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Socio-Economic and Environmental Factors Affecting Female Labor Force Participation in Saudi Arabia: ARDL Bounds Testing Approach

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Abstract

The paper aims to highlight the issues and obstacles of the women labor force by examining the economic, social and environmental factors affecting female labor force participation in KSA during the period 1990-2018. Auto-Regressive Distributed Lag ARDL bounds testing approach applied to estimate the relationship between female labor force participation (FLFP), education, per capita Gross Domestic Product (PGDP), the ratio of urban population to the total population (urbanization) and CO_2 Emissions. One of our important contributions is the introduction of the effect of CO_2 emission on women's labor force participation. All findings confirm the presence of co-integration between female labor force participation, education, GDP per capita, urbanization and CO_2 emissions. It is found that in the short-run, education had no impact on female labor force participation. It concludes that regardless of the obstacles and challenges faced by the female labor force in KSA; Vision 2030 paves a new path to empower women to contribute effectively to the economic growth of the country.

Keywords: Socio-economic, Environmental, Female labor force participation, Saudi Arabia.

Introduction

Saudi Arabia is an oil dominant economy. It ranks as one of the largest exporters of oil in the world. Nevertheless, with a steep fall in oil prices worldwide in the past few years, Saudi Arabia no more depends on its oil as the only main source of revenue. Therefore, to diversify the economy, the Kingdom launched its vison 2030 and implementation of various development projects. It emphasizes more on non-oil activities for its growth and development. These activities embark need for more labor force. The KSA economy and KSA labor market are presently undergoing a wide-range transmission that will enhance its economic growth. Saudi labor market 2018 report, shows a major imbalance between male and female labor-force participation rates, However, this gap is rapidly declining during recent years; female labor force of total labor force increases from 10.8 percent in 1990 to 16.8 percent in 2018 (world Bank, 2019). With the expansion of more education avenues, women are coming forward for higher education and fast filling up employment positions in both government and private sectors.

Based on recently estimates among the G20 countries, KSA recorded a significant growth of women joining the labor force over the past 20 years reflecting the efforts to promote more women empowerment. KSA's labor force contained 23 percent female in 2018 an increase of 9 percent from 1990 figures. According to the World Bank data from 1990 to 2018, the average value of the female labor force participation rate for Saudi Arabia during that period was 17.59 percent with a minimum of 14.21 percent in 1992 and a maximum of 23.37 percent in 2018. (World Development Indicators, 2019). However, the slow growth of female labor participation in KSA indicates that there are many challenges and that more effort has to implement to highlight and analyze the factors affecting women's participation in the KSA labor force.

Saudi Arabia is at the starting of an economic transmission that will unlock the full potential of its competitive advantages. With the Vision 2030 plan, the country has a clear path for creating a sustainable future for the Kingdom. The Ministry of Labor and Social Development policies aims to enable a significant rate of women to participate in the workforce and lower their unemployment rate. Vision 2030 dedicated to ensuring that women and youth have the skills and opportunities they need to participate effectively in the kingdom's economic transformation and give them more opportunities to increase their productivity. KSA Vision 2030 seeks to tap the potential of its women's labor force and give them employment opportunities at all levels. Vision 2030 paves the way for

employment opportunities, especially for women's education and employment in all sectors of the economy. The ministry of labor and social development also has the objective to empower women and recognize their potential to contribute to economic development, with the aim to increase the FLFP to 30% by 2020 compared with the 2018 FLFP of 23.37% (World Development Indicators, 2019).

Saudi women are very competitive and a great asset to the nation. More than 50% of Saudi women are graduates (World Development Indicators, 2019) and the government will continue to invest and provide them with more education and employment opportunities to develop their talents and contribute to the development of society and economy at large.

Female students have more opportunities to higher education base including business, law, architecture, medicine and other fields. This has led to a greater number of women working in the retail industry, hospital and other sectors. In addition, training and practicing certificates are given. The government also helps people with disabilities to become more independent with education and employment opportunities. This investment and encouragement boost female labor productivity. In addition, many measures have been taking to maintain work-life balance providing various benefits, such as maternity benefits, effective transportation.

The objective of the study is to identify the socio-economic and environmental factors in KSA and analyze its effect on FLFP. In addition, to identify how Saudi Vision 2030 will empower females to overcome challenges and issues in female labor force participation.

