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# UNLOCKING WOMEN'S WORK : KEY DETERMINANTS OF FEMALE LABORFORCE PARTICIPATION (FLFP) IN PAKISTAN USING TIME SERIES TECHNIQUES

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**Abstract**
*This study analyzes the determinants of Female Labor Force Participation Rate (FLFPR) in Pakistan from 2000 to 2023 using the ARDL model. Results identify gender parity (FLFPR_RATIO) as the most statistically significant determinant, while maternal mortality exerts a marginal positive influence. Conversely, public education expenditure and political representation were found to be statistically insignificant, suggesting a mismatch between policy design and labor market outcomes. Cointegration tests indicate a lack of long-term equilibrium, limiting interpretations to shorter-term dynamics. Correlation analysis further links FLFPR to legal frameworks, adolescent fertility, and GDP per person employed. To dismantle persistent socio-cultural and institutional barriers, the study advocates for integrated, evidence-based policies. Key recommendations include advancing gender parity, improving maternal healthcare, restructuring education policy, and fostering substantive political roles for women to ensure sustainable economic inclusion and overcome structural hurdles in Pakistan's labor market.*

## INTRODUCTION

Female labor force participation has become a key factor of economy's growth and social development but in Pakistan, the rate of FLFP is still very weak as compared to worldwide average. The female segment of society in the country numbers is close to making up the 50% of the whole population, but due to multiple socio-economical, cultural, institutional, and legal barriers, their participation in the economic life is still limited. The report by World Bank (2023) shows that the FLFP rate in Pakistan is around 25.7(approximately), much below their neighbors like Bangladesh and India. The historical gap between women and men in labor force does not only calm economic advances but structure deeper disparities in education, job opportunities, health, political control, and societal norms (Konu, 2024; Malhi, 2024). The determinants of FLFP identified with reference to multiple studies are the level of education and low fertility rates, legal rights, political participation, and macroeconomic factors. The study of Rehman et al. (2023) and Singh & Sethi (2023) points out that the higher the levels of education and inclusive labor policies, the higher the levels of female workforce

participation are. Nevertheless, cultural norms and conventional gender roles sometimes disincentivize women by attempting to prevent women to actively participate in the workforce, especially in conservative cultures, which is the case in Pakistan (Gomes, 2024; Singh & Meher, 2024). Moreover, new factors like gender-sensitive government and maternal mortality have been found to have a great impact on the labor market performances of women (Joyce et al., 2024; Ghani et al., 2013). Measures of macro economy like GDP per person employed (constant 2021 PPP $) are becoming commonplace in efforts to comprehend that productivity-based growth as well as its correlation with labor force developments (Su et al., 2019). Research paper also notes the significance of gender-inclusive legal frameworks, including those which are captured through the Women, Business and the Law Index, to signify the extent to which regulatory environment is conducive to women in business endeavors (Trumbic, 2020). Also, the rate at which women serve in national parliaments, as a proxy of political empowerment, has been found to influence positively the female labor participation through the influence it causes on gender-sensitive public policies (Ghani et al., 2013). Maternal mortality ratio is also very critical as a health indicator. When maternal mortality is high, it is a sign of poor access and support to the healthcare system that may deter the decision of the working population because of the higher risks of reproductive health problems (Joyce et al., 2024). In the same line of thought, gender imbalance in the labor market can be identified through demographic statistics, which includes percentage of women in the total population and the female-to-male participation rate in the labor market rates (Muslinawati et al., 2024). The women contribution to the economy is one of the main factors that contribute to FLFP because of the sociocultural perceptions of women in relation to the economy. The employment of women is not believed to be a primary priority since most of them are staying in traditional families where they are forced to raise children and take care of domestic concerns (Junaid et al., 2019; Sunday et al., 2024). Such traditional perceptions can be overcome by creating awareness regarding the financial advantages of gender equality and hailing the success stories of working women to boost the number of females joining the work force. Though numerous attempts have been made to improve FLFP, the area of concern remains major because of wage gaps, job segregation, low representation in managerial duties, and the poor enforcement of gender-sensitive labor laws (Saha & Singh, 2024). Policy makers require putting in place specific measures that would combat gender discrimination during recruitment, offer flexibility in the work place and offer legal cover against discrimination. Moreover, entrepreneurial initiatives concerning women and the development of the women credit market may be used to establish other means of women economic activity, especially in the informal and home sector (Malhi, 2024; Sajid, 2021). By incorporating these complex obstacles, Pakistan will be able to unleash the potential of Pakistan's women workforce, which will invigorate economic growth and social justice. In order to evaluate the effect of the gender parity in labor force participation (FMLFPR_RATIO) on FLFPR.. To determine the effect of the governmental spending in education and female political attendance is contributory to FLFPR. In addition, To determine how maternal health (defined in terms of maternal mortality) relates to women work involvement in the labor market. Although several policy procedures and economic development have taken place, the level of FLFP in Pakistan is shockingly low, which has been triggered by binding cultural expectations, educational constraints, lack of law enforcement, and barriers to health. Although there have been improvements in the level of education provided to women, the equity in the move into employment has been poor especially considering the absence of supportive institutions and they have not been covered fully in the economic policy. Early childbirth and maternal mortality due to adolescent fertility are some factors that affect FLFP big time because of the discouragement to participate in economic activities brought upon by the vagaries of childbirth. Besides, women have less access to the labor market due to under representation in

