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Impact of female labour force participation on the economic growth: Evidence from Saudi Arabia

1. Introduction

Historically, societies have often rigorized the potential role of women in the workforce. In this regard, the participation of women in the labor force has long been documented as a critical factor driving economic growth and development worldwide. Notably, the role of women in the workforce has undergone significant transformations, offering new avenues for economic progress and societal advance. However, in conservative societies such as the Saudi Arabia's societies, the gender roles are based on societal norms, community traditions and religious values. As part of public policy, the integration of women into the labor force has been a subject of deliberation and gradual evolution.

Kingdom of Saudi Arabia (KSA), a nation undergoing notable socio-economic reforms, has embarked on a transformative vision towards diversifying the national economy and empowering its female population (Naseem and Dhruva, 2017; Varshney, 2019; Samargandi et al., 2019). Historically, cultural and structural barriers have constrained

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female participation in the workforce, resulting in underutilization of a substantial segment of the population's potential contributions to the economic growth.

On the other hand, the Vision 2030 was lunched as a strategic agenda designed to achieve some goals related to economy diversification and reduce the oil dependence of the Saudi economy. Regarding this vision, one of the central concerns is to enhance women's participation in the workforce. Then several initiatives were introduced by the government to achieve this goal. Particularly, many reforms was implemented to increase opportunities of woman employment and promote education and training programs to this important participant in the labor market. These efforts are designed to integrate more women into various economic sectors, thereby fostering a more inclusive and sustainable economic growth.

The economic growth in KSA has experienced significant transformations, especially during the last decay. This reality was especially driven by ambitious reform agendas based on diversification efforts suggested by the implementation of 2030 vision. This study aims to investigate the impact of female labor force participation (FLFP) on economic growth in Saudi Arabia. By examining recent trends and patterns, alongside with the exploration of the multifaceted factors influencing women's engagement in the labor market, this study seeks to provide nuanced insights into the potential impact of increased female workforce participation on Saudi Arabia's economic trajectory.

The significance of this study lies in its relevance to ongoing policy discussions and socio-economic reforms aimed at fostering inclusive growth and sustainable development in Saudi Arabia. By empirically analyzing the dynamics between female labor force participation and key economic growth indicators, this study may contribute substantially as robust evidence that assist in policy formulation and strategic interventions that harnessing the untapped potential of the female workforce.

Moreover, the importance of this study lies in the context of the socio-economic climate of Saudi Arabia via the vision 2030, which suggests transformative changes. In fact, this vision aiming to economic diversification and reduction of its reliance on oil. In this context, the integration of woman in the labor force and the increase of the increase of its participation in the economic activities can significantly enhance productivity, innovation, and economic resilience. In addition, investigating this nexus at a sectoral and regional levels is important since it helps identify areas with the greatest potential for growth and informs targeted policies. Then, such study is useful in line with a rapidly evolving

economic landscape, in the sense that it provides critical insights supporting the Saudi goals regarding inclusive growth by ensuring gender equality, making it highly relevant and timely.

The present study employs the standard and panel regression models, drawing on a diverse range of data sources, including official statistics issued from the General Authority for Statistics in Saudi Arabia. By adopting these comprehensive approaches, this study aspires to shed light on the complex interplay between female workforce participation and various dimensions of economic growth, encompassing aspects such as productivity, GDP growth, and social well-being.

Through a meticulous examination of the existing landscape and a projection of potential scenarios based on varying levels of female labor force participation, this study provides operational insights for policymakers, businesses, and stakeholders interested in driving sustainable economic growth while advancing gender equality in Saudi Arabia.

The reminder of this study is organized as follows. The second section provides a literature review. The third section is reserved for the data and descriptive analysis. The fourth section presents the used methodology. Section five provides an interpretation and discusses the results. Finally, section six concludes the paper.

2. Literature review

The empirical literature that examines the impact of female labor force participation on economic growth in Saudi Arabia remains scant and under the process of emerging. However, some studies have been identified the impact of female labor force participation on economic growth in this country. For instance, Agboola (2021) reveals that the inclusion of Saudi women into the workforce is one of the visible characteristics of the ambitious Saudi Arabia's Vision 2030, that seeks to reduce oil dependence, enhance competitiveness, diversify income sources and open up alternative business sectors. This is why Saudi Arabia's Vision (long-term strategy) recognized female labor force participation as a key factor for economic growth. A similar study by Naseem and Dhruva (2017) concluded that female labor force participation plays a key role in economic growth, and although the Kingdom of Saudi Arabia. The KSA economy relies mainly on men rather than women to achieve its development objective the Vision 2030 unlocks a new direction to empower women to contribute to the economic growth of the Kingdom. Bursztyn, González and Yanagizawa-Drott

(2018) found that social norms play a key role in constraining female labor force participation in Saudi Arabia but these constraints might be lifted by the simple provision of information. A study by Almutairi (2022) shows that the Saudi economy dependents on oil, delays female employment in the industry sector, and increases female employment in the services sector.

A study by Elhaj (2022) highlighted different obstacles that faced women labor force in Saudi Arabia and these obstacles are the social, economic and environmental factors that affecting female labor force participation in KSA during the period between 1990 and 2018.

A study by Parveen (2022) outlined how Saudi Government has formulated several policies and reforms to empower women in the workplace, and achieving gender equality and the period of 2006, 2017 and 2020 that has shown radical changes in inspiring Saudi women empowerment towards the labor market, the educational field, economic participation and gender equality. The most interesting point was that the total Saudi employed persons, especially males are double of females' ratio. It depicts that until Q3 and Q4, 2018 females were still facing unemployment phase and their economic participation was less in comparison with male Saudis. However, there found to have a new paradigm shift; rising of Saudi women in various sectors in the year 2019 where unemployment decreased to 5,7%, labor force participation at 58,8%.

An early study of Alfarran (2020) stated that Saudi government is actively supporting Saudi women to participate in the private sector through Nitaqat policy. Despite these government efforts to empower women, 35% of women including university degrees holders remain unemployed. Evidence explain that there are several barriers to Nitaqat policy in the form of legal restrictions on women's employment, cultural norms, economic influence and lack of skills.