This paper proceeds further clearly to summarize the much comprehensive literature review. It highlights the various socio-economic and environmental factors that affect female labor participation in the Kingdom of Saudi Arabia and various other countries. Another section introduces and explains in detail the data and methodology used in our analysis. We try to offer discussion in relation to our data and methodology on a descriptive portrait of various factors affecting FLFP in KSA and our econometric results on FLFP in KSA. The final section concludes the paper and gives policy implications for development and future research.

Review of Literature

A study by Abd Almunem and Gaalool, (2018) on 19 Arab countries, concluded female's economic participation influenced by a range of economic, institutional, social and demographic determinants. Economic determinants were most capable of interpreting female's participation in the labor market 51% of the overall phenomenon; GDP per capita was the strongest explanatory factor affecting positively female's participation in the labor market. Demographic determinants were responsible for the interpretation of 28% of the total phenomenon. Social determinants also play a significant role in the interpretation of female's participation in the labor market of relative importance estimated at 21%, tertiary education was the strongest explanatory factor within this set of determinants as it positively affects female's participation in the labor market.[1]

The relationship between female's labor force participation, economic development and macroeconomic changes associated with structural adjustment highlighted in the studies of Cagatay and Ozler (1995), using cross-country data pooled for 1985 and 1990, their results proved that the long-term relationship between development and women's share of the labor force is U-shaped. [9] The "feminization U" hypothesis also confirmed by Luci (2009), Ambreen and Humera (2009) their findings suggest that an increase in education and dynamics of economic activity increase the women labor force participation in later stage of growth.[3]

Mahmud and Bidisha (2018) found a positive association between FLFP and economic growth in Bangladesh.[24] Mishra and Smyth (2010) assessed the relationship between globalization and the economic participation of women measured as FLFP and employment rate in 47 Sub-Saharan African countries for the period 1990-2013. The findings showed a positive effect of the overall globalization index on the economic participation of women.[26]

A study by Verick (2018) Using cross-section data on 172 developing countries, his results showed weak evidence of the U-shaped relationship between the log of per capita Gross Domestic Product and FLFP rate. And he concluded that FLFP is driven by multi socio-economic factors, including education, social norms, the nature and ability of job creation.[34] Li, et al (2019) showed that the increase of economic waste promotes the increase in carbon emission in this region. However, it has a restraining effect on the carbon emission in the surrounding areas. Moreover, gender factors have a significant positive effect on the region at the National level and the Eastern and Northeastern regions, but not significantly in other ones, and have a significant negative impact on carbon emissions in surrounding areas. Overall, the influence intensity of economy on carbon emission increases with the increase of gender in the National level and the Eastern and Northeastern, while the influence intensity of economy of peripheral regions on carbon emission in Central Region decreases with the increase of gender factors in peripheral regions.[22]

Tansel (2002) study investigated the long-run association between female labor force participation rates and economic development in Turkey. His results affirmed the U-shaped impact of economic development on FLFP. In addition according to this study unemployment and education significantly affect FLFP.[31] A study by Tsani, et al. (2013) investigated the relationship between

female labor force participation and economic growth in the South Mediterranean countries. Their results confirmed the U-shaped function of the relation between FLFP and economic development. An important outcome of this study is that lowering of region barriers to FLFP might have a positive impact on growth.[33]

King (1978) emphasized how the per capita GDP increased by increasing FLFP in countries like Egypt, Syria, Tunisia, and Libya with Arab pro-democracy movements.[18] Analysis of Reena Kumari (2018) was only based on past studies on FLFP. She explained the positive relation between FLFP and economic development and female education. Also, the study highlights a significant gender pay gap against women. In addition she mentioned a number of factors determine FLFP; demographic factors (including fertility, migration, marriages and child care) economic factors (including unemployment, per capita income, non-farm job and infrastructure) and other explanatory variables (which include the regulatory context encompassing family and childcare policies, tax regimes, presence of subsidized health- and care for workers).[19]

Lechman and Kaur (2015) provided a new view regarding the relationship between the female labor force and economic growth in 162 world countries over the period 1990-2012. Their results supported the hypothesis of the U-shaped relationship between female labor force participation and economic growth. One contribution of this study was that at low-income countries, the U-shaped feminization hypothesis was not positively verified.[20]

