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Determinants of female labor force participation in emerging countries

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ABSTRACT

This study investigates the factors that influence female labor force participation (FLFPR) in the Gulf Cooperation Council (GCC) region, focusing on a panel of four GCC countries from 2003 to 2022. It uses several empirical methods, such as fixed effects (FE), generalized least squares with random effects (GLS-RE), maximum likelihood estimation with random effects (ML-RE), and the generalized method of moments (GMM), to produce reliable results. The analysis includes variables such as gross domestic product (GDP), inflation rate (INF), fertility rate (FER), educational attainment (EDU), unemployment rate (UNEMP), urban population (URB), the effects of COVID-19, and indicators of economic recession. The results show that GDP, education, and urbanization have a positive and significant effect on FLFPR, meaning that economic development, better education, and urban living conditions help increase women's participation in the workforce. On the other hand, the fertility rate is found to have a negative and significant effect on FLFPR, suggesting that having more children can reduce women's job opportunities. These findings point to the need for policies that support economic growth, expand access to education, and promote family planning in order to improve women's participation in the labor market and advance gender equality in the GCC region.

1. Introduction

Over the last few decades, there have been significant social, political, and economic developments across the world. Such changes have made the world's population more conscious of the issues of the modern period. Lifestyle and inflation have made 'economic' status a dominant aspect of our lives where nations are in a race for economic expansion and employ all their resources. The labor force is the resource that has the greatest direct impact on economic progress.

A comprehensive review of the worldwide labor market situation in the Persian Gulf region, which includes Bahrain, Kuwait, Oman, the United Arab Emirates (UAE), Saudi Arabia, and Qatar, reveals extremely rapid growth of the immigrant population (Kamrava, 2020), where noncitizens constitute a significant portion of the labor force. According to Kamrava and Babar (2012), the Persian Gulf states spend significant amounts on managing migrant laborers because they have a significant impact on the economy and hydrocarbon investments, with a gross domestic product (GDP) of USD 3.655 trillion and a GDP per capita of more than USD 71.205 (Charfeddine and Barkat, 2020). Nonetheless, labor market demand heavily influences labor absorption (Kamrava, 2020; Stamarski and Son Hing, 2015).

Moreover, there has been a compositional change in the labor force in the form of expanding female labor force participation (FLFP). This trend is relatively attributed to the rise of the female-to-male ratio around the world. Women are claimed to promote economic growth. As a result, the gap between men's and women's activities in terms of employment nature has narrowed. Women are becoming more aware of their economic independence because of the current developments. Accordingly, there has been a noticeable increase in the magnitude of FLFP.

However, in the Persian Gulf region, FLFP is low and has flat trends when compared to male labor force participation (Assaad et al., 2020). Despite tremendous progress in recent decades to minimize gender gaps in areas such as education, health, and mortality, the number of women in the Persian Gulf states' labor markets remains almost half that of the global average (Ganguli et al., 2014). According to Mansour et al. (2022), the Persian Gulf states' labor

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markets can be broadly classified into three groups in terms of FLFP. Kuwait is the only country in the first category with an FLFP rate of around 50%. The second category includes countries with low FLFP rates (about 30-35%), such as Qatar and Bahrain. The third category consists of three nations with low FLFP rates: Oman, Saudi Arabia, and the United Arab Emirates.

Accordingly, the study aims to investigate challenges and issues of the female labor force and analyze the factors that affect the female labor participation rate (FLFPR) in four emerging countries, specifically in Kuwait, Qatar, Saudi Arabia, and the United Arab Emirates.

This study seeks to address the following research questions:

- What are the main factors influencing female labor force participation in emerging countries such as Kuwait, Qatar, Saudi Arabia, and the United Arab Emirates?
- How do selected independent variables—namely inflation rate, fertility rate, urban population, wages and salaried workers, educational attainment, and female unemployment—affect female labor force participation in these countries?

This research examines the challenges and factors influencing FLFP in four Gulf states—Kuwait, Qatar, Saudi Arabia, and the UAE. It aims to address the following research questions:

1. What are the key determinants influencing FLFP in these emerging economies?
2. How do independent variables—such as the inflation rate, fertility rate, urban population, wages and salaried workers, educational attainment, and female unemployment—affect FLFP?

By analyzing these dimensions, this study seeks to provide actionable insights for improving female labor market participation in the Gulf region.

The inflation rate is included to analyze its impact on the overall economic environment and how it affects women's employment prospects. Rising inflation can lead to higher living costs, potentially motivating more women to enter the workforce to support their households. The number of wages and salaried workers provides insight into the overall employment landscape and the availability of stable, formal job opportunities for women.

Educational attainment is another critical variable, as it is often associated with improved job prospects and greater participation in the labor market. Higher levels of education typically enhance a woman's employability and may lead to higher-paying job opportunities, thus encouraging FLFP.

Additionally, the study incorporates COVID-19 and the 2008 recession as dummy variables. These events have significant implications for labor markets worldwide, and including them allows for examining how these external shocks influence female labor force participation. By analyzing these variables, the researchers aim to comprehensively understand the multifaceted factors that affect FLFP in emerging economies.

Ultimately, the insights derived from this analysis are essential for developing targeted policies and interventions that promote gender equality in the labor market. Understanding the linkages between these variables will enable policymakers to identify barriers that hinder women's participation and implement strategies that create more inclusive and supportive environments for female workers.

The rest of the paper is structured as follows: Section 2 reviews the literature on FLFP, identifying key determinants and research gaps. Section 3 outlines the data and methodology, detailing the variables, econometric model, and analysis techniques. Section 4 presents empirical findings, discussing the impact of various factors on FLFP and their policy implications. Finally, Section 5 concludes with a summary of findings, recommendations for policy interventions, and directions for future research.