politics as well as poor legal systems. Other macroeconomic data like GDP per head of the population that are also utilized also point to systemic flaws on the use of female talent. The proposed study will address the research gaps of data presented in previous studies to provide result-oriented evidence to guide selection and implementation of gender-responsive labor policies.The paper is most essential in knowing the changing and diverse factors of female labour supply in Pakistan. The fact that the study takes into consideration both the traditional (education, fertility) and emerging (maternal health, legal rights, political representation) variables makes the study even more comprehensive in terms of the angle through which women and their performance in the labor market is viewed. Its results will provide policy-makers with feasible guidelines to develop inclusive policies on the labor market to empower females in their economic wellbeing. The research is part of the global and national discussions in gender equity, Sustainable Development Goals (SDGs), as well as inclusive growth, making FLFP a development fundamental in the socio-economic transformation in Pakistan.

**Literature Review**

The participation of the women in the labor force is dependent on many elements such as economic pressures, cultural values, education, health, political empowerment, and the nature of the labor market needs. These issues on women involvement in paid work have been studied by scholars worldwide. Although certain obstacles, like wage gaps, poor access to education, and occupational segregation are frequently found, the scope and severity of such issues can vary widely, depending on conditions in different localities. The appreciation of these forces is important in countries such as Pakistan where the rate of labor participation among females is still quite low even though there has been improvement in terms of education and policy changes. In order to offer a good background to this research work, the next section is used to identify some of the critical empirical and theoretical books on the aspects of female labor force participation determinants.

The possible prior research is structured and presented below in the form of the most related research pointing out not only the global perspective but also the research aimed at Pakistan and other developing countries. dwell persistently on a number of aspects of FLFP in Turbkiye including how education, cultural norms and the policies of the government play out. In their study, they conclude that gender-responsive labor policies hold a position of critical importance in influencing FLFP when put to practice and that far more frequently than otherwise can no longer be regarded as an artificial issue when it comes to labor participation among women[1]. Global employment gender gaps in studying the employment gaps between women and men, looks at the FLFP differences among various economies. The research identifies that in certain areas significant gains have been achieved in the field of narrowing the gender inequality in employment yet in other regions the problem persists. Among the main influential aspects, one can distinguish wage disparities, occupational segregation, and the lack of access to and limited opportunities to establish skill development programs [2]. By placing specific emphasis on Indonesia, explores what factors determine the participation of women in a workplace in varied social and geographical settings. In the study the researcher concludes that education, marriage, marital status and household responsibilities have significant influence on FLFP. Moreover, rules that encourage work-life and childcare are proposed to exist as imperative measures to enhance women labor market presence[3]. It realizes a content analysis of current literature on FLFP, pointing out the key trends and topics. This study has emphasized the role played by factors inclusive of government policy, economic circumstances and cultural expectation within the society which shape the choice of females to work in the labor force. One of the most important findings is that gender-equitable policies and flexibility in the labor market could have a positive effect on the rates of FLFP [4]. Comparative analysis of rural, and urban labor market in India as conducted by showing that female workers in the rural spaces have different impediments including mobility