Education is one of the most significant factors affecting FLFP. According to Almujjahid (2009), women education in Saudi Arabia experienced significant progress. The Saudi government has applied considerable effort to increase girls' access to education and reduce the gender gap at different educational levels. Women's education has brought about several social developments in the country, such as a reduction in fertility and mortality rates, an improvement in health and nutrition, and an increase in female participation in the labor force.[2] Another study of women's education in Saudi Arabia by Hamdan (2010) explored some of the restrictions and achievements of KSA women in education. This study cited many types of research showed that economic issues might affect a social shift on female's education. For example, many men believe that educated women can support the income of the family. This view helped KSA women ensuring a high position in the labor market.[15]

Mujahid (2014) showed that at high levels of education the probability of women participation in the labor markets increases substantially. Also, the study outputs indicate that the age and experience of women have a significant impact on the decision to participate in the labor market.[27]. Arfah and Putra (2019) in their analysis of productivity and distribution of female workers in 2019 has emphasized education and its significant effect on the productivity of female workers. They concluded that policies must have been directing to the distribution and efficient utilization of the labor force through improving skills.[4]

Jaumotte (2003) studied the main determinants of female labor force participation in OECD countries, the Middle East, North Africa and focused especially on the Middle Eastern women living in Europe. The study showed that higher education (post-secondary/university/post-university) has a positive and significant impact on FLFP, whereas secondary and below do not. In addition, there is a strong negative and statistically significant association between traditional social norms and the participation of women in the labor force.[17]

According to Asmari (2008), most working women are found working in the public sector, mainly for two organizations, the General Presidency for Girls' Education (Ministry of Education) and the Ministry of Labor and Social Affairs (Ministry of Labor). The total segregation between the sexes makes it virtually impossible for women to find suitable jobs in the wider community. Women's participation in private sector organizations is almost non-existent.[5] As stated about women empowerment by Billiava and Nayak (2016), the goal of women's empowerment will not be accomplished by reservations alone. To expedite and speed up this process it is essential to implement some supplementary policies which encourage the self-confidence of women, build women's capabilities and remove operational obstacles.[6]

Lisaniler and Bhatti (2005) findings showed, that education is an important factor affecting women labor supply in North Cyprus, in addition, they concluded that other factors such as; age, marital status, and residence significantly affect women's decision to participate in the labor force.[21]

A study by Blau and Kahn (2000) concluded that, over the latest 25 years of 19 century in the USA the gender salary gap has narrowed, and that women have increasingly entered traditionally male occupations. These two labor market outcomes closely linked, since research suggests that predominantly female occupations accompanied with less salary, even controlling for personal characteristics of workers.[7] this finding indicates the existence of different factors such as beliefs in addition to gender differences in salaries affect FLFP.

Cortes, et al (2018) implied that a greater increase in the demand for female (versus male) skills in good jobs related to other occupations could account for the empirical patterns. They found a link between the change in an occupation's female share and the change in the importance of social skills in the occupation in USA.[12]

Yakita (2018) model analyzed the effect of childcare on FLFP. The female wage rate is low when mothers prefer to spend their time rearing children at home. Because the marginal utility of time spent in childbearing is higher than that spent in supplying market

labor.[36] This means that at high levels of economic development and hence the female wage rate, and with the lower price of external child-care, female labor supply will increase.

Fertility and female labor force participation as explained by Bloom, et al (2009) implied that the effect of fertility on female labor supply is strongest during the fertile years (20–39 years of age). On an average, their results indicated that with each additional child, female labor force participation decreases by about 10–15 percentage in the age group 25–39, and about 5–10 percentage in the age group 40–49.[8]

Chevalier and Viitanen (2010) addressed the problems of childcare scarcity, declining fertility rates and work-family conflict faced by the growing female labor force in Japan.[10] Their results showed that having more children at home does not discourage female labor force participation. Connelley and Kimmel (2010) found that in the USA an increased probability of full-time employment is associated with an increase in the use of center care for both married and single mothers, and that price elasticities of modal choice are larger for single than married mothers.[11]

Dutta and Mallick (2018) Found that the fertility rate has a negative and significant effect on women entrepreneurship. However, greater tertiary enrollment of females and higher ratios of female to male labor force participation rates can setoff this negative impact and can make it positive.[13]

A study by Hartani et al (2015) assessed the relationship between FLFP and fertility rate of 6 ASEAN countries, their results confirmed that the female labor force participation and total female fertility rate are cointegrated. In addition, the results detected causality to run from female fertility to FLFP.[16]