2. Literature review

Women possess equal potential to men in participating and contributing to social, economic, and political spheres, particularly in Western developed nations. Despite progress, disparities persist, such as the underrepresentation of women in public office (less than 20% globally) and gender wage gaps, with women earning 16% less than men in OECD countries. These challenges are further exacerbated in developing countries, where societal constraints limit women's decision-making power within households, restrict their social mobility, and curtail their political rights. Economically, women face additional barriers compared to men, including fewer career opportunities, lower earnings, reduced benefits, and diminished economic independence.

In examining the Middle East and North Africa (MENA) region, Solati (2017) identified the patriarchal societal structure as a significant factor contributing to the region's low FLFP. Patriarchy, defined as a male-dominated system relegating women to secondary societal roles, perpetuates gender inequality. Eisenstein (1981) further highlighted patriarchy as a "sexual system of power" where men maintain superior economic privilege. This patriarchal framework often casts women primarily as housewives and caregivers rather than as economic contributors, a notion particularly prevalent in traditional Middle Eastern societies (Mirzaie, 2015). However, the intensity of these gender norms varies over time and across contexts, with differences observed between urban and rural settings and traditional versus non-traditional families. Elbushra et al. (2025) argued that gender inequality suppresses productivity and economic resilience by neglecting half the available human capital, and that empowering women stimulates long-term economic growth.

A growing body of research adopts diverse structural, institutional, and cultural frameworks to explore the predictors shaping FLFP across individual, societal, and institutional dimensions (Mansour et al., 2022). Key micro and macro-level determinants influencing women's employment include economic and labor market factors such as unemployment rates, urbanization, and economic growth, as well as socioeconomic indicators like age, educational attainment, occupational status, and household income (Amin and Al-Bassusi, 2004; McRae, 2003). Additionally, social expectations and gender roles continue to significantly affect FLFP, particularly in contexts where cultural norms and societal structures are more restrictive.

Economic transitions also play a critical role in shaping FLFP. During the shift from agrarian to industrial economies, the agricultural sector's decline often results in a temporary reduction in FLFP, as new industrial employment opportunities are primarily occupied by men. However, as economies advance, factors such as expanded female education, reduced fertility rates, increased household decision-making power for women, and the growth of service and manufacturing industries contribute to a resurgence in FLFP.

This dynamic is encapsulated in the U-shape hypothesis, which posits that FLFP follows a U-shaped trajectory relative to GDP per capita during economic growth and transformation. Empirical validations of the U-shape hypothesis are extensive, with studies identifying four primary drivers behind this pattern.

First, economic transitions from agriculture to industry and services create new employment opportunities better suited to educated women. Second, increased access to secondary education for women acts as a critical threshold, enabling their entry into modern professional fields. Third, demographic shifts, particularly declining fertility rates, result in delayed marriages, shorter reproductive periods, and prolonged workforce participation for women. Finally, cultural and societal norms, including religious attitudes, traditional views of women's roles, and evolving gender expectations, significantly influence FLFP (Verme et al., 2016).

These insights indicate the linkages of structural, economic, and cultural factors in shaping FLFP and highlight the need for targeted interventions that address these multifaceted influences to promote gender equity in labor markets.

Kingdon and Unni (2001) explored the relationship between education and FLFP, uncovering a U-shaped correlation. Their findings suggest that during the initial stages of economic growth, the number of female workers decreases but gradually rises after a certain threshold of educational attainment is reached. Over the past three decades, FLFP has shown significant growth across all age groups, although variations persist by age. Labor-leisure theory provides a framework to understand FLFP by examining women's trade-offs between participating in the labor market and allocating time to household duties. This theory posits that labor force participation depends on projected market wages and the perceived value of household activities.

Meanwhile, neoclassical theory views labor supply as a function of real wages, framing participation as a choice between work and leisure, with labor demand determined by wage levels under the assumption of free market competition.

In contrast, labor-seeking theory highlights the incomplete information available to employers and workers in the labor market. This theory accounts for the costs associated with acquiring information and the potential loss of leisure time, acknowledging the coexistence of unemployment and job vacancies that remain unfilled due to mismatches in the labor market.

These perspectives offer a comprehensive understanding of the multifaceted factors shaping FLFP and emphasize the complexity of labor market dynamics.

Women's participation in the labor market is both a driving force and a critical indicator of economic progress in the Gulf Cooperation Council (GCC) countries. Despite significant economic development, these nations exhibit low FLFP, creating a pressing need for research that examines the social, economic, and political dynamics specific to the region.

The existing evidence on FLFP in the GCC context is limited, leaving critical gaps in understanding the factors influencing women's economic roles in these rapidly transforming societies. This study seeks to address these gaps by analyzing key structural and socioeconomic variables that impact FLFP in the GCC.

Indicators such as educational attainment, fertility rates, wages and salaries, female unemployment, urbanization levels, industrialization, and inflation rates are evaluated to understand their roles in shaping women's participation in the labor force. By leveraging robust data and incorporating tested methodologies, the research explores the constraints of traditional labor market theories and compares them with the unique structural and cultural pressures prevalent in the GCC.

This approach offers insights into how industrial reforms, rural-to-urban migration, and shifting societal norms interact to influence FLFP, providing valuable guidance for policymakers to design effective interventions that empower women in the workforce.

Several studies have examined the factors influencing FLFP in the GCC region and the broader MENA context.

Solati (2015) analyzed the impact of patriarchy and oil income on FLFP using dynamic panel data regression across 54 developing countries over 35 years (1975–2010). The study revealed that patriarchy remains a significant barrier to FLFP in MENA countries, contributing to lower participation

levels in public life, education, and demographics compared to non-MENA nations. Interestingly, while oil income positively impacts FLFP in non-MENA countries, it does not exhibit a similar effect in MENA, highlighting regional socio-economic disparities.

Lari et al. (2022) conducted a micro-level analysis of FLFP determinants in Qatar, a country grappling with persistent gender gaps. Using data from a national telephone survey of Qatari nationals, the study identified key factors influencing FLFP, such as education level, marital status, age, number of children under 18, and household income. These variables were found to exert significant direct and indirect effects on women's labor market participation, underscoring the importance of targeted interventions in addressing gender inequality in Qatar.

