FEMALE LABOR FORCE PARTICIPATION IN MALAYSIA: TIME-SERIES EVIDENCE

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ABSTRACT

Human resource is one of the main contributing factors for economic growth and for social, political, and technological development. Even though Malaysia has been experiencing a significant demographic change in workforce pattern with increasing participation of women since its independence in 1957, the participation rate of women in the labor market is still lower (around 46%). In order to examine determinants of women labor force participant rate in Malaysia, this paper uses the autoregressive distributed lag (ARDL) co-integration framework, and the results based on the bounds testing procedure confirm that a long-run relationship exists between women labor force participant rate and its determinants: GDP, education rate and fertility rate. The empirical results show that the comprehensive long-term influence of the GDP, education and fertility rate on women labor force participant rate seems to be statistically insignificant. The coefficient of GDP and education are positive, and the coefficient of fertility rate is negative, which suggests that in the long run, increase in female labor force participant is associated with increase in GDP and education, and decrease in Fertility rate. The results also reveal that after incorporating the CUSUM and CUSUMSQ tests, women labor force participant rate function is stable between 1980 and 2015.

Keywords: Women labor force participant rate, ARDL, Stability, Malaysia

1 Introduction

Human resource is the main factor for economic growth and for social and technological development (Bakar & Abdullah, 2007). In modern living, the participation of female in the labor market is contributing to development economy (Ismail & Sulaiman, 2014). Dallakyan and Bakhtavoryan (2012) revealed that high female labor force participation rates increase labor productivity, reduce poverty and improve overall socio-economic development. Malaysia has completed its population transition and has entered the modern population reproduction stage, characterized by low birth rate, low mortality rate and low population growth rate (Siah & Lee, 2015), what is more, since independence in 1957, Malaysia's labor force model is experiencing a major demographic change with increasing women's participation (Ghazali, Peck-Leong, & Tan, 2015).

According to (Lisaniler & Bhatti, 2005), the participation in labour market is decided by the value of time. Under all other things remaining constant, if the value of time spent on market activities exceeds that of non-market activities, people will decide to participate in the labor market. The participation of women in the labor market varies greatly across countries, reflecting differences in economic development, education levels, fertility rates, wage rate and other supportive services (Chaudhary & Verick, 2014).

Over the past few decades, even though the labor market in Malaysia has witnessed an improvement in gender labor market outcomes, as women's labor force participation rates have increased and the gender wage gap narrowed (Milanovic, 2001). According to the world bank data (2016), the percentage of female in the total population is more than 48%, while the statistics show that the participation of female participation remains at a range from 44 to 48 % yearly over the last three decades. In order to increase the female labor force participation rate in Malaysia, I will focus on three research objectives: 1) To find the factors which affect the female labor force participation rate through the literature review; 2) To decide the factors that influence the female labor force participation rate in Malaysia; 3) To find the implication of the factors for Malaysia policy makers. This study examines determinants of women labor force participant rate in Malaysia using the autoregressive distributed lag (ARDL) co-integration framework. This study is arranged into five sections. Section 1 discusses the background of the study and the objective of the study. Section 2 reviews the determinants of the female labor force participation rate, and section 3 explains the methodology and data resource. Furthermore, section 4 will explain the empirical results, and the last section gives some conclusions and implications for the study.

2 Literature Review

Many previous studies have investigated female labor force participation in different countries (Leuthold, 1978; Cogan, 1980; Greenhalgh, 1980; Schultz, 1980; Mroz, 1987; Fair and Macunovich, 1997; Bloom et al., 2009; Thévenon, 2013). In order to analyze the determinants of female labor force participation, this paper starts with review of some articles and summarizes the factors influencing the female labor force participant rate.