According to Njangche and Sundjo (2018) in Cameroon found that a woman with a non-working husband, high age and presence of a woman in the household affect positively the decision of women to participate in the labor market. In contrast, the presence of young children and being Muslim affect negatively the decision of women to participate in the labor market.[28]

Shekhar, et al (2019) Government of India (2016), "National policy for women 2016: articulating a vision for empowering women" a research paper by on prevalence of socio-demographic determinants and self-reported reasons for hysterectomy in India focuses on health issues in women affecting labor productivity.[29]

Zhang et al (2018) investigated the effect of pollution on China's labor supply; their results showed that environmental pollution has a negative and nonlinear impact on labor supply and that the effect of pollution on labor supply influenced by economic development levels.[37] Tatli and Barak (2019) study tested the relationships between energy consumption and female unemployment in 29 OECD countries. The findings reveal that energy consumption significantly and inversely affects female unemployment. In addition, the finding showed a causality between energy consumption and the female unemployment rate in the two directions .[32]

Studies by Ghazal Bayanpourtehrani and Kevin Sylwester (2012) examined whether female labor force participation (FLFP) in a cross-section of countries between 1985 and 2005 varies depending upon the religion practiced in these countries. It was found that initially religion had an effect on FLFP but it diminishes, as other controls are included. They found that the association between FLFP and religion is weakening over time.[14]

Data and Methodology

The research model for this study conducted in a time series framework spanning from 1990 to 2018. Data on the variables obtained from the World Development Indicators of the World Bank. The variables used in this research are Female Labor force participation rate, School enrollment, (tertiary), Education (Female), (GDP)Gross domestic product (per capita) measure at constant 2010 US$, Age dependency ratio (percentage of working-age population), urbanization measure as the ratio of urban population to total population and CO_2, denotes per capita carbon emissions (metric tons per capita). The data is analyzed by using Evies version 10.

Auto-Regressive distributed lag (ARDL) co-integration Approach, or the Bound co-integration Approach (Pesaran and Shin 1999 & Pesaran et al. 2001), is preferred and expected to give realistic and efficient estimates. Since we are dealing with variables that are integrated into a different order, I (0), I (1) or a combination of both. This testing approach yields effective results in the studies with small sample sizes.

An ARDL is a least-squares regression containing lags of the dependent and independent variables. The general form ARDL model (p, q1 …qk) can be written as:

$$Y_t = \beta_0 + \sum_{i=1}^{p} \gamma_i Y_{t-1} + \sum_{i=1}^{k} \sum_{i=0}^{q_i} \beta_{ij} X_{t-i_{1i}} + \varepsilon_t \qquad (1)$$

Where p is the number of lags of the dependent variable; FLP is the female labor force participation rate and qj is the number of lags of the independent variables. The independent variables (Xi) used in this model are: Edu, denotes Female School enrollment, (tertiary). PGDP denotes gross domestic product per capita (constant 2010 US$). DEP denotes the Age dependency ratio (percentage of working-age population). Urbanization denotes the ratio of urban population to the total population. CO_2 denotes per capita

carbon emissions (metric tons per capita) financial development (domestic credit to private sector percentage of the GDP). All the variables are in logarithmic form.

The long-run ARDL equation was specified as follows:

$$\text{Lnflp}_t = \beta_0 + \sum_{i=0}^{p} \beta_{1i}\text{Lnflp}_{t-1-i} + \sum_{i=0}^{q1} \beta_{1i}\text{Lnedu}_{t-i} \sum_{i=0}^{q2} \beta_{2i}\text{Lnpgdp}_{t-i} \sum_{i=0}^{q3} \beta_{3i}\text{Lndep}_{t-i} \sum_{i=0}^{q4} \beta_{4i}\text{Lnurb}_{t-i} \sum_{i=0}^{q5} \beta_{5i}\text{Lnco2}_{t-i} + \varepsilon_t \quad (2)$$

To select the lag values in equation (2), model selection criteria, such as AIC, SIC, Hannan-Quinn information criteria, and Adjusted R-squared were used.