Samargandi, Al Mamun, Sohag and Alandejani (2019) investigated the determinants of female labor force participation in Saudi Arabia, where religion and natural resources lay a significant role in defining the social and economic parameters.

Mansour, Al-Awadhi, Al Nasiri, and Al Balushi (2022) found that the labor market structures and mechanisms vary geographically between countries from the same region as the Gulf Cooperation Council (GCC) states. Several variables such as female education, urbanization, private sector jobs, divorce rates and female administrative jobs were used as predictors of female labor force participation rates. The most interesting result is that education and urbanism both have significant positive impacts on predictions for the labor force participation of women.

Varshney (2019) claimed that although the government's recent reforms have encouraged the women participation into the workforce. However, effective participation is still a significant challenge. Nevertheless, Saudi women have consistently shown consistency toward their employment and career development various challenges such as limiting culture, deeply embedded traditions, are real obstacles. In addition, Ramady and Ramady (2010) stated that there are several socio- economic, and political factors for the Saudi government to address the current state of the labor market and to Saudi unemployment issues.

In line with this finding, Sulaimantal (2024) revealed that the economic growth and the female longevity, education, and investments factors are strongly impacted by the female labor force participation, as the case of Southeast Asia economies from 1992 to 2020. On the other hand, Amber et al., (2023) said the female workforce engagement in public and private sectors of Pakistan negatively impacts Gross Domestic Product (GDP) and this is because of the societal norms and religious factors, as showed by the study's findings using the Johansen co-integration test and VECM model. Moreover, the Southern and Eastern Mediterranean Countries (SEMC) are also considered to be good example for a U-shaped relationship between female labor force participation and economic growth. In addition, the authors found region-specific barriers that are preventing women to enter into the labor force (Tsani etal., 2015). A study conducted by Omran and Bilan, (2022) showed that the Egypt's GDP growth in the long run is positively impacted by the female labor force participation. Whereas the gross fixed capital formation growth is increased there is absence of any significant relationship exists in the short term.

Obviously, Yıldırım and Akinci, (2021) showed a U-shaped relationship between female labor force participation and economic growth in middle-income countries, highlighting the significance of economic growth for promoting female labor force participation. Concerning the economic growth, disparity, and determinants of female labor force participation an investigation of study showed that the FLFP rate displayed a U-shaped throughout the process of economic development. Additionally, there are indications of gender pay difference across the sectors which have been justified by documenting a large number of existing literature. Demographic elements (fertility, migration, marriages and child care), economic elements (unemployment, per capita income, non-farm job and infrastructure) and other explanatory variables which include the regulatory context including family and childcare policies, tax regimes, and presence of subsidized health-care for workers determine the FLFP (Kumari,

2018). Furthermore, Tsani et al. (2013) examined the relationship between FLFP and economic growth in South Mediterranean countries using a two-step methodology including econometric analysis and general equilibrium modeling. Econometric estimations confirm a U-shaped relationship and highlight region-specific barriers to female labor participation. The above-mentioned estimations are then integrated into a general equilibrium model to enhance the effects of (i) changes in female labor force participation due to income developments and (ii) the reduction of region-specific barriers. The results show that the first scenario might slightly reduce economic growth, addressing region-specific barriers could significantly enhance growth. In addition, Tasseven, (2017) figured out female labor force participation components which include per capita GDP, unemployment rate, female to male enrollment ratios, fertility rate, and life expectancy. Findings confirmed that unemployment negatively impacts female labor force participation, whereas education positively affects it.

The literature considered above mentioned with varied degrees the impact of female labor force participation on the economic growth in Saudi Arabia. One can conclude that social norms, cultural norms, economic and environmental factors play key role in constraining female labor force participation in Saudi Arabia. The study agrees with several studies stating that government's recent reforms have encouraged the women participation into the workforce in addition to the that education and urbanism positive impact on labor force participation of women. The present study utilizes some of the variables as suggested in the literature in explaining the impact of female labor force participation on the economic growth in Saudi Arabia.

3. Data and study variables

In this study, we use quarterly data on the global GDP growth and FLFP. In addition, we collected data on the GDP in various activity sector and the FLFP in different regions in the Kingdom of Saudi Arabia. Notably, we collect these variables for 10 sectors and 13 regions over the period from the first quarter of 2015 to quarter 3 of 2023. The data is sourced from General Authority of Statistics of Kingdom of Saudi Arabia.

Female labor force participation refers to the percentage of women who are either employed or actively seeking employment within KSA workforce in each region and for each activity sector. It is a key indicator of the economic involvement of women in a particular society or country. Then, the female labor force participation rate is calculated by dividing the number of women in the

labor force (those employed or actively seeking employment) by the total number of women in the working-age population.

Table 1 presents descriptive statistics on the different variables of the study. FLFP is in average about 45,54%, expressing an important percentage, indication equality between the two genders in the Saudi labor force. This means that, on average, around one half of women in the specified population or workforce are either employed or actively seeking employment. This percentage provides insight into the level of economic engagement of Saudi women.