Mirzaie (2015) extended the analysis to a comparative framework involving Iran, Egypt, and Turkey, using data from 1991–2013 to explore the socioeconomic drivers of female unemployment. Regression analyses revealed contrasting outcomes: higher per capita income growth reduced FLFP in Iran and Turkey but had a positive effect in Egypt. Additionally, the age dependency ratio negatively affected FLFP in Iran but positively influenced it in Turkey. Increased government spending on development projects in Iran was associated with higher female unemployment, indicating structural barriers unique to specific national contexts.

These studies highlight the complex linkages of structural, institutional, and cultural factors that shape FLFP in the GCC and MENA regions. While patriarchy and socio-economic constraints remain dominant barriers, education, marital status, and government policies emerge as pivotal determinants. Understanding these dynamics is crucial for designing policies that promote gender equality and enhance women's economic participation in the region (Table 1).

Moreover, Mansour et al. (2022) asserted that local factors significantly influence women's employment, particularly in relation to modernization aspects. They utilized advanced Geographic Information System (GIS) techniques to analyze FLFP in Oman. The research identified key predictors of FLFP rates, including female education, urbanization, private sector job availability, divorce rates, and female administrative positions.

By employing both global Ordinary Least Squares (OLS) and local Geographically Weighted Regression models, the study aimed to understand and forecast the spatial distribution of FLFP rates across different Omani Wilayats. The results indicated that both education and urbanization positively impact predictions of women's labor force participation. Integrating local spatial modeling with GIS technology sheds light on strategies to enhance women's employment in Oman, highlighting geographical variations in FLFP rates and their underlying dynamics. Verme et al. (2016) explored the low female labor participation rates in the Arab World, especially when compared to the economic development levels of various Arab countries. They utilized two distinct datasets: a quarterly dataset comprising regional statistics sourced from macroeconomic data and labor force surveys (LFS) spanning 1999 to 2012, analyzed through a regional panel medium-term model, and a second individual panel dataset based on LFS data from 2007 to 2011, assessed using a short-term model.

Their findings revealed that factors such as marriage, household inactivity rates, secondary education levels, and GDP per capita negatively impact female labor participation. Notably, the study found that urban-educated women with secondary education levels significantly predict the region's low female labor participation rate.

Al-Hamli (2013) examined the effect of women's workforce participation on economic growth in Kuwait, analyzing the relationship with the country's GDP growth rate. The researcher distributed 360 questionnaires among a selected sample of academics, policymakers, and business professionals, with each group receiving 120 questionnaires. The findings indicated that independent variables such as education level, income inequality, foreign direct investment, population growth rate, exports, human capital, political empowerment, and technology significantly influence Kuwait's female labor force participation rate, which affects economic growth.

In addition, Urama et al. (2022) conducted a study to investigate the impact of women's labor force participation on economic growth in sub-Saharan African (SSA) countries. Utilizing the system Generalized Method of Moments (GMM), the analysis focused on 35 SSA countries over a 27-year period from 1990 to 2017, selected based on data availability. All data were sourced from the 2018 World Development Indicators (WDI). The results indicated a positive correlation between gross fixed capital formation, the female labor force participation rate, and economic growth in the region, while also highlighting a negative relationship between economic growth and fertility rates.

In another study, Chapman (2015) explored the link between economic development and female labor force participation in the MENA region. This research utilized a panel dataset of 20 countries from 1990 to 2012 and developed an econometric model to test the U-shape hypothesis, drawing on existing literature that examines this relationship in both time series studies for developing countries and cross-country analyses. The findings revealed a U-shaped relationship between economic growth and female labor force participation rates, suggesting that the decline in participation rates at the lower end of the curve contributes to the low levels observed in the MENA region.

Lastly, the research by Naseem and Dhruva (2017) aimed to identify the challenges faced by the female labor force in Saudi Arabia. The study employed a regression model to analyze data

spanning 10 years, from 2005 to 2015. The dependent variable was the FLFPR, while the independent variables included the unemployment rate, urban population, fertility rate, and higher education levels. The results indicated that the unemployment rate, fertility rate, and urban population had statistically significant effects on the FLFPR, whereas higher education did not have a significant impact. Despite the challenges faced by Saudi women in the labor market, the study concluded that Vision 2030 presents a promising opportunity to empower women and enhance their contributions to the Kingdom's economic development.

Moreover, the study by Naheed et al. (2024) investigated the key factors influencing women's labor force participation and its broader impact on households in Pakistan. Drawing on time series data from 1981 to 2020, the research highlights the dual influence of positive and negative determinants. Utilizing the ARDL model, the findings reveal that the female population, female worker ratio, female-headed households, and female literacy rate significantly and positively contribute to women's participation in the labor force. On the other hand, fertility rates and child mortality rates exert significant negative impacts, underscoring the multifaceted nature of women's economic engagement.

In addition, Mukoki et al. (2024) investigated the impact of COVID-19 lockdowns on FLFP in Uganda using data from the Uganda High-Frequency Phone Survey. Their findings revealed a 17% reduction in FLFP during the initial lockdown, with more pronounced effects for women with children and when both partners stayed home. The study found that lockdown measures had a greater impact on FLFP than self-reported COVID-19 threats. Notably, employed women were more likely to remain active in the labor market, demonstrating resilience amidst the pandemic's challenges.

Similarly, AlGhamdi and Shaheen (2024) investigated factors influencing female labor force participation in Saudi Arabia from 2000 to 2022 using a least squares regression model. The study examined variables such as GDP growth, employment-to-population ratio, inflation, urban population growth, tertiary enrollment, fertility rate, and age dependency ratio. Results revealed that higher employment-to-population ratios, inflation, urban population growth, and age dependency ratios significantly enhance female labor force participation, highlighting the dynamic impact of economic and demographic factors in shaping women's engagement in the labor market.