The short-run dynamics of the variables was described by employing the Error Correction Model (ECM). Which specified as follows:

$$\Delta\text{Lnflp}_t = \alpha_0 + + \sum_{i=0}^{p} \lambda_i \Delta\text{Lnflp}_{t-1-i} + \sum_{i=0}^{q1} \emptyset_i \Delta\text{Lnedu}_{t-i} \sum_{i=0}^{q2} \theta_i \Delta\text{Lnpgdp}_{t-i} \sum_{i=0}^{q3} \delta_i \Delta\text{Lndep}_{t-i} \sum_{i=0}^{q4} \varphi_i \Delta\text{Lnurb}_{t-i} \sum_{i=0}^{q5} \gamma_i \Delta\text{Lnco2}_{t-i} + \lambda\text{ECM}_{t-1} + \varepsilon_t \quad (3)$$

Results and Discussion

Stationary Tests:

The values of the variables transformed into logarithmic values and tested for the stationary of series using the Unit root test. The test results of the Augmented Dickey-Fuller (ADF) and Philips Perron (PP) tests presented in table (1) and table (2) below:

Table (1): Unit root tests at the level of the variables:

Variables	ADF Test statistics	Philips Perron test statistic	Order of Integration
Lnflp	-2.713096	-1.318403	
Lnedu	-1.960637	-2.175590	
Lnpgdp	-2.004242	-2.106631	
Lnurb	-8.349368***	-17.53004***	0
Lndep	-0.987385	-1.075040	
Lnco2	-4.824295**	-2.641929	0

Note: * are significance at 0.01 level, ** are significance at 0.05.**

Table (1) show that there was no stationary in the level except for urbanization and co2 emission they were stationary at the level data I (0). The absolute value of the test statistics was greater than the absolute value of 5 percent critical value.

Table (2): Unit root tests at the first differences of the variables:

Variables	ADF Test statistics	Philips Perron test statistic	Order of Integration
Lnflp	-4.903163***	-2.956578	1
Lnedu	-5.975973***	-5.975973***	1
Lnpgdp	-5.808998***	-6.428996***	1
Lnurb	-4.189075**	-14.74571***	1
Lndep	-3.880135**	-3.880135**	1
Lnco2	-5.012926***	-6.463418	1

Note: * are significance at 0.01 level, ** are significance at 0.05 level.**

Table (2) show that the first differences of the variable series were stationary I (1), implying that they were all integrated of degree 1.

Since the variables series integrated of different levels, the Auto Regressive Distributed Lagged (ARDL) bound test approach supposed to be an appropriate method for analyzing the long-run relationship between the series.

Cointegration tests:

Cointegration among the variables tested by employing the bound test approach.

Table(3): ARDL Bount test for cointegration

K	F	Critical value at 1%		Critical value at 5%		Critical value at 10%	
		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
5	5.644746***	3.06	4.15	2.39	3.38	2.08	3.00

Note: * is significance at 0.01 level**

The results in a table (3) show that the computed f-statistic (5.644746) was greater than the upper bound critical value at 1% level of significance; hence, the null hypothesis was rejected, confirming the existence of co-integration among the variables series in the model. The existence of co-integration supports the short-run and the long-run relationship of the factors that affected female labor participation.

The next step is to select the lag length values (p, q1, q2, q3, q4, q5), model selection criteria, such as Akaike info. Criterion ACI, Hannan-Quinn HQ, and Adjusted R-squared used. ARDL (2, 0, 2, 1, 1, 2) model was revealed as the best model for the series.

The estimates of the long-run relation and short-run dynamics presented in table (4) and table (5) below.

Table (4): Long-run estimation

Variable	Coefficient	Std. Error	t-statistic	Prob.
LnEDU	0.114568	0.059101	1.938502	0.0746
LnPGDP	0.476777	0.175453	2.717405	0.0176
LnDEP	0.431090	0.268699	1.604358	0.1326
LnURP	3.841620	1.540601	2.493584	0.0269
Ln CO2	-0.120478	0.037426	-3.219071	0.0067
C	-20.66124	6.301924	-3.278561	0.0060

Table (4) shows the results of long-run parameters. The finding indicates that most of the long-run coefficients are significant (at or under 5%), in explaining the dependent variable, education was significant at 10%. However only Age dependency was revealed as insignificant.

Following the estimation of long-run coefficients, the error correction model (ECM) based on the ARDL model was formed to estimate the short-run coefficients.