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2.1 Fertility

Women's reproductive behavior is measured by the fertility rate, and there are many articles which studied the effect of fertility on female labor force participation. For example, the result of (Ismail & Sulaiman, 2014) showed that the number of children was an important determinant of the supply of married women labor through a field survey in Malaysia based on the data collected in 2011. Considering the relationship between wives' labor force participation and fertility, a study by Mason and Palan (1981) indicated that due to serious conflicts existed between working and caring for children, an inverse relationship between female labor force participation and fertility by using the analysis of the 1974 Malaysian. Akhtar (1981) examined comparative rates of female labor force participation for migrant women, and found that fertility was a highly significant inverse association to female labor force participation. Kottis and Dimelis (1992) explained that Islamic countries have high the total fertility rate which led to lower women's labor force participation. In addition, Azid, Khan and Alamasi (2010) found that the number of infants decreases women labor force participation, and Roopnarine and Ramrattan (2012) found that the presence of children in the household had negative effects on participation, and it showed an inverse relationship between fertility and female labor force participation for developed economies.

However, Duncan et al. (1993) indicated that the presence of children in the household significantly affects the probability of labor force participation of married women. Gangakharan et al. (1996) found the positive relationship between an unexpected child and the women labor participation. Apps and Rees (2001) explained that the presence of child-care centers leads to the likelihood of a positive relationship between fertility and female labor force participation.

On the other hand, Karen and Palan (1980) implemented that an increase in women's labor participation had little effect on fertility in Peninsular Malaysia. Siah and Lee (2015) indicated that female participation in Malaysia had an insignificant impact on the fertility rate, and women's employment situation had insignificant effect on the childbearing. Additionally, Iacovou (2001) pointed out that children had no effect on the mothers' labor force supply. Dallakyan and Bakhtavoryan (2012) indicated that the effect of the number of children on female labor force was insignificant. Furthermore, Abdullah et al. (2013) tended to investigate the ambiguous relationship between fertility and women's labor force participation in the case of Malaysia and other Asian countries such as Singapore, Thailand, Indonesia, the Philippines and Vietnam, by using a panel data from 1995 to 2009, and the results showed that labor participation rate did not granger-cause fertility rate in these countries. And, the findings of (Siah & Lee, 2015) found that the women's child bearing decisions were unaffected by their employment situation.

2.2 Education

Education is considered as the major factor for the decision of labor force participation (Roopnarine & Ramrattan, 2012). According to Al-orabi (1999), women's education had the most significant positive influence on Saudi women's decision to participate in the labor force. The study of (Hafeez & Ahmed, 2002) found that the females' education level had significant and positive influence on female labor force participation. In addition, Nor'aznin and Norehan (2007) implicated that the increased years of schooling would increase women labor force participation opportunities, as the females took full advantage of working opportunities by increasing their level of education attainment (Fatima & Sultana, 2009). The study of (Dallakyan & Bakhtavoryan, 2012) indicated that rural women with higher education or secondary technical education had higher labor force participation relative to rural women with less than higher education by using the 2012 survey data in Armenia.

In addition, Ismail and Sulaiman (2014) attempted to identify that how educational attainment to determine married women's participation in the labor market, and the results showed that years of schooling positively affect the supply of married women labor. Chaudhary and Verick (2014) attempted to explore the situation of women in South Asia, and the findings revealed that improving access to education and training programmers would increase job opportunities for women in developing countries. Furthermore, Ghazali, Peck-Leong and Tan (2015) explained that the improvement of women's access to education increased women's participation in the labor. The result of Nor and Said (2016) identified the determinants in female labor force participation, and results indicated that labors aged between 25-34 years with tertiary education background significantly and positively influence the labor force participation rates.

However, the results of (Viljoen & Dunga, 2013) showed that the education level of the head of household was not a significant relationship with labor force participation in Bophelong Township. On the other side, according to (Akhtar, 1981), education demonstrates a negative association to immigrant female labor force participation, while professional qualification seems to have a positive impact specifically if women have the advantage of having obtained a nursing qualification.