Henceforth, current research addresses several critical research gaps in the literature regarding FLFP in the GCC countries. Despite a growing body of research on women's employment in various global contexts, there is limited empirical analysis specifically focusing on the unique socio-economic, cultural, and institutional factors influencing FLFP in the GCC region. Previous studies often overlook the linkages between traditional gender roles, educational attainment, and economic policies within these countries, which can significantly shape women's employment opportunities. By examining these dynamics, our research seeks to provide a nuanced understanding of the barriers and enablers of FLFP in the GCC, contributing to a more comprehensive discourse on gender and labor market participation in this context.

Additionally, our study aims to fill the methodological gap in existing research by utilizing advanced econometric techniques and a robust dataset that captures the complexities of FLFP in the GCC countries over time. While many prior studies rely on cross-sectional analyses or limited time frames, our research employs a longitudinal approach, allowing a more detailed exploration of trends and causal relationships.

By integrating diverse indicators such as educational attainment, fertility rates, and economic factors, we provide a holistic perspective on how these variables interact to influence women's labor force engagement. This methodological rigor not only enhances the validity of our findings but also sets a precedent for future studies to adopt similar comprehensive approaches when investigating gender dynamics in labor markets, particularly.

3. Model specification and data

3.1 Data

To determine the factors that influence the female labor force participation rate, a panel data set of four emerging countries is reflected in this research while using the World Bank database (World Development Indicators) from 2003 and 2022. These emerging countries are Kuwait, Qatar, Saudi Arabia, and the United Arab Emirates. Female labor force participation rate is the dependent variable, and the explanatory variables used in this study are fertility rate, inflation rate and educational attainment, unemployment rate, and the number of waged and salaried workers. COVID-19 and the 2008 recession are two dummy variables the researcher has considered to identify how they affect the participation rate of the female labor force in emerging countries. Also, the two variables that were removed later because of their insignificant impact on FLFF are Net migration and GDP per capita.

Table 2 shows the variables, their abbreviations, and the definition of the dependent and each independent variable considered in conducting this study, although net migration and GDP per capita were excluded later for their insignificance based on the World Bank database in 2023.

The dependent variable in this study is FLFPR female labor force participation rate is the percentage of women who are economically active and either employed or actively looking for employment, as a percentage of the total female population of working age (individuals aged 15 and

above) and the independent variables that are considered for this study: Inflation Rate (INF), Fertility Rate (FER), Female UNEMP, Waged and Salaried Workers (Female WSW), Urban Population (URB), Educational Attainment (EDU). The description of each variable is mentioned in Table 3. While all explained variables have a significant impact on female labor force participation in emerging nations, there are many additional factors that the researcher has considered.

But due to their insignificant impact on female labor force participation, they were avoided. These variables are Net migration and GDP per capita growth.

Table 1: Major studies on the determinants of female labor force participation

Reference	Study period	Methodology	Findings
Solati (2015)	1975–2010	Dynamic panel data regression	FLFP is low in MENA countries mainly due to the persistence of patriarchal culture.
Mirzaie (2015)	1991–2013	OLS regression	Growth in per capita income reduces women's LFP in Iran and Turkey, but increases it in Egypt.
Lari et al. (2022)	2019–2020	Regression analysis	Education, marital status, and age significantly influence Qatari women's labor force participation.
Mansour et al. (2022)	N/A	OLS and geographically weighted regression	Education and urbanization have significant positive effects on women's labor force participation.
Verme et al. (2016)	1999–2012; 2007–2011	Regional medium- and short-term models	Marriage, inactivity rates, secondary education, and GDP per capita lower FLFP. Urban, secondary-educated women explain much of the low participation.
Al-Hamli (2013)	N/A	SPSS analysis	Education, income inequality, FDI, population growth, exports, human capital, political empowerment, and technology significantly affect women's participation in Kuwait.
Mehmood et al. (2015)	2003–2013	Robust estimation technique	Tertiary education positively influences FLFP, while number of children negatively affects participation.
Urama et al. (2022)	1990–2017	Two-step system GMM with panel data	Gross fixed capital formation and FLFP are positively linked to economic growth in SSA; fertility has a negative effect.
Chapman (2015)	1990–2012	OLS regression	A U-shaped relationship exists between economic growth and FLFP.
Naseem and Dhruva (2017)	2005–2015	Regression model	Unemployment, fertility, and urban population significantly affect FLFP, but higher education does not.

Table 2: Description of variables

Variables	Abbreviation	Definition
Female labor force participation rate	FLFP	Labor force participation rate, female (% of female population ages 15-64) (modeled ILO estimate)
Inflation rate	INF	Inflation rate, consumer prices (annual%)
Fertility rate	FER	Fertility rate, total (birth per woman)
Unemployment rate	UNEMP	Unemployment, female (% of female labor force)
Urban population	URB	Urban population
Number of waged and salaried workers	WSW	Wage and salaried workers, female (% of female employment) (modeled ILO estimate)
Educational attainment	EDU	Educational attainment (Educational attainment, at least bachelor's or equivalent, population 25+, female (%) (cumulative)
GDP per capita	GDP	GDP per capita growth (annual %)
Net migration	NETM	Net migration

Table 3: Description of variables in detail

Variable	Description
Inflation rate	Measures the rise in overall price levels within an economy. High inflation can create instability, reduce job opportunities, and make it harder for women to access or maintain employment.
Fertility rate	Average number of children per woman (15–49 years). Higher fertility can limit women's participation in the labor force due to childcare responsibilities and limited access to affordable childcare.
Female unemployment	Share of women actively seeking but unable to find work. High female unemployment discourages participation and can lead to withdrawal from the labor force.
Wages and salaried workers	Women in wage/salary-based employment. Higher earnings incentivize participation, but gender pay gaps and limited promotion opportunities may discourage long-term engagement.
Urban population	Share of population living in urban areas. Urbanization generally increases job opportunities for women, especially in the formal sector.
Educational attainment	Highest level of education achieved. Higher education improves women's skills and access to better job opportunities, raising FLFP.
Net migration	Difference between immigration and emigration. Large inflows of foreign workers can alter labor market dynamics and cultural norms, sometimes discouraging local women from participation.
GDP per capita	Indicator of average income/output per person. Economic growth expands job opportunities and improves attitudes toward women's workforce participation.
COVID-19	Pandemic-led disruptions caused job losses and higher unemployment, disproportionately affecting women.
Recession 2008	Economic downturn reduced job opportunities and exacerbated gender discrimination, negatively influencing FLFP.