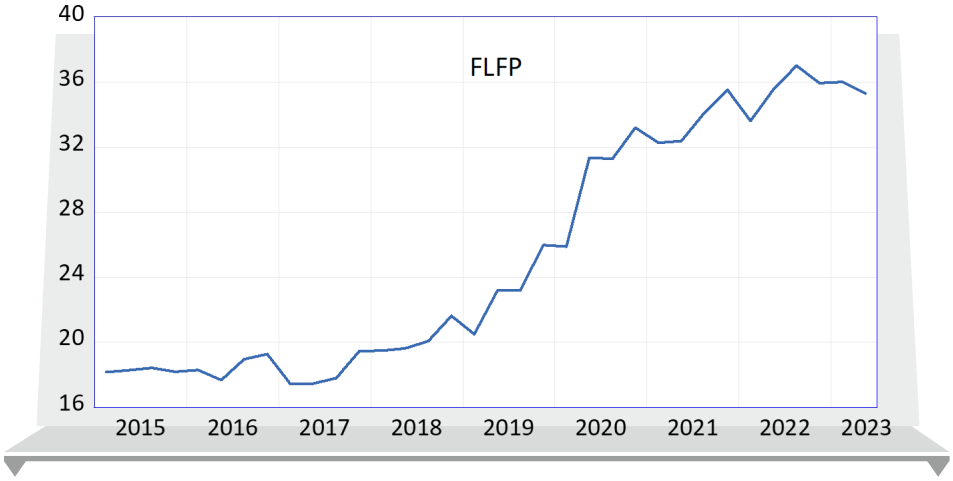

Figure 1. Female labor force participation rate between 2015 and 2023

Source: General Authority for Statistics of Saudi Arabia

Table 1. Descriptive statistics of the variables

	Mean	Std	Skewness	Kurtosis	JB	p-value
Global FLFP	45,5400	7,3771	0,3668	1,3988	4,3942	0,1111
Global GDP	6,1350	4,5406	0,3072	1,4458	3,9568	0,1383
GDP by sector						
Agriculture, Forestry & Fishing	5,8853	4,6724	1,3620	4,2799	12,8322	0,0016

Mining & Quarrying	10,9824	50,0376	0,6224	2,4354	2,6466	0,2663
Manufacturing	9,3471	15,8514	0,8903	3,8252	5,4565	0,0653
Electricity, Gas and Water	4,3265	6,6901	0,1605	2,3789	0,6925	0,7073
Construction	3,6794	6,9923	0,2501	2,3372	0,9769	0,6136
Whol & Retail Trade, Rest & hotels	4,2647	8,9929	0,2758	6,2651	15,5340	0,0004
Transport, Storage & Communication	3,5618	6,2860	-1,3657	5,7007	20,9022	0,0000
Finance, Ins, R. Estate & Bus Servi	4,8735	3,1134	0,5860	2,7706	2,0207	0,3641
Community, Social & Pers Services	8,4118	11,3579	-0,4139	2,9929	0,9709	0,6154
Government Services	6,0176	10,7278	1,6437	6,6766	34,4602	0,0000
FLFP by region						
Riyadh	48,9079	6,7878	0,4807	1,4294	4,8040	0,0905
Makkah	46,2459	4,4300	0,1285	1,3643	3,8838	0,1434
Madinah	43,7294	3,4818	-0,4382	2,1768	2,0478	0,3592
Qaseem	44,7177	3,8696	-0,0435	2,2515	0,8045	0,6688
Eastern Region	46,0018	5,5940	0,3497	1,3620	4,4941	0,1057
Aseer	41,0497	4,3130	0,0371	1,8672	1,8257	0,4014
Tabuk	45,5012	3,7461	0,0360	1,5696	2,9059	0,2339
Hail	41,3377	4,3888	0,4267	1,7624	3,2016	0,2017
Northern Borders Region	45,6885	3,1080	0,3216	1,8850	2,3473	0,3092
Jazan	42,3700	2,8642	0,8291	4,2378	6,0661	0,0482
Najran	43,8209	5,5684	0,2592	1,6560	2,9397	0,2300
Al-Baha	40,8282	4,5718	0,3299	2,1706	1,5911	0,4513
Al-Jouf	44,2509	3,4756	0,0145	2,3205	0,6552	0,7206

Sources: authors' calculations

Results from figure 1 highlight a remarkable surge in the female labor force participation over the period of study. This increase shows that engagement in the workforce within the country under study. This figure reflects important progress, as there have been concerted efforts in recent years to empower women economically through policy changes and social initiatives. However, it also highlights potential opportunities for further improvement, signaling that barriers such as cultural norms, legal restrictions, or other socio-economic factors may still impact women's participation in the labor market.

Table 1 presents a description of the variables used in the study. First, the global FLFP has an average of 45,54% and a standard deviation of 7,37%, expressing a high variability suggested by policy measures that encourages female participation in the economic activity in Saudi Arabia. Second, the table presents the GDP growth for different economic sectors and the FLFP for different regions of the considered country. At sectoral levels, the highest average of GDP is related to the Mining & Quarrying, followed by Community, Social & Personal Services by 10,98% and 8,41%, respectively. Regarding the distribution of the FLFP at a regional level, it is evident that the capital (Riyadh) has the highest percentage of 48,9%, while Al-Baha has the lowest GDP by 40,82%.

In addition to the mean values, the standard deviation of the GDP either at regional and sectoral levels, we find high variability of the GDP growth. This variability can be attributed to several factors. Firstly, the country has undergone significant economic diversification efforts in recent years regarding the 2030 vision goals, with a shift away from traditional sectors like oil and gas towards non-oil industries. This transition introduces greater volatility as different sectors experience varying growth rates in response to changing global economic conditions and domestic policies.

4. Methodology

To examine the impact of FLFP on economic growth in Saudi Arabia, we used both OLS regressions and Panel regressions models. The first model is essential to control for sectoral and regional variations within the analysis is crucial, given the noted high variability in GDP growth and FLFP. This approach will help account for potential heterogeneity in economic conditions across regions and sectors, providing a more accurate assessment of the relationship between female labor force participation and overall economic growth in Saudi Arabia.

To investigate this impact, we estimate the following model:

$$GDP_t = \alpha_0 + \alpha_1 FLFP_t + \epsilon_t \quad (1)$$

Where $FLFP_t$ is the female labor force participation at time t and GDP_t is the Gross Domestic Product at time t. The parameter α_1 measures the impact of FLFP on the GDP. Finally, ϵ_t is an error term of the regression.