2.3 Economic development

The rapid economic growth largely increased female labor force participation in Malaysia due to the growth in the manufacturing and services sectors, and the improvement in the female labor force participation also is attributable to increase the economic incentives (Nor'aznin & Norehan 2007). Fatima and Sultana (2009) examined the relationship between female labor force participation and economic development, and the result confirms the U-shape relationship between the female labor force participation and economic development. Overall, it is concluded that higher economic development is increasing the female participation in labor force by providing more work opportunities for women. In addition, Chaudhary and Verick (2014) showed that the women's full economic potential was critical to increasing economic growth.

However, Kottis and Dimelis (1992) implicated that oil wealth helps explain the low female share of the labor force in Muslim countries. Lahoti and Hema (2013) explored the relationship between economic developments and women's labor force participation by using state-level data in India, and the study found insignificant relationship between the level of economic development and women's participation rates in the labor force.

2.4 Age

In terms of age group in female labor force participation rate, the rate decreased significantly for the group of 35-44 years, and the rate decreased from 58% to 50 % for the group of 45-54 years and decreased to only 25 % for the group of 55-64 years in Malaysia (DOS, 2011). As women get older, particularly those with high education levels, their decision to participate in the labor force becomes more favorable (Al-orabi, 1999). The study of (Hafeez & Ahmed, 2002) examined the various economic and demographic factors, which influenced the decision of educated married women about participation in the labor market, and age affected the female labor force participation rate positively. Age had positive influences on female participation (Roopnarine & Ramrattan, 2012). Furthermore, Dallakyan and Bakhtavoryan (2012) indicated that the odds of rural women labor force participation decreased for each additional year of age. In addition, the result of Ismail and Sulaiman (2014) showed that women's age was an important determinant of the supply of married women labor, which had an adverse effect on the participants of the female labor force.

2.5 Wage rate

Fatima and Sultana (2009) found the negative effect of wages on female labor force participation. Addison and Ozturk (2010) estimated the effect of minimum wage regulation in 16 OECD countries from 1970 to 2008 and reported that increase in minimum wages led to lower female labor force participation rates. Additionally, Dallakyan and Bakhtavoryan (2012) indicated that the effects of being married and monthly household income were statistically insignificant. The result of (Ismail & Sulaiman, 2014) also showed husbands' wage and own wage were insignificantly determined the supply of married women labor, which means wage is not a prime determinant of married female labor supply.

2.6 Marital status

The marriage and female labor force participation relationship is seen to differ among ethnic groups. In the Asian community, the migration and particularly the post-migration circumstances have not significantly altered this relationship for Asians (Akhtar, 1981). The higher the family income, the lower the probability that the women will join the labor force, particularly a married woman with a large number of young children (Al-orabi, 1999). In addition, marital status also indicate negative and significant effect of both female being married and female being single (Fatima & Sultana, 2009). Dallakyan and Bakhtavoryan (2012) indicated that divorced or separated or widowed rural women were more likely to participate in the labor force relative to single rural women. Similarly, Roopnarine and Ramrattan (2012) explained that being the head of the household and being single had positive influences on female participation. Furthermore, in term of marital status, married women were less likely to participating in labor market (Nor & Said, 2016).

2.7 Other Factors

Other factors apart from the mentioned above may be the reason behind low female labor force participant, such as socio-cultural factors. For example, the system of family allowances which encourages the raising of large families led to a negative decision concerning women's labor force participation (Al-orabi, 1999). Spierings et al. (2010) distinguished between three conditions affecting women's participant: needs, opportunities, and values, and these conditions can manifest themselves differently at different levels of analysis (individual, household, sub-national regional and national level). Morikawa (2015) explained that the low female labor participation rate in Morocco is hindering social institutions, societal values and employers' preferences in different industries.

In the studies of female labor force participation in Malaysia, Tan and Gibson (2013) explained that demand for foreign maids by households in Malaysia has increased rapidly and expected to affect female labor force participation. Ali (2014) outlined the socio-economic factors which had contributed to women's increasing participation in the Malaysian workforce.