3.2. Model specification

To determine the factors influencing female labor force participation rates in four GCC countries, this research specifies the model as follows:

$$FLFPR_{i,t} = \beta_0 + \beta_1 INF_{i.t} + \beta_2 FER_{i.t} + \beta_3 UNEMP_{i.t} + \beta_4 URB_{i.t} + \beta_5 WSW_{i.t} + \beta_6 EDU_{i.t} + \beta_7 COVID_{i.t} + \beta_8 REC_{i.t} + \beta_9 GDP_{i.t} + \beta_{10} NETM_{i.t} + \varepsilon_{i.t} \quad (1)$$

where, FLFPR is the female labor force participation rate, INF is the inflation rate, FER is the fertility rate, UNEMP is the female unemployment, and URB is the urban population.

WSW is the number of female wages and Salaried Workers (% of female employment), EDU is the female educational attainment, GDP is the GDP per capita growth, and NETM is the net migration. The FLFPR is shaped by various socio-economic and

demographic factors that interact in multifaceted ways. One key variable is the INF, which affects the cost of living and can drive women into the workforce to supplement household income. In periods of high inflation, the necessity to maintain living standards may increase female participation. However, inflation can also deter workforce entry if rising costs, such as those associated with childcare, outweigh employment benefits. Similarly, FER plays a significant role, as higher fertility often reduces FLFPR by increasing domestic responsibilities tied to child-rearing. In contrast, lower fertility rates typically allow more women to seek and sustain employment.

Female UNEMP also has a dual relationship with FLFPR. High unemployment might reflect structural challenges and discourage women from entering the labor force, while simultaneously signaling an increased willingness to work among women actively seeking jobs.

URB is another critical factor, as urban areas generally offer better access to education, employment opportunities, and supportive infrastructure like childcare services, all of which encourage female workforce participation. Moreover, the proportion of WSW highlights the availability of formal employment opportunities, which tend to be more stable and appealing for women than informal work arrangements.

EDU is one of the most influential factors, as higher education equips women with the skills and qualifications necessary to access and excel in the labor market. Education also empowers women by challenging traditional gender norms and fostering autonomy, further boosting their likelihood of participation.

Economic growth, measured by GDP per capita growth, generates new employment opportunities, often creating roles in sectors accessible to women, such as services and retail. However, during the early stages of development, FLFPR may decline temporarily as structural shifts favor male-dominated industries.

Lastly, net migration (NETM) influences FLFPR by altering labor market dynamics, either by introducing skilled female workers or by introducing cultural norms that impact women's workforce participation positively or negatively, depending on the context. These variables provide a detailed understanding of the factors influencing FLFPR across the GCC region.

To examine the factors driving female labor force participation, various panel data estimation techniques are employed, each chosen for its ability to address specific analytical challenges.

The fixed effects (FE) model is initially used to account for unobserved heterogeneity across countries, controlling for time-invariant characteristics such as cultural norms or institutional frameworks. This model focuses on within-country variations, providing a clear understanding of how changes in economic and demographic variables over time impact female labor force participation. However, since the FE model cannot estimate the effects of time-invariant variables, alternative methodologies become necessary.

The generalized least squares random effects (GLS-RE) model is then applied to capture both within- and between-country variations. By assuming that unobserved individual-specific effects are uncorrelated with the explanatory variables, GLS-RE enables the inclusion of time-invariant factors like urbanization or long-term policy measures. The decision to use GLS-RE is supported by the Hausman test, which validates the assumption of random effects and ensures efficient and reliable estimates.

Following this, the maximum likelihood random effects (ML-RE) model is utilized for its ability to estimate parameters precisely through the likelihood function. This approach is particularly effective in addressing datasets with complex variance structures, enhancing the robustness of the findings. Moreover, ML-RE facilitates model comparisons and hypothesis testing, providing deeper insights into the determinants of female labor force participation.

Finally, the GMM approach is implemented to address endogeneity issues, which are common in such analyses. GMM uses lagged values of endogenous variables as instruments to overcome biases arising from simultaneity, omitted variables, and measurement errors. This method is especially useful in dynamic panel data settings, where past economic conditions or participation rates influence current outcomes.

By employing GMM, the study ensures robust and unbiased estimates, offering a comprehensive understanding of the factors shaping female labor force participation across a panel of four GCC countries during the period from 2003 to 2022.

4. Results and analysis

This study starts its analysis by examining the descriptive statistics, offering a comprehensive overview of the dataset utilized in the research. Table 4 provides descriptive statistics for the variables under study, spanning 80 observations across the years 2003 to 2022.

The average female participation rate remained 43.05% with significant variation (SD = 13.46), suggesting heterogeneity across regions and time. In addition, GDP per capita growth, with an average of 0.36% and a standard deviation of 5.78, reflects fluctuations in economic performance, with some regions experiencing economic contraction (minimum -17.15%). In comparison, others exhibit robust growth (maximum 14.71%).

INF also shows considerable variability, averaging 5.58% annually but ranging widely from -4.86% to 65.69%, highlighting differences in macroeconomic stability. FER averages 2.24 births per woman, with a smaller standard deviation of 0.50, indicating moderate variation influenced by

demographic and cultural factors. EDU among women, at an average of 26.94% (SD = 11.07), points to disparities in access to higher education. Female UNEMP, with an average of 6.82% and significant variation (SD = 13.43), reflects uneven labor market conditions, including potential gender-based barriers. URB, averaging 9.91% but with a remarkably high standard deviation of 68.13, indicates stark differences in urbanization levels, possibly driven by country-specific development trajectories. These statistics provide a foundation for understanding the linkages between the selected factors and FLFPR across the study period.