After estimating individual regression model for each sector and each region, we also proceed with a panel regression analysis for robustness. This approach is used in this study to offer some advantages. Firstly, panel regression leads to more accurate and reliable results, since it allows us to control for unobserved heterogeneity by accounting for individual differences across sectors and regions that may influence the relationship between female labor force participation and economic growth. Secondly, panel data combines cross-sectional and time-series dimensions and enables us to capture the dynamic effects and temporal variations that single cross-sectional or time-series analyses might miss. Furthermore, panel regression can control for potential endogeneity issues by using techniques such as fixed effects or random effects models, thereby reducing bias in the estimates. Overall, employing panel regression in this context allows for a more comprehensive and nuanced understanding of the impact of female labor force participation on economic growth across different sectors and regions in Saudi Arabia.
Then, by introduction of some control variables including the population growth (PG), education attainment (ED), trade openness (TO), inflation rate (INF), unemployment rate (UNP), and foreign direct investment (FDI), we estimate the following model:

$$GDP_{i,t} = \beta_0 + \beta_1 FLFP_{i,t} + \beta_2 PG_{i,t} + \beta_3 ED_{i,t} + \beta_4 TO_{i,t} + \beta_5 INF_{i,t} + \\ + \beta_6 UNP_{i,t} + \beta_7 FDI_{i,t} + \epsilon_t \quad (2)$$

where the indicate the value for the sector/region over the period *t*.[1]

1 In this case, we used data at annual frequency due to the data availability. The data related to the control variables is sourced from the world Bank database.

In addition to the model in equation 2, we also consider the dynamic panel modeling, which can offer several advantages leading to improve the quality of the modelling process. Indeed, this approach allows incorporating lagged dependent variables as regressors, which helps capture the dynamic relationships and persistence effects over time. Then, it allows us to better understand how past levels of economic growth influence current growth, providing insights into the long-term impact of female labor force participation. Additionally, dynamic panel models can address endogeneity issues more effectively, using techniques like the Generalized Method of Moments (GMM), leading to more robust and reliable estimates. This makes dynamic panel modeling particularly suitable for analyzing complex economic phenomena where past behavior significantly affects future outcomes. Based on this approach, the estimated model is presented as follows:

$$GDP_{i,t} = \gamma_0 + \gamma_1 GDP_{i,t-1} + \gamma_2 FLFP_{i,t} + \gamma_3 PG_{i,t} + \gamma_4 ED_{i,t} + \gamma_5 TO_{i,t} + \gamma_6 INF_{i,t} + \gamma_7 UNP_{i,t} + \gamma_8 FDI_{i,t} + \epsilon_t \quad (3)$$

5. Results and discussion

In this study, the effect of the female labor force on the economic growth is analyzed in two levels. Firstly, we proceed by a standard regression model. Secondly, a panel regression analysis is employed.

5.1. Regression results

Table 2. Estimation results of the effect of female labor force on the GDP by sector

	Coefficient	std	t-stat	p-value	R2
Panel A: Global GDP	0,6595*	0,3504	1,8823	0,0689	0,0997
Panel B: GDP by sector					
Agriculture, Forestry & Fishing	0,3457***	0,0938	3,6857	0,0008	0,2980

Mining & Quarrying	1,9379	1,1491	1,6865	0,1014	0,0816
Manufacturing	0,9225**	0,3431	2,6891	0,0113	0,1843
Electricity, Gas and Water	-0,4318***	0,1410	-3,0633	0,0044	0,2267
Construction	0,6306***	0,1251	5,0412	0,0000	0,4426
Wholesale & Retail Trade, Restaurants & hotels	0,4008*	0,2035	1,9693	0,0576	0,1081
Transport, Storage & Communication	0,0164	0,1506	0,1086	0,9142	0,0369
Finance, Insurance, R. Estate & Bus Servi	0,1640**	0,0687	2,3852	0,0232	0,1509
Community, Social & Personal Services	-0,2395	0,2689	-0,8909	0,3796	0,0242
Government Services	-0,4520*	0,2443	-1,8498	0,0736	0,0966

Notes: This table reports the coefficient estimation of the impact of female labor force on the GDP in different economic sector. std denotes the estimated standard error. t-stat is the calculated statistics of the significance test. (*), (**), and (***) indicate the significance of the coefficient at 10%, 5%, and 1% level, respectively.

Sources: authors' calculations

Table 2 presents the estimation results of the effect of female labor force on the GDP globally and by economic sector. Figure 2 represent the estimated coefficient for comparative purposes. The model is estimated for the global GDP and the GDP of 10 sectors including Agriculture, Forestry & Fishing, Mining & Quarrying, Manufacturing, Electricity, Gas and Water, Construction, Wholesale & Retail Trade, Restaurants & hotels, Transport, Storage & Communication, Finance, Insurance, R. Estate & Bus Servi, Community, Social & Personal Services, and Government Services.

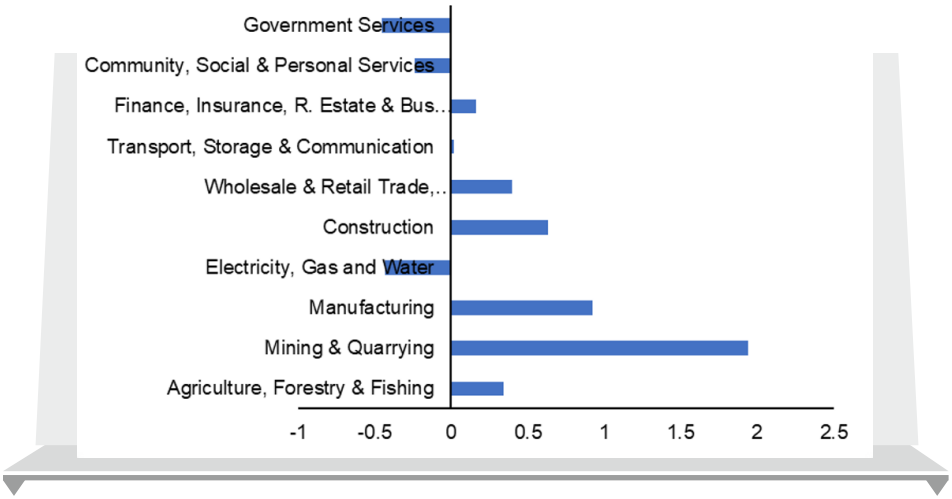

Figure 2. Estimated coefficient for each sector

Sources: authors' calculations

The investigation into the relationship between female labor force participation and economic growth, starting with a global perspective in Panel A, reveals that the overall impact is statistically significant at the 10% level. This conclusion is drawn from the t-statistics, which exceeds the critical value of 1,64, and p-values lower than 10% threshold. However, when requiring a significance level of 5% the results show no significant impact at this level. Then, a more nuanced analysis focusing on individual economic sectors unravels a distinct pattern.