In sum, different factors influenced women's labor force participation simultaneously in different countries. Women's labor force participant depends on whether a job is needed, whether a job can be obtained and whether having a job is considered acceptable. In addition, from the literature review, the fertility, education, economic development and age are the popular variables which have a significant influence on the female labor force participation. Furthermore, in my knowledge, there are limited articles which focused on the determinants of female labor force participation in Malaysia. Thus, this study will focus on this area to explore how the fertility rate, education, and economic development influence the female employment rate in Malaysia.

3 Methodology and Data Sources

3.1 Data Sources

The sample considered in this study contemplates information on women labor force participant starting from 1980 to 2015. The explanatory variables included in the model are:

GDP is a monetary measure of the value of all final goods and services produced in a period (quarterly or yearly). GDP is not a complete measure of economic activity. It accounts for final output or value added at each stage of production, but not total output or total sales along the entire production process. Gross domestic product (GDP) figures in Malaysia were taken from the IMF. In addition, the Malaysia female labor force participant rate figures were taken from the IMF. For the female education rate, the information was gathered from the Education Statistics (World Bank) and is based upon the enrolment of secondary female. Data on the fertility rate was collected from IMF.

3.2 The model:
Using the above variables mentioned, the determinants of female labor force participation rate in the Malaysia can be explained using the following model:
$P_{Rate} = a * Log\ (GDP) + b * Log\ (EDUCATION) + \mathrm{c} * FERTILITY_{rate} + \mathrm{d}$ (1)

From the above, therefore get the econometric empirical model to be:
$P\_rate_t = \alpha_1 + \alpha_2 gdp_t + \alpha_3 edu_t + \alpha_4 fert_t$ (2)

Where:
P_rate represents women labor force Participants rate
gdp represents Log(GDP)
edu represents Log (EDUCATION)
fert represents FERTILITY rate

3.3 Methodology
The study examines the determinants of female labor force participants in Malaysia by using time series analysis. The stationarity of the data is implemented to examined by the presence of long run cointegration amongst the variables, and an error correction is examined the short-run and long-run relationship.

3.3.1 Unit root tests
The unit root test is examined whether the data is stationary by comparing the ADF test statistic with the critical value at a given level of significance. The null hypothesis of non stationarity is rejected if the value under ADF test statistic is less than the critical value. The result of the unit root test is showed in the table 1.

Table 1 Unit root test result

Variable	Level	First difference	Stationary
P_rate	-4.527469*	----------	I(0)
GDP	-1.172330	-4.561531*	I(1)
education	-1.247175	-5.017160*	I(1)
fertility	-4.432650*	----------	I(0)

GDP and education are stationary at first difference I(1) while female labor force participant rate and fertility rate are stationary at level I(0).

3.3.2 The Autoregressive Distributed Lag (ARDL) bounds approach
The ARDL bounds testing approach to cointegration was developed by (Pesaran et al., 1999) and further extended by (Pesaran, Shin, & Smith, 2001). As there are I(0) and I(1) variables in the set, the Autoregressive Distributed Lag (ARDL) bounds approach is employed to cointegration. And a unique statistical procedure uses the Wald-*F* statistic to test for the significance of the any variables and to predict for the existence of long run relationship and compare the F-statistic with the upper and lower bounds as developed by (Pesaran et al., 1999).

3.3.3 The Bound Testing Approach
As the Unit root results indicate variables are stationary at level or at first difference, we can proceed with the ARDL bounds testing (Narayan & Smyth 2004).

The first step is to examine the existence of a long-run relationship amongst the variables under study. Based on the study of (Pesaran et al., 2001) in Case III, unrestricted intercepts and no trends and the long run and short run dynamics of the model can be estimated by following model.

$$\Delta P\_rate_t = \alpha_0 + \sum_{i=1}^{q} \beta_i \Delta P\_rate_{t-i} + \sum_{i=0}^{q} \theta_i \Delta\ gdp_{t-i} + \sum_{i=0}^{q} \pi_i \Delta edu_{t-i} + \sum_{i=0}^{q} \omega_i\ \Delta fert_{t-i} + \delta_1 P\_rate_t + \delta_2 gdp_t + \delta_3 edu_t + \delta_4 fert_t + \mu_t$$
(3)

From Equation (3), the **Δ** is the first difference operator and *q* represents maximum number of lags of the ARDL model which is determined by the Schwarz Bayesian criterion (SBC).