Table 4: Descriptive statistics

Variable	Obs.	Mean	SD	Min	Max
FLFPR	80	43.05	13.46	17.68	62.88
GDP	80	0.36	5.78	-17.15	14.71
INF	80	5.58	11.30	-4.86	65.69
FER	80	2.24	0.50	1.33	3.50
EDU	80	26.94	11.07	11.19	50.30
UNEMP	80	6.82	13.43	0.00	75.54
URB	80	9.91	68.13	0.00	100.00

Table 5 presents pairwise correlations among the selected variables. It shows FLFPR has a strong negative correlation with the FER at -0.759 ($p < 0.01$), indicating that higher fertility rates are associated with lower female labor participation, potentially suggesting that women with more children may face barriers to engaging fully in the labor market.

Conversely, FLFPR exhibits a significant positive correlation with EDU at 0.348 ($p < 0.01$), highlighting the importance of educational investment in promoting higher female labor participation. Furthermore, FLFPR has a notable negative correlation with the UNEMP at -0.449 ($p < 0.01$), suggesting that increased female labor participation is linked to lower unemployment rates among women.

Although the correlation with GDP per capita is weak but statistically significant (0.095, $p < 0.05$), it implies a potential positive relationship between economic growth and female labor force engagement. Additionally, FLFPR shows a positive correlation with URB at 0.200 ($p < 0.1$), indicating that increased urbanization is associated with higher female labor participation, likely due to improved access to jobs and resources in urban areas.

Overall, these correlations indicate the linkages of fertility, education, unemployment, urbanization, and economic growth in shaping female labor market dynamics.

Table 5: Pairwise correlations

Variables	FLFPR	GDP	INF	FER	EDU	UNEMP	URB
FLFPR	1.000						
GDP	0.095**	1.000					
INF	-0.115*	-0.040	1.000				
FER	-0.759***	0.183*	0.086	1.000			
EDU	0.348***	0.064	-0.095	-0.656***	1.000		
UNEMP	-0.449***	0.283**	0.356***	0.428***	-0.215*	1.000	
URB	0.200*	0.124	-0.113	0.251**	-0.001	-0.067	1.000

***: $p < 0.01$; **: $p < 0.05$; *: $p < 0.1$

Table 6 presents the estimation results from four alternative specifications of the model outlined in Eq. 1. These models are estimated using FE, generalized least squares with random effects (RE), maximum likelihood (ML) with random effects, and GMM. All models employed robust standard errors to ensure the reliability of the estimates.

The estimation results from the four models in Table 4 provide valuable insights into the factors influencing the FLFPR in the context of the GCC region, known for its unique socio-economic landscape. Estimates in Table 4 reveal that GDP has a positive association with FLFPR, with coefficients of 0.287 (FE), 0.289 (GLS-RE), and 0.292 (ML-RE), indicating a statistically significant influence at the 10% level. The GMM estimate of 0.167 is also marginally significant.

These findings are consistent with the study by Alghamdi and Shaheen (2024), which suggests that economic growth positively impacts female labor participation. The correlation likely reflects the increased availability of job opportunities in a growing economy, as firms expand and require more workers. Additionally, economic growth may facilitate investments in infrastructure and education, creating an environment more conducive to female employment. In the context of the GCC region, where economic diversification efforts are ongoing, such findings highlight the importance of sustained economic growth in promoting women's labor force participation.

While examining the INF, the FE model shows a significant positive effect (0.112, $p < 0.05$), while the other models yield insignificant results. These findings are consistent with the studies by Naheed et al. (2024) and Alghamdi and Shaheen (2024), which suggested that inflation may have a complex and potentially counterintuitive impact on women's labor participation. On one hand, rising prices can necessitate increased household income, prompting women to enter the workforce. Conversely, higher inflation can lead to greater economic uncertainty, affecting job availability and stability, and potentially deterring women from seeking employment. The nuanced relationship indicates the need for careful policy consideration to manage inflation in a way that supports female labor participation.

Furthermore, the FER consistently exhibits a strong negative relationship with FLFPR across all models, with highly significant coefficients ranging from -23.732 to -25.082 (all $p < 0.01$). These findings are consistent with the study by Naheed et al. (2024) that suggested that higher fertility rates are associated with lower female labor participation.

The findings reflect the socio-cultural barriers that high fertility can create for women's engagement in the workforce, as women may prioritize child-rearing responsibilities over employment. In many cases, high fertility can restrict women's access to education and job opportunities, compounding the challenges they face in balancing work and family obligations.

Addressing fertility-related challenges through family planning and education initiatives could be crucial for enhancing female labor participation in the region.

Table 6: Model estimation

	FE	GLS-RE	ML-RE	GMM
	FLFPR	FLFPR	FLFPR	FLFPR
GDP	.287*	.289*	.292*	.167*
	(.156)	(.051)	(.154)	(.067)
INF	.112**	.009	.001	-091
	(.031)	(.072)	(.175)	(.116)
FER	-23.831***	-23.732***	-23.91***	-25.082***
	(5.871)	(7.856)	(7.912)	(3.621)
EDU	.375**	.373**	.364**	.381***
	(.021)	(.065)	(.049)	(.147)
UNEMP	-.199	-.2	-.192	-.105
	(.316)	(.317)	(.322)	(.109)
URB	.012*	.001*	.002*	.198**
	(.02)	(.0028)	(.007)	(.085)
COVID	1.373	1.366	1.373	2.797
	(2.189)	(2.294)	(2.189)	(2.599)
Recession	-3.59***	-3.602***	-3.757***	-2.732
	(.752)	(.789)	(.696)	(2.174)
Constant	108.252***	107.998***	108.369***	108.818***
	(17.895)	(22.794)	(22.848)	(10.701)
Observations	80	80	80	80
Pseudo R^2	.z	.z	.z	.z

Robust standard errors are in parentheses; ***: p < 0.01; **: p < 0.05; *: p < 0.1

Similarly, the EDU variable shows a positive correlation with FLFPR across all models, with coefficients of 0.375 (FE), 0.373 (GLS-RE), 0.364 (ML-RE), and 0.381 (GMM). These findings are consistent with the study by Naheed et al. (2024), which suggested that greater access to education leads to increased labor force participation among women. Education empowers women by providing them with the skills and qualifications necessary to compete in the job market, ultimately enhancing their employability and career prospects.