When scrutinizing different sectors, it becomes evident that female labor force participation significantly influences the economic growth of some sectors including "Agriculture, Forestry & Fishing", "Manufacturing", "Electricity, Gas and Water", "Construction", and "Finance, Insurance, R. Estate & Bus Servi". These sectors stand out as areas where the involvement of women in the workforce demonstrates a discernible impact on economic expansion. This sector-specific finding underscores the importance of disaggregating data and examining nuanced relationships to gain a comprehensive understanding of how female labor force participation contributes differentially across various segments of the economy in Saudi Arabia. Further exploration into the unique dynamics of these sectors may provide valuable insights for policymakers and

researchers seeking to foster inclusive and sustainable economic growth in Saudi Arabia.

The significant impact observed in these sectors underscores the importance of targeted policy interventions. These sectors appear to benefit the most from increased female participation, suggesting that tailored training programs, skill development initiatives, and gender inclusivity policies could further enhance their economic performance. Conversely, the non-significant effects observed in sectors indicate potential challenges or barriers that need to be addressed to realize the benefits of female labor force participation.

Moreover, the findings emphasize the need for sector-specific policies to foster a conducive environment for female workforce integration. Implementing measures such as work-life balance improvements, affordable childcare, and gender-based barrier removal can encourage more women to join and remain in the workforce, contributing to broader socio-economic development. Additionally, sector-specific incentives like mentorship programs, flexible work arrangements, and promoting women's leadership roles can create a more inclusive and diverse workforce. By addressing these sectoral differences, policymakers can better support economic growth, gender equality, and social well-being, aligning with the goals of Saudi Arabia's Vision 2030.

The findings indicating a statistically significant impact of female labor force participation on the economic growth of these sectors in Saudi Arabia carry important policy implications. Firstly, recognizing the sector-specific nature of this influence suggests that policymakers should tailor interventions to address the unique characteristics and challenges faced by these sectors. Implementing targeted training programs, skill development initiatives, and policies promoting gender inclusivity within these sectors could enhance their overall economic performance. Secondly, fostering an environment conducive to increased female participation in these sectors can contribute to broader socio-economic development. For instance, policies aimed at improving work-life balance, providing affordable childcare facilities, and addressing gender-based barriers could encourage more women to join and remain in the workforce. This not only supports economic growth but also promotes gender equality and social well-being. Moreover, policymakers may consider sector-specific incentives and support mechanisms to attract and retain female talent. Initiatives such as mentorship programs, flexible work arrangements, and promoting women's leadership roles within these sectors can create a more inclusive and diverse workforce.

For comparison between the effects across economic sectors represented by figure 2, we remark that this effect varies in sign and in strength. Particularly, despite the effect is non-significant, it is negative for three sectors such as "Electricity, Gas & Water, community", "Social & Personal Services", and "Government Services", and positive for the others.

Table 3. Estimation results of the effect of female labor force on the GDP by region

	Coefficient	std	t-stat	p-value	R2
Riyadh	0,8984***	0,0352	25,5435	0,0000	0,9532
Makkah	0,5693***	0,0338	16,8606	0,0000	0,8988
Madinah	0,3726***	0,0512	7,2738	0,0000	0,6231
Qaseem	0,3893***	0,0621	6,2650	0,0000	0,5509
Eastern Region	0,7452***	0,0248	30,0498	0,0000	0,9658
Aseer	0,5084***	0,0510	9,9652	0,0000	0,7563
Tabuk	0,3879***	0,0579	6,6958	0,0000	0,5835
Hail	0,5510***	0,0397	13,8927	0,0000	0,8578
Northern Borders Region	0,3726***	0,0348	10,7220	0,0000	0,7823
Jazan	0,2231***	0,0562	3,9709	0,0004	0,3301
Najran	0,6992***	0,0503	13,9132	0,0000	0,8581
Al-Baha	0,4985***	0,0651	7,6583	0,0000	0,6469
Al-Jouf	0,4068***	0,0420	9,6804	0,0000	0,7454

Notes: This tables reports the coefficient estimation of the impact of female labor force on the GDP in different regions. std denotes the estimated standard error. t-stat is the calculated statistics of the significance test (***) indicates the significance of the coefficient at 1% level.

Sources: authors' calculations

Table 3 presents the results of the regression analysis by region in Saudi Arabia and figure 3 represents graphically the coefficient estimation of the impact of female labor force on the GDP for different region. The model is

estimated for 13 regions including Riyadh, Makkah, Madinah, Qaseem, Eastern Region, Aseer, Tabuk, Hail, Northern Borders Region, Jazan, Najran, Al-Baha, and Al-Jouf.