Table (5): Short-run estimation

Variable	Coefficient	Std. Error	t-statistic	Prob.
DLnpgdp	0.237929	0.079912	2.977408	0.0107
DLnpgdp(-1)	-0.394895	0.082603	-4.780267	0.0004
DLnDEP	-1.140339	0.311072	-3.665838	0.0028
DLnurb	20.55698	2.554927	8.046015	0.0000
DLn CO2	-0.014627	0.029370	-0.498007	0.6268
DLn CO2(-1)	0.057619	0.028085	2.051607	0.0609
CointEq(-1)	-0.922566	0.121401	-7.599348	0.0000

Table (5) shows the results of the short-run. The finding shows that in cases of disequilibrium in the short-run the Error Correction Mechanism ECM can be significantly adjusted to restore the long-run relationship within the first year. ECM(-1) coefficient value of 0.92 indicated that 92% of adjustment from disequilibrium into long-run equilibrium will be made within the first year.

Discussion

According to the results in a table (4) and (5); the partial elasticity of female labor participation to change in education was positive and significant at the 10% probability level. The (0.114568) coefficient for the education variable showed that a 1% increase in tertiary female enrolment increased female labor participation by 0.115%. In the short- run education had no impact on female labor force participation. However, the finding of Tansel (2002) studies on labor force participation in Turkey[32] were consistent with these

results. Furthermore, some (Hamdan (2010), Women and Education in Saudi Arabia: Challenges and Achievements[3)] found that education has little impact in a short period and a significant impact in the long run.

The per capita GDP had significantly affected the female labor participation in Saudi Arabia, both in the long and short-run. Its partial elasticity was 0.476777 in the long-run, indicated that a 1% increase in per capita GDP will increase female labor participation by 0.48 %, and it was 0.237929 in the short-run; indicated that 1% increase in per capita GDP will increase female labor participation by 0.24%. But the lag of this variable significantly and negatively affects female labor participation. These results are consistent with studies of Tsani, et al (2013) on FLFP and economic growth in south Mediterranean countries[33]

The partial elasticity of female labor participation to change in age dependency was significant at 5% probability level in the short run only. The (-1.140339) coefficient for the age dependency variable showed that a 1% increase in age dependency decreased the female labor participation by 1.14%. This finding was consistent with studies of Yakita (2018) Female labor supply**,** fertility rebounds, and economic development[1]

Urbanization was another significant variable affect female labor participation in the long run and short-run. Its partial elasticity, in the long run, indicated that 1% increase in urban population will increase female labor participation by 3.84 %. In addition, the short-run coefficient indicated that 1% increase in urban population would increase female labor participation by 20.56%. This result was consistent with Verick (2014), "Female labor force participation in developing countries", International Labor Organisation[35]

The CO_2 emission has a significant effect on female labor participation in Saudi Arabia in the long run. Its partial elasticity was -0.120478, indicated that 1% increase in CO_2 emission will decrease female labor participation by 0.12 %. In the short-run, only its lag affects female labor participation negatively at 10% probability level. These results consistent with studies of Jaumotte (2003), "Female labor force participation: past trends and main determinants in OECD countries"[19]

Different diagnostic tests employed such as the Serial Correlation test and the Heteroscedasticity test.

Table (6): Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.761367	Prob. F(1,12)	0.0763
Obs*R-squared	6.443407	Prob. Chi-Square(1)	0.0.111

The results presented in table (6), show that there was no problem with serial autocorrelation, based on the F statistic test.

Table (7): Heteroskedasticity Test Breusch-Pagan-Godfrey:

F-statistic	0.983821	Prob. F(13,13)	0.5115
Obs*R-squared	13.38990	Prob. Chi-Square(13)	0.4182
Scaled explained SS	2.374222	Prob. Chi-Square(13)	0.9994

The results in a table (7) showed the absence of heteroscedasticity problem.

Finally, the stability of the parameters tested using CUSUM and CUSUM sq. tests figure (1) and (2) shows the results.

Figure (1): Cumulative Sum

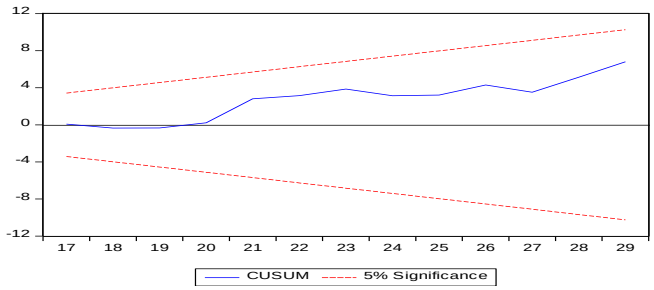
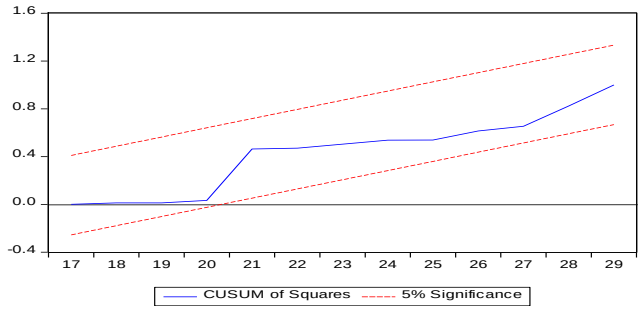