The first part of equation (3) that has got β, θ, ω and ρ is used to capture the short run parameters while $\delta_1, \delta_2, \delta_3$ and δ_4 explain the long run relationship amongst the variables under study.

Presence of cointegration is examined through comparing the calculated F-Statistic and the upper critical bounds (UCB) and lower critical bounds (LCB) developed by Pesaran et al. (2001). If the Wald F-statistic is higher than the UCB, the null hypothesis is rejected and there is presence of a long run relationship among the variables. When the computed Wald F-statistic is lower than LCB, there is no presence of long run cointegration.

To establish existence of cointegration among the variables, the Schwartz–Bayesian criteria (SBC) is selected the optimum number of lags, and then the conditional ARDL long-run model is estimated as:

$$\Delta P\_rate_t = \alpha_0 + \sum_{i=1}^{o} \beta_i \, P\_rate_{t-i} + \sum_{i=0}^{p} \theta_i \, gdp_{t-i} + \sum_{i=0}^{q} \pi_i \, edu_{t-i} + \sum_{i=0}^{r} \omega_i \; fert_{t-i} + \mu_t \quad (4)$$

On the other hand, error correction model (ECM) estimates the short run dynamics of the model, and a lagged error correction term (ECT) and the general ECM are as follows:

$$\Delta P\_rate_t = \alpha_0 + \sum_{j=1}^{q} \lambda_{1i} \, \Delta P\_rate_{t-j} + \sum_{j=0}^{q} \lambda_{2i} \, \Delta \, gdp_{t-j} + \sum_{j=0}^{q} \lambda_{3i} \, \Delta edu_{t-j} + \sum_{j=0}^{q} \lambda_{4i} \, \Delta fert_{t-j} + \eta_1 ECT_{t-1} + \vartheta_t \quad (5)$$

To look into the dynamics of the equation (5), ϑ_t is the error (residual) term which is presumed to be identically independent and normally distributed. As well, the lag error term is expected to be negative and statistically significant, indicating a long run relationship. The coefficient of ECT also explains the speed of adjustment from the short run towards long run equilibrium.

To ensure the goodness of fit of the estimated ARDL model, the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of the recursive residuals ($CUSUM_{SQ}$) are used as stability tests, both being introduced by (Durbin, Brown & Evans, 1975). The results of the two tests, CUSUM and $CUSUM_{SQ}$ are shown to be expected to stay within the 5% level of significance, thus we conclude stability for the ARDL model estimated.

4 Empirical Results

The results of the bound test indicate that the calculated F statistics (4.250067) surpasses the upper bound critical value (4.08) and is significant at 2.5%, and the null hypothesis of no cointegration is rejected, which means there is a long-term equilibrium among the considered variables during the examined period. The initial maximal lag in the equation (3) has been set equal 4, which is the maximal order. The estimated long term coefficients are given in Table 2.

Table 2 ARDL (1,0,0,0) Model Long Run Results (Dependent variable is p_rate)

Independent variables	Coefficient
GDP	0.052850
Education	0.532786*
Fertility	-0.903236*
C	46.283725

Note: **, ** and *** indicates significance at 10, 5 and 1% level.*

As shown in Table 2, the comprehensive long-term influence of GDP, the education and fertility rate on female labour force participation rate seems to be statistically insignificant. While in the case, the coefficient of GDP and education are positive, and the coefficient of fertility rate is negative, and it suggests that in the long run, increase in female labor force participant is associated with increase in education level and GDP and decrease in Fertility rate.

Having quantified the error termε_t, we follow the estimation of the final model (5). The optimal lag was selected according to the Schwarz Criterion (SC). The estimated results are given in Table 3.