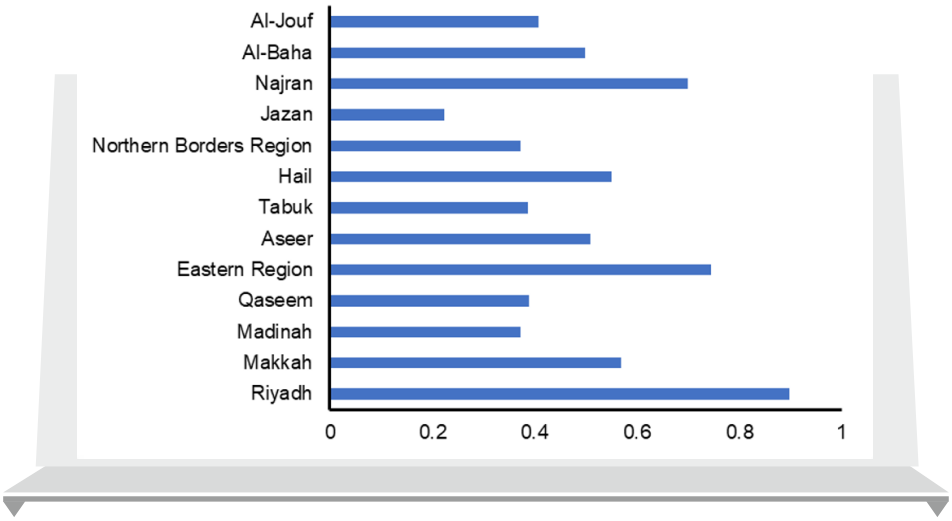

Figure 3. Estimated coefficient for each region

Sources: authors' calculations

The results show that the FLFP has a positive and significant impact on the GDP for all regions of Saudi Arabia. This positive impact implies that an increase in the female labor force participation led to an increase in the economic growth of the considered regions. Specifically, the highest impact is for Riyadh, Makkah and Najran regions, while the lowest one is for Jazan.

The observed positive and significant impact of female labor force participation on the GDP across all regions in Saudi Arabia suggests that increasing the involvement of women in the workforce is associated with higher economic growth. This result aligns with the growing recognition of the economic benefits of gender diversity and inclusive labor practices. Economically, this finding implies that as more women participate in the labor market, there is a concurrent stimulation of economic activities, leading to enhanced regional GDP.

Table 4. Estimation results of the panel regression model in sector and region levels

Variable	Panel by sectors				Panel by region		
	Coefficient	std	t-stat		Coefficient	std	T-stat
C	17,1903***	3,2061	5,3617		-58,0099***	20,4950	-2,8304
FLFP	1,2981***	0,5378	2,4136		0,4622	0,4114	1,1235
PG	3,0838	6,5986	0,4673		13,2559***	5,0386	2,6309
TO	-0,8102	2,1608	-0,3749		3,1750***	1,1870	2,6747
ED	-1,4314	2,4769	-0,5779		3,0946***	0,8970	3,4500
INF	2,1675***	0,6620	3,2739		-2,8342	1,9365	-1,4636
UNP	-1,4728	21,0778	-0,0699		32,7040***	12,8156	2,5519
FDI	1,0910***	0,2780	3,9244		-1,8456***	at0,7059	-2,6144

Notes: This tables reports the coefficient estimation of the panel regression model in equation 2 at a sector and region levels. std denotes the estimated standard error. t-stat is the calculated statistics of the significance test. (***) indicates the significance of the coefficient at 1% level.

Sources: authors' calculations

The varying degrees of impact across regions highlight potential regional disparities in how FLFP contributes to economic growth. Riyadh, Makkah, and Najran experiencing the highest impact could be indicative of these regions having conditions or policies that particularly support and leverage the economic contributions of women. This could include factors such as better access to education and training for women, supportive workplace policies, and a more diversified economic structure.

On the other hand, the comparatively lower impact in the Jazan region may suggest that additional factors, such as specific regional challenges or structural aspects, could be influencing the relationship between FLFP and GDP. Identifying and addressing these region-specific dynamics can be crucial for tailoring policies and initiatives that promote gender inclusivity and maximize the economic benefits of increased female workforce participation. Overall, these results underscore the economic importance of fostering gender equality in the labor market as a driver of regional economic growth in Saudi Arabia.

5.2. Panel regression results

To provide more insight on the impact of the FLFP on the economic growth in Saudi Arabia, we also proceeded by the panel regression analysis. The estimation results of the model in equation 2 are presented by table 4. We estimated the panel regression model at both sectoral and regional levels by considering the control variables indicated in the methodology section. The first one is based on a 10 sectors panel (in the right part of table 4), while the second is based on 13 regions (in left part of table 4).

At the sector level, results indicate some significant relationships between the variables and economic growth. Particularly, FLFP has a positive and significant effect on economic growth, with a coefficient of 1,2981, implying that an increase in female labor participation leads to higher economic output across sectors. Population growth and trade openness do not show significant effects on economic growth in this context, as indicated by their high standard errors and low t-statistics. Education also does not show a significant impact. Inflation has a positive and significant effect on GDP growth with a coefficient of 2,1675, indicating that in the sectoral context, moderate inflation might be associated with higher economic activity. Finally, foreign direct investment significantly boosts economic growth, with a coefficient of 1,0910, highlighting the importance of investment inflows for sectoral development.

At the regional level, the results show a different set of dynamics. In fact, FLFP does not have a significant impact on economic growth, as indicated by the non-significant coefficient of 0,4622. However, population growth positively influences economic growth, highlighting the importance of demographic factors in regional economic performance. Trade openness and education are also significant, with positive coefficients of 3,1750 and 3,0946, respectively, suggesting that regions with higher trade activity and better education levels experience higher economic growth. Inflation does not show a significant effect, whereas unemployment has a surprisingly positive and significant impact, which might indicate complex regional labor market dynamics. Lastly, foreign direct investment has a negative and significant impact on regional economic growth, with a coefficient of -1,8456, suggesting that the benefits of FDI might not be evenly distributed across regions or could be associated with negative externalities that need addressing.

The panel regression results reveal distinct differences in how female labor force participation and other economic factors impact growth at the sectoral and regional levels. While female labor force participation significantly boosts

economic growth across sectors, it does not show the same effect at the regional level. This discrepancy highlights the importance of sector-specific policies to leverage female workforce potential. Population growth, trade openness, and education significantly enhance regional economic growth, emphasizing the role of demographic and educational factors in regional development. The positive impact of inflation and foreign direct investment in sectors contrasts with their mixed effects at the regional level, suggesting the need for tailored regional strategies to optimize the benefits of these factors. These findings underscore the complexity of economic growth drivers and the necessity for nuanced, context-specific policy interventions.

5.3. Dynamic Panel regression results

To provide a clearer picture on the effect of FLFP on the economic growth, it is important to consider the effect of the past values of GDP in the model. To do so, we estimated the model in the equation 3 using the GMM method. The results are presented by table 5.