Figure (2): Cumulative Sum of square



The stability tests results of the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUM sq.) presented in figure (1) and figure (2) above shows that the model correctly specified and stable.

Figure (3): Recursive Coefficients

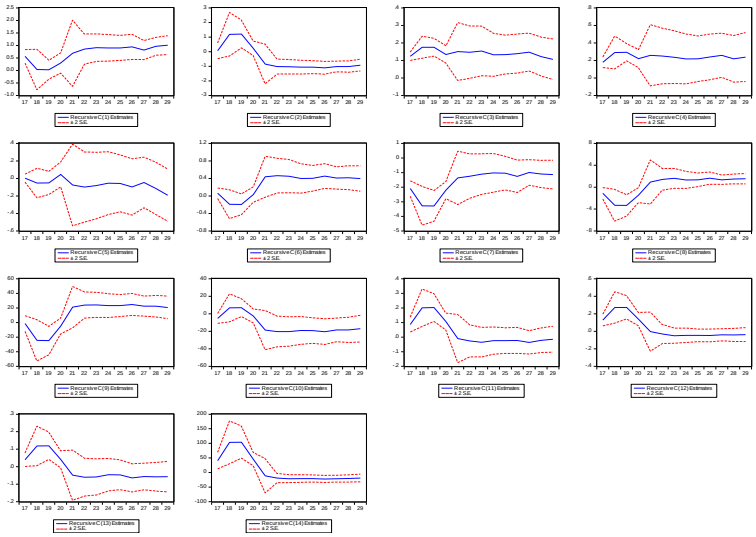


Figure (3) showed that both tests CUSUM and CUSUMsg confirmed the stability of the parameters, which means that no problem of possible structural breaks appears.

This indicates that the model was good enough for the study of co-integration among the variables

Conclusion and Policy Implications

This paper examined the macroeconomic factors affecting female labor participation in Saudi Arabia during the period (1990-2018), using Auto-Regressive Distributed Lag ARDL bounds testing approach. The findings confirmed the presence of co-integration between female labor force participation, education, GDP per capita, urbanization and co2 emissions. In the short-run, education had no impact on female labor force participation.

Women's participation has been a critical dimension of the development process since the education revolution in Saudi Arabia and its launch of vision 2030. Increasing numbers of women in the labor market have generated a significant impact on future generations to come and play an important role in driving the demographic dividend and pushing overall economic growth.

Various factors drive female labor force participation, including the nature of economic growth and job creation, education, and social norms. Policymakers and further researchers can take advantage of the CO_2 emission effect on female labor being identified for the first time and how it affects overall women's labor participation and sustainability.

It is important to bring equality in the gender pay gap. There is a need for replacing the traditional value system based on an inequality of sexes to a more egalitarian system. For developing countries like Saudi Arabia, flexible working-time arrangements to be made. This means policies that remove distortions against part-time work will boost female participation.

Limitations and Gaps

The literature has recognized that no significant research conducted so far on factors affecting female labor productivity in KSA. In addition, women's participation in the labor force poorly measured and underestimated. However, data collection has improved, but this remains a major obstacle to the analysis of official statistics.

Another limitation arises from the results and survey statistics. Since the survey enumerators are not widespread in the country and poorly trained, labor force surveys underestimate the participation of women, especially at the lower or unskilled category of jobs. Enumerators can inadequately probe for the economic activities of female members, but the problem is that men are typically the survey respondents especially in countries where female labor force participation is low.

Time-use surveys proposed as a means of gathering more accurate and insightful data on the factors affecting women's work participation in all sectors, especially in subsistence production and informal employment. The challenge, however, is that time-use surveys are costly and difficult to implement regularly.

However, this research paper can be useful for further finding used as a basis for measuring other factors affecting FLFP

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