In the GCC region, where educational attainment among women has been on the rise, these results highlight the importance of continued investment in women's education as a means of promoting gender equality in the labor market.

Considering the UNEMP, the estimates show no significant impact across all models. This lack of significance suggests that the unemployment rate's influence on FLFPR may be overshadowed by other factors. While high unemployment can deter job seekers, it is possible that women are less responsive to labor market conditions, particularly in contexts where cultural norms and family responsibilities shape their labor force decisions. Further investigation may be needed to understand the complexities of how unemployment affects women's labor participation in the GCC region.

When examining URB, the estimates indicate a positive relationship with FLFPR in the GMM model (0.198, $p < 0.05$), while the FE, GLS-RE, and ML-RE models show insignificant but positive coefficients. These findings are consistent with the study by Naheed et al. (2024) that suggested that urbanization could provide more employment opportunities and resources for women, enabling them to participate more actively in the labor market. Urban areas typically offer greater access to education, healthcare, and social services, which can facilitate women's employment. In the GCC region, where urbanization is rapidly increasing, these findings indicate the importance of creating supportive urban environments that promote female labor participation.

Additionally, the impact of COVID-19 is reflected in the models, with coefficients of 1.373 (FE), 1.366 (GLS-RE), and 1.373 (ML-RE), while the GMM model presents a higher estimate of 2.797. These results indicate that the pandemic's effects on female labor participation are substantial. The crisis has disproportionately affected women in the workforce, as many have faced job losses, increased caregiving responsibilities, and barriers to returning to work. The significant coefficients highlight the need for targeted policies to support women's reintegration into the labor market in the aftermath of the pandemic, particularly as economies recover.

Lastly, the recession variable demonstrates a significant negative effect across all models, with coefficients ranging from -2.732 to -3.757 (all significant at $p < 0.01$). This indicates that economic downturns adversely affect female labor participation. Recessions typically lead to job losses, reduced hiring, and economic uncertainty, which can disproportionately impact women, especially in sectors that tend to employ a higher percentage of female workers. Addressing the challenges posed by economic downturns through targeted support and policies aimed at enhancing women's labor participation is crucial for fostering gender equality in the workforce.

Overall, the findings across these models indicate a complex linkage of economic, social, and structural factors that influence female labor participation in

the GCC region. The consistent significance of fertility rates and the positive contributions of education and GDP highlight key areas for policy intervention aimed at enhancing women's labor market engagement. Additionally, it is essential to note that all models employ robust standard errors, ensuring the reliability of these estimates.

5. Conclusion

The primary aim of this research was to investigate the determinants of FLFPR in the GCC region, with a specific focus on Qatar, Kuwait, Saudi Arabia, and the United Arab Emirates (UAE). This study analyzed data spanning from 2003 to 2022 to identify the economic, social, and structural factors influencing women's engagement in the workforce.

The research examined several key variables, including GDP, INF, FER, EDU, UNEMP, URB, the impact of COVID-19, and recession periods. By employing multiple methodologies, including FE, GLS-RE, ML-RE, and GMM, the study provided a comprehensive analysis of the complex dynamics at play in the labor markets of these four GCC countries.

The findings from the various models revealed significant insights regarding the relationships between the independent variables and female labor force participation. The positive association between GDP and FLFPR indicates that economic growth plays a crucial role in creating job opportunities for women. As economies expand, demand for labor typically increases, leading to greater inclusion of women in the workforce.

This relationship is particularly relevant in the GCC region, where efforts to diversify economies away from oil dependency are essential for sustainable growth. In this context, policymakers must prioritize initiatives that stimulate economic development to enhance employment prospects for women.

Conversely, the analysis of inflation's impact on female labor force participation showed mixed results across different methodologies. The significant positive correlation observed in the FE model suggests that rising inflation may prompt women to seek employment to supplement household income. However, the GMM findings indicated a negative relationship, highlighting the complexities involved in understanding inflation's effects on labor participation. Policymakers must be cognizant of these dynamics, as high inflation can create economic uncertainty that may deter women from entering the labor force.

Moreover, the negative correlation between fertility rates and female labor participation emerged as a pivotal finding in this study. Across all models, higher fertility rates were consistently associated with lower levels of female labor force participation. This trend reflects traditional societal norms and expectations that prioritize child-rearing responsibilities, often limiting women's access to employment.

To address these challenges, comprehensive family planning initiatives and policies aimed at empowering women to make informed choices about family size and career aspirations are essential. Such measures can significantly improve labor market engagement among women in the GCC region, where fertility rates have historically been high, particularly in countries like Saudi Arabia.

Additionally, educational attainment is another critical factor influencing female labor force participation. The consistently positive coefficients across all models highlight the importance of investing in women's education to promote gender equality in the labor market. Education equips women with the necessary skills and qualifications to compete effectively in various industries, enhancing their employability and career prospects.

Given that the GCC countries have seen increases in women's educational attainment, it is crucial for governments to continue prioritizing initiatives that facilitate women's access to quality education and vocational training.

The analysis also revealed an insignificant impact of unemployment rates on female labor participation, which raises important questions about the unique barriers women face in the labor market. Despite high unemployment rates in certain periods, the lack of significant effects suggests that women may encounter distinct challenges that affect their labor force decisions independently of broader economic conditions.

Cultural norms, family responsibilities, and inadequate support systems can limit women's ability to participate in the workforce. Policymakers in the GCC region must develop targeted interventions to address these challenges and promote women's employment.