Table 5. Estimation results of the panel regression model in sector and region levels

	Panel by sectors				Panel by region		
	Coefficient	**std**	**t-stat**		**Coefficient**	**std**	**T-stat**
GDP(-1)	0,1565***	0,0224	6,9900		0,6286**	0,3060	2,0541
FLFP	0,3349**	0,1582	2,1165		0,9120***	0,1215	7,5062
PG	1,8287	5,0037	0,3655		1,0215	0,9874	1,0346
TO	-0,4514	2,2491	-0,2007		5,1656	4,5578	1,1334
ED	0,4461	3,6305	0,1229		1,7751***	0,3457	5,1348
INF	1,2415**	0,5227	2,3752		1,6802***	0,4573	3,6743
UNP	-3,1645	9,8629	-0,3208		-2,3391**	1,0024	-2,3335
FDI	0,3517***	0,0832	4,2279		0,4059***	0,1447	2,8053

Notes: This tables reports the coefficient estimation of the dynamic panel regression model in equation 3 at a sector and region levels by using the GMM method, std denotes the estimated standard error, t-stat is the calculated statistics of the significance test, (**) and (***) indicate the significance of the coefficient at 5% and 1% level, respectively.

Sources: authors' calculations

The results at sectoral level indicate that the lagged GDP term (GDP(-1)) is highly significant at the 1% level with a coefficient of 0,1565, suggesting that past economic performance positively influences current growth. FLFP has a positive and significant impact on sectoral economic growth, with a coefficient of 0,3349, emphasizing the importance of female participation in driving sectoral output. Population growth and trade openness do not show significant effects on growth in this context. Education also appears insignificant. However, inflation has a positive and significant effect, with a coefficient of 1,2415, indicating that moderate inflation may boost sectoral economic activity. The unemployment rate is not significant, while foreign direct investment significantly boosts sectoral growth with a coefficient of 0,3517.

The regional analysis, in the right part of table 5, shows different dynamics. The lagged GDP term is significant at the 5% level with a higher coefficient of 0,6286, indicating a stronger persistence effect of past economic performance on current regional growth compared to the sectoral level. Female labor force participation has a substantial positive impact on regional economic growth, with a highly significant coefficient of 0,9120. Population growth and trade openness remain insignificant in the regional context. Education is significant at the 1% level with a coefficient of 1,7751, highlighting the critical role of education in regional development. Inflation also shows a significant positive effect on growth. Interestingly, the unemployment rate has a significant negative impact on regional growth, suggesting that high unemployment hinders economic performance. Lastly, foreign direct investment continues to have a positive and significant effect on regional growth, reinforcing its importance for economic development.

These results also underscore the importance of female labor force participation in both sectoral and regional economic growth, highlighting the need for policies that promote gender inclusivity and support women in the workforce. The significant positive impact of education on regional growth suggests that investments in educational infrastructure are crucial for economic development. Additionally, the findings on inflation and foreign direct investment imply that maintaining moderate inflation levels and attracting FDI can enhance economic performance. The negative impact of unemployment on regional growth calls for targeted interventions to reduce unemployment rates and support job creation. Overall, these results advocate for tailored, multi-faceted policy approaches to leverage the benefits of female labor force participation and other growth drivers.

6. Conclusion and recommendations

This study delves into the intricate relationship between female labor force participation and economic growth in various regions and for different sectors in Saudi Arabia. The findings reveal a positive and statistically significant impact of increased female labor force participation on the GDP across all regions, signaling a potential avenue for fostering economic growth. The observed variation in the magnitude of this impact among regions underscores the need for nuanced, region-specific policies to maximize the economic benefits of gender inclusivity.

While the global analysis did not show a significant effect, the sector-specific examination uncovered noteworthy impacts in the "Transport, Storage & Communication" and "Community, Social & Personal Services" sectors. These nuanced findings emphasize the importance of disaggregated analyses, as sectoral dynamics can significantly influence the relationship between female labor force participation and economic growth.

To provide more insight on the impact of female labor force participation on the economic growth in Saudi Arabia, we also proceeded with a panel regression analysis by introducing some control variables in the regression equation. The results show significant relationships between variables and economic growth at the sector and regional levels. This analysis confirms that the female labor force participation has a positive effect on economic growth, while population growth, trade openness, education, inflation, and foreign direct investment (FDI) have no significant effects. At the regional level, population growth positively influences economic growth, while trade openness and education are significant. Inflation and FDI have mixed effects at the regional level, suggesting the need for tailored regional strategies. The findings highlight the complexity of economic growth drivers and the need for nuanced, context-specific policy interventions. Sector-specific policies are needed to leverage female workforce potential and optimize the benefits of these factors.

Results of this study carry out several policy implications. Particularly, policymakers should consider these results in shaping initiatives that promote gender equality in the workforce. Targeted interventions, such as training programs, supportive workplace policies, and incentives tailored to regional contexts, can be instrumental in realizing the full economic potential of increased female participation. The highest impact observed in Riyadh, Makkah, and Najran regions suggests the existence of favorable conditions or policies that can serve as models for other regions. In addition, the results from

panel regression analysis suggest important policy implications for fostering economic growth in Saudi Arabia. Given the significant positive impact of female labor force participation on sectoral growth, policymakers should focus on enhancing women's participation in specific sectors through targeted training, skill development, and inclusive workplace policies. Additionally, the significant role of education and trade openness in regional growth implies that investments in educational infrastructure and policies promoting international trade can drive regional economic development. Addressing region-specific barriers to female participation and ensuring equitable distribution of foreign direct investment are crucial for balanced regional growth. Overall, tailored policies that address sectoral and regional dynamics are essential to harness the full economic potential of female labor force participation and other growth drivers.

In essence, the study provides valuable insights for policymakers, researchers, and stakeholders aiming to advance gender inclusivity and sustainable economic growth in Saudi Arabia. It underscores the importance of recognizing the diverse economic landscape and tailoring interventions to harness the economic contributions of women across different regions and sectors.