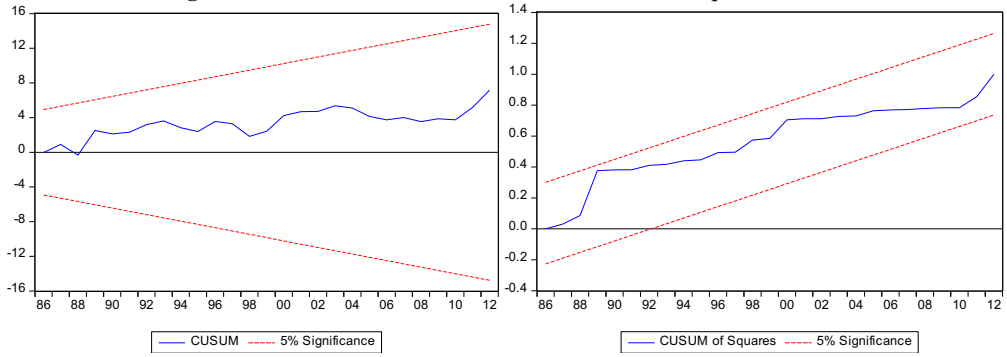
Table 3. ARDL Model ECM Results

Regressor	Coefficient	Std
△GDP	4.961868	8.701864
△EDU	6.580840	12.084465
△FERT	2.680507	4.170496
ε(-1)	-0.640480***	0.142998

*Note: R-squared=0.37; F-statistic=4.043***; DW= 2.103*

The stability of the long-run coefficients is used to form the error-correction term in conjunction with the short run dynamics. In view of this applied the CUSUM and CUSUMSQ tests, which are Brown et al. (1975) developed. A graphical presentation of these two tests is provided in Figure 1.

Figure 1. Cumulative Sum and Cumulative Sum of Square of Recursive Residuals (P_rate)



Since the plots of CUSUM and CUSUMSQ statistic for female labor force participant rate marginally cross the critical value lines, it can conclude that female labor force participant is stable. The error correction coefficient is negative and statistically significant, which confirms that the long-run relationship between the variables is significant. Its value (-0.64) indicates a slow adjustment process, with the little disequilibrium of the previous year's shock adjusting back to the long-run equilibrium in the current year. The estimation results from the model reveal that education and fertility rate have significant implications for female labor force participant rate in Malaysia.

5 Conclusion

This paper investigate the determinants of the women labor force participant rate in Malaysia over the period of 1980-2015. The long run estimate of the women labor force participant rate function has been derived using the highly efficient ARDL bounds approach. The results of the study indicate that the long-term influence of GDP, the education and fertility rate on women labor force participant rate seems to be statistically insignificant, and it suggests that in the long run, increase in female labor force participant is associated with increase in GDP and education level and decrease in fertility rate. This result is supported by the study of Abdullah et al. (2013), which suggested that relationship between determinants and female labor force participation is insignificant in Malaysia.

The findings from the empirical result of GCC countries with outside countries have some implications. Firstly, the coefficient of GDP is positive which suggests that 1 percent increase in GDP leads to 0.05 percent increase in the female labor force participant rate, and Malaysia needs to expand market size of economy and increase GDP in order to increase female labor force paticipation. Secondly, the coefficient of education is positive which suggests that 1 percent increase in education leads to 0.53 percent increase in the female labor force participant rate, and Malaysia government should increase education accessibility. Lastly, the coefficient of fertility rate is negative which suggests that 1 percent increase in fertility leads to 0.90 percent decrease in the female labor force participant rate, and Malaysia government should increase child-care centers to increase the female labor force participation.

From the history of Malaysia, there is a high immigration rate, and recently the demand for foreign maids by households in Malaysia has increased rapidly and expected to affect female labor force participation (Tan & Gibson, 2013). In addition, Malaysia is a multicultural and multiconfessional country, whose official religion is Islam. So further study can focus on influence of factors, such as the female immigration rate, value and culture on the female labor force participant rate.

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