Urbanization displayed a positive relationship with female labor force participation, particularly in the GMM model. Urban areas tend to provide more opportunities for women to engage in the labor market, as they typically offer improved access to education, healthcare, and social services. As the GCC continues to urbanize rapidly, it is essential for governments to create supportive urban environments that promote women's employment. Investments in public transportation, childcare services, and safe working conditions can empower women to seek employment opportunities in urban settings.

Moreover, the findings related to the impact of COVID-19 on female labor participation underscore the profound challenges faced by women during the pandemic. The significant coefficients across models highlight that the crisis disproportionately affected women's employment, exacerbating existing inequalities. As economies recover from the pandemic, targeted policies are necessary to support women's reintegration into the labor market. This may involve providing training and reskilling opportunities, expanding access to affordable childcare, and implementing measures that promote work-life balance for working mothers.

The negative impact of economic recessions on female labor participation was also evident in the analysis. Significant negative coefficients indicated that economic downturns could lead to job losses and reduced hiring, disproportionately affecting women in sectors with higher female employment rates. Policymakers must prioritize support measures that protect jobs and promote workforce resilience during economic downturns, particularly for women who often bear the brunt of economic shocks.

Considering these findings, several policy implications emerge for enhancing female labor force participation in the GCC region. First and foremost, fostering economic growth is essential for creating sustainable job opportunities for women. Policymakers should implement strategies that promote economic diversification, reduce dependency on oil, and stimulate growth in sectors that are more inclusive of female labor.

Cultural norms and societal expectations often impose significant barriers to women's labor market participation. Initiatives aimed at changing these perceptions and promoting gender equality in the workforce are crucial. Public awareness campaigns, community engagement, and educational programs can help shift societal attitudes, encouraging greater acceptance of women in various professional roles.

Family planning and reproductive health services play a vital role in enabling women to make informed choices about family size, which can positively influence their labor market engagement. Policies that support access to quality family planning services, along with initiatives aimed at providing affordable childcare, are essential for allowing women to balance work and family responsibilities.

Furthermore, enhancing access to quality education and vocational training for women is paramount. Governments in the GCC region must prioritize initiatives that provide women with the skills and qualifications necessary to compete in the labor market. This includes not only traditional education but also targeted vocational training programs that align with the demands of a diversifying economy. As urbanization continues to reshape labor markets in the GCC region, creating urban environments that support women's employment is essential. Investments in public infrastructure, transportation, and childcare services can facilitate women's access to job opportunities in urban areas. Policymakers should also consider implementing flexible work arrangements that accommodate the needs of working mothers.

Finally, in the aftermath of the COVID-19 pandemic, it is vital to focus on strategies that support women's reintegration into the workforce. This includes providing training and reskilling programs, expanding access to childcare, and promoting flexible work arrangements that consider the unique challenges faced by working mothers.

While this study provides valuable insights into the determinants of female labor force participation in the GCC region, several avenues for future research can further enhance our understanding of this complex issue. Conducting longitudinal studies can help capture the dynamics of female labor participation over time, allowing for a deeper understanding of the factors influencing changes in participation rates. Investigating the factors influencing female labor participation in specific sectors can provide more nuanced insights, as different industries may present unique challenges and opportunities for women's employment that warrant further exploration.

In conclusion, this research highlights the significant impact of economic, social, and structural factors on female labor force participation in the GCC region. The findings underscore the importance of comprehensive strategies that address the multi-dimensional challenges faced by women in the labor market. Policymakers must prioritize initiatives that promote economic growth, address cultural barriers, enhance educational opportunities, and create supportive environments for women's employment. By doing so, they can foster greater gender equality in the labor market, ultimately contributing to sustainable economic development and social progress in the GCC region.

6. Limitation

The research relies on panel data extracted from the World Bank Database 2023, which consists of 80 observations for females aged 15-64. While this dataset is widely used and delivers valuable information, it may have limitations in terms of coverage, accuracy, and availability. The data may not capture all important variables or may have missing values, which could affect the robustness of the findings. Having a small sample size may limit the generalizability of the findings to the total population of other countries. Thus, the results may be specific to the studied countries and may not entirely represent the dynamics in other contexts.

Additionally, other unobserved factors or omitted variables could be driving the relationships observed in the study. Also, the research focuses on Kuwait, Qatar, Saudi Arabia, and the United Arab Emirates, which have unique social, cultural, and economic contexts. The findings may not be directly relevant to other countries or regions with different institutional settings, labor market dynamics, or gender norms. The specific factors shaping female labor force participation in these countries may not be fully captured in the chosen variables.

Besides that, the research considers several factors such as inflation rate, fertility rate, female unemployment, wages and salaried workers, urban population, and educational attainment. However, there could be additional factors that influence female labor force participation, such as social norms, childcare availability, legal frameworks, and cultural attitudes regarding females' work. The absence of such factors may restrict the comprehensiveness of the analysis.

Also, the research covers the years 2003-2022. While this provides a relatively long period, societal and policy changes may have occurred during this period that could impact the relationship between variables. The results need to be interpreted in the context of the specific timeframe.

Lastly, it is important to take these limitations into account when interpreting the outcomes of the research and to consider further research and analysis to gain a comprehensive understanding of the factors shaping female labor force participation in these countries.

List of abbreviations

EDU	Educational attainment
FE	Fixed effects
FER	Fertility rate
FLFP	Female labor force participation
FLFPR	Female labor force participation rate
GCC	Gulf Cooperation Council
GDP	Gross domestic product
GIS	Geographic information system
GLS-RE	Generalized least squares with random effects
GMM	Generalized method of moments
INF	Inflation rate
MENA	Middle East and North Africa
ML-RE	Maximum likelihood estimation with random effects
NETM	Net migration
Obs.	Observation
OLS	Ordinary least squares
SD	Standard deviation
SSA	Sub-Saharan Africa
UAE	United Arab Emirates
UNEMP	Unemployment rate
URB	Urban population
WDI	World development indicators
WSW	Waged and salaried workers

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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