Abstract

This study (FLFP) investigates the impact of female labor force participation on the economic growth in Saudi Arabia, a country currently implementing extensive socio-economic reforms. We conduct a sectoral and regional analysis using regression techniques on data from 2015 to 2023. Our findings indicate that FLFP has a statistically significant positive effect on the gross domestic product across all regions in Saudi Arabia. However, the impact is not uniform across different sectors. Notably, substantial contributions to GDP growth are observed in the Transport, Storage & Communication, and Community, Social & Personal Services sectors. By addressing the intersectionality of gender dynamics and economic growth, this study provides valuable insights for policymakers, businesses, and stakeholders. These insights are crucial for fostering inclusive economic growth and promoting gender equality as part of Saudi Arabia's Vision 2030 objectives.

Keywords: *female labor force; economic growth; regional economic growth.*

JEL codes: J16; J21; J24 ; O15.

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Appendix

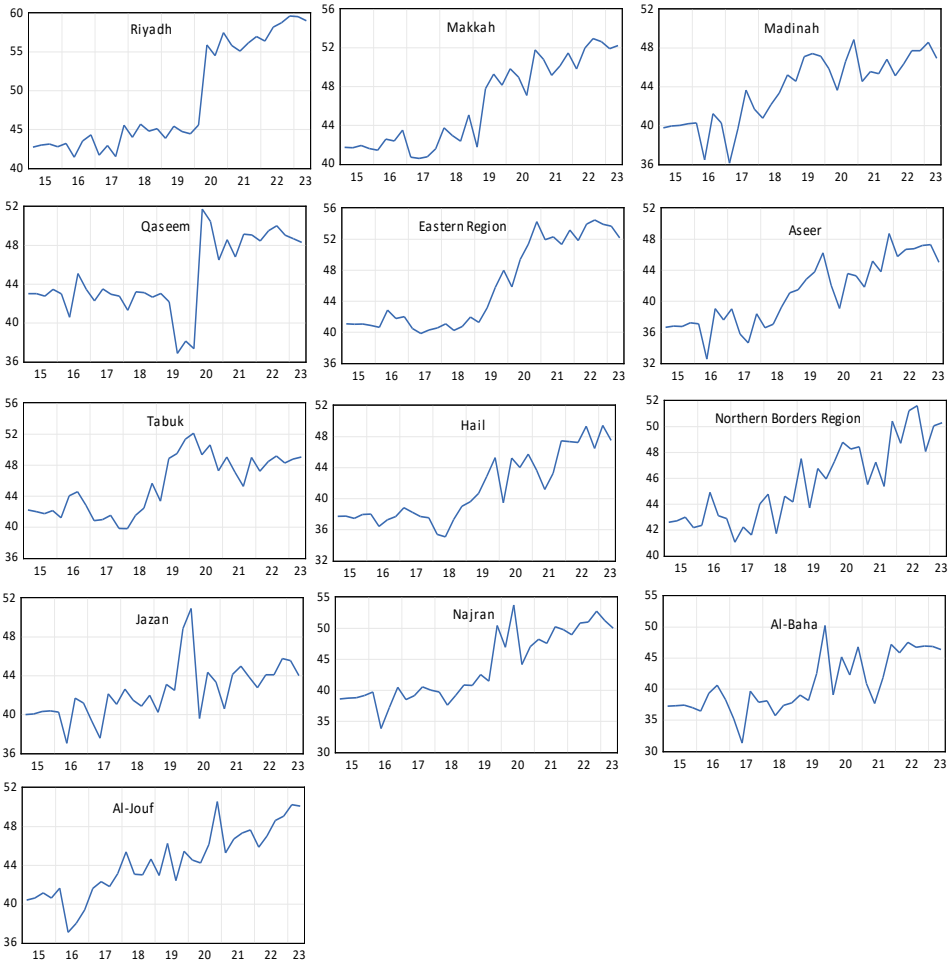

Figure A1. FLFP for different regions

Sources: authors' calculations

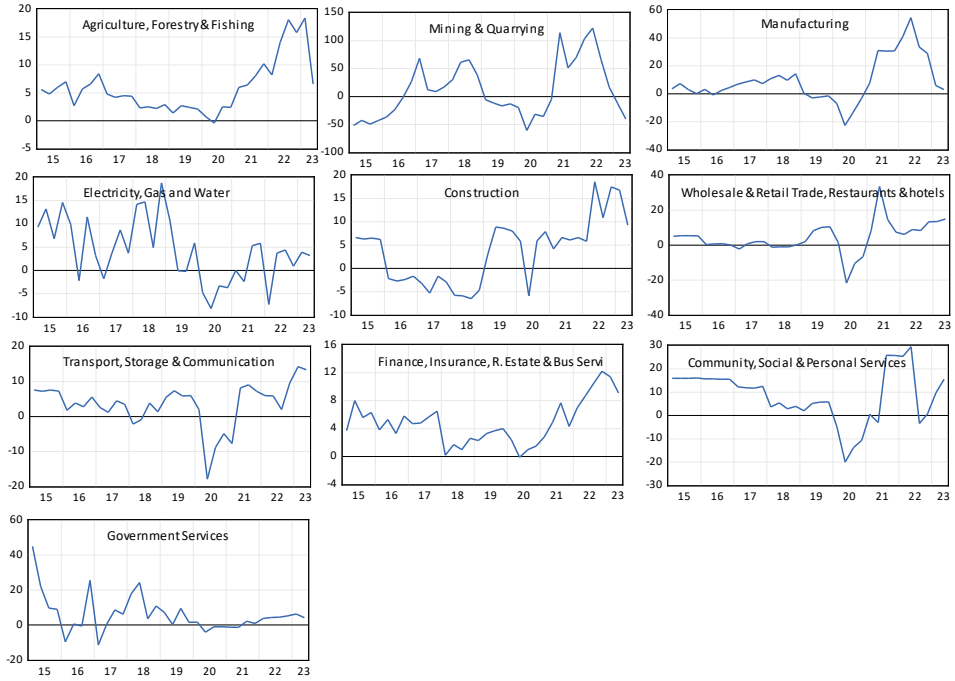

Figure A2. GDP growth for different sectors

Sources: authors' calculations