooling have a positive and significant influence on labor absorption in district cities in Jawa Barat Province in 2013-2019. Partially, each of these variables has a significant effect on labor absorption in Jawa Barat Province.

From the results of the August 2023 National Labor Force Survey (SAKERNAS), the average female labor wage ($X_1$) in Nusa Tenggara Barat is the smallest in Indonesia. The livelihoods of the population of Nusa Tenggara Barat Province are mainly in the agriculture, trade and services sectors. When compared to urban areas, people there generally work in the industrial sector. The concept of income distribution mainly refers to how income is distributed among all members of society or households. Due to different natural resources and demographic conditions, there are developed and underdeveloped areas in every region. The term inequality describes the relative quality of life in a society. Due to these differences, the level of development of each region varies. This leads to differences or gaps in the prosperity of the region, in this case income (Kuncoro, 2006). This is what causes the real difference for the Average Wage of Female Labor in Nusa Tenggara Barat Province.

If seen in each province with a significant Basis Function, there is always a Basis Function 5 or $BF_5$ except in Nusa Tenggara Barat Province. In Basis Function 5, the predictor variable Average Female Labor Wage ($X_1$) is included. The relationship between the predictor variable Average Wage of Female Labor in BF_5 can be interpreted that an increase in Average Wage of Female Labor can increase the Percentage of Female Workers with Labor Status. Basis Function 5 or $BF_5$ shows a positive relationship between Average Female Labor Wage and the Percentage of Female Workers with Labor Status in Indonesia. According to research by Putri and Purwanti (2012), the results of multiple linear regression found that the wage/income variable has a positive effect on the absorption of female labor. This is because the wages received increase along with the increase in working hours and wages depend on the number of working days, which means that the more working days, the higher the wages received. Because they feel financially responsible for supporting their families, women work to earn additional income. The higher the wage offered, it will increase labor interest to work. Therefore, the amount of labor offered will be higher in the labor market (Cantika, 2019).

The significant Basis Functions with the most provinces are $BF_4$, $BF_5$, and $BF_7$. Almost one-third of provinces in Indonesia have these Basis Functions. Basis Function 4 contains the predictor variables Female Workers with at least a high school education ($X_3$) and Female Workers who are Heads of Households ($X_6$). The relationship between the two predictor variables in $BF_4$ means that a lower percentage of female workers with at least a high school education and female workers who are heads of households can reduce the percentage of female workers who are laborers. Basis Function 4 or $BF_4$ shows a positive relationship between Female Workers with Household Head Status and the Percentage of Female Workers with Labor Status in Indonesia. According to data from the Central Bureau of Statistics (BPS), in 2023 there were 12.73% of female household heads in Indonesia. This percentage is due to reasons such as husband's death, divorce, or husband's disability. In a situation like this, women must carry out two roles: caring for the family and earning a living to make ends meet. The results of Hanum's (2017) research show that some housewives play a dual role due to economic problems that prevent them from continuing their education to a higher level.

## 4. CONCLUSIONS AND RECOMMENDATIONS

The characteristics of the variables that influence the percentage of female workers with labor status in each province in Indonesia show that there are still significant differences compared to male workers. This shows that there is still a gender gap in the labor force in Indonesia. Based on the results of modeling the percentage of female workers with labor status in Indonesia using the Multivariate Adaptive Regression Spline (MARS) approach, the best model estimation results were obtained with $BF = 12, MI = 3$, and $MO = 3$ with a minimum GCV value of 2.976, MSE value of 1.228 and $R^2$ of 90.8%. The MARS model that was formed included several influential variables contained in the basis function, namely Average Female Labor Wage ($X_1$), Female Workers with Minimum High School Education ($X_3$), Life Expectancy ($X_4$), and Female Workers who are Head of Household ($X_6$). Based on significant Basis Functions, all provinces in Indonesia have Basis Function 5 except for Nusa Tenggara Barat Province. Basis Function 5 ($BF_5$) contains the predictor variable Average Female Labor Wage ($X_1$), which shows a positive relationship

between Average Female Labor Wage and Percentage of Female Workers with Labor Status in Indonesia. Meanwhile, based on the level of importance of the predictor variables, the top two are Female Workers with at least a high school education ($X_3$) and Female Workers who are Heads of Households ($X_6$). Thus, it is hoped that the government will be able to provide effective regulations in tackling gender inequality by making these three variables a top priority in overcoming the problem of labor gender gap in Indonesia.

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