and access to education. On the contrary, wage differentials and occupational segregation affect women in urban areas more. The need to have region specific policies in regard to dealing with these challenges is brought out in the study[5]. The significance of political and institutional processes in designing FLFP is discussed. In their study, they prove that the more women exhibit political activity, the more they are engaged in labor market activity. The article maintains that gender sensitive labor policy is created when women occupy policymaking roles in support of the interests of FLFP [6]. It discusses why female labor is invisible in an assessment of the traditional labor market. This is because the employment study contends that unpaid and the informal sector works are usually ignored, and as such, women contribution to the economy cannot be fully captured. Malhi advocates shift in defining works in the labor market to capture unpaid domestic and caring agencies and enhances the measurement of FLFP more accurately[7]. Through the interstate analysis of FLFP in India, it is seen that high female educational achievements and women-inclusive policies result in higher labor force engagement by women in those states. The research concludes that economic growth cannot be enough in enhancing FLFP as specific policies that tackle education, affordable childcare services, and legal policies, among others are required to achieve long-term gains [8]. it assess the macroeconomic factors defining the FLFP of various nations using the panel data method. According to their findings, social norms, family policies, and state of economy are critical dimensions of the female employment levels influence. The paper focuses on the need of gradual gender policies and economic incentives as a way of enhancing FLFP [9]. The author examines the financial role of the labor underrepresentation of women on the economy. Some of the barriers described in the study include discriminatory actions, expectations in the society, and inadequate institutional support. Lim opines that disparity in employment between women and men results in a sub-optimal economic growth and raises affirmative action policies as a remedial measure in ensuring inclusion at work [10] . it address the issue of the inequality of massification of tertiary education and the workforce among the female population in Malaysia. They apply the approach of statistical tests to then figure out the impact of education on FLFP using World Bank data. Despite the fact that women are bringing on more graduates than the men, they continue to be underrepresented in the employment. There are other barriers mentioned in the paper in denying the direct education and work participation. The given research contributes to the debates regarding gender parity and the idea that the problems concerning gender parity cannot be solved solely via education. [11] . In their study of the factors resulting in mean FLFP in Lahore, Pakistan, it examine cross-sectional data consisting of 450 observations compared with logit regression. Study conclusion The study concludes that higher education and marriage positively influence participation whereas joint family arrangements or urban living reduces participation. There is also a negative impact of the economic behavior of household heads as well as poor women empowerment on labor force participation. The necessity to consider these socioeconomic factors is pointed out in the paper [12]. It explores such a paradox as the low labor participation of the female population in MENA in spite of the level of education that increases. They apply multinomial logit models to survey data of labor forces on Algeria, Egypt, Jordan and Tunisia to investigate the participation trends. The educated women become less likely to secure jobs in the public sector and thus become unemployed or reduce participation. The research paper follows the trend of structural reforms as the cause of the slowdown in the labor force participation of women due to a decrease in employment opportunities in the government sector [13]. It study the work and education of the Indian women in the era of liberalization, paying attention to Sustainable Development Goals (SDGs). Exploiting data on NSSO and PLFS (1993–2022), they examine Women's Labor Force Participation Rates (LFPR) and gender inequalities. This is despite a growing economy, Sweden still has gender gaps and rural/urban differences lie at the center of this. There has been raised education levels in women, reducing the

gender gaps. The paper discovers a curvature-like correlation between education and LFRA, which implies specific policies [14]. it employies shift-share and multiple regression analysis in this paper to eamine low participation of female to the labor force in Pakistan. The male participation in labors was decreased between 2002 and 2015, and there was an increment in the participation of women but at a lower rate in urban settings. The growth in the level of educated women did not affect participation in the upper labor markets. The most crucial factors comprise GDP per capita, level of poverty, unemployment among women, fertility rate, and literacy. The research emphasizes the demand to expand the female presence toward socioeconomic development.[15]. It investigates on the factors that determines female fertility on labor force participation on Tanzania using Demographic and Health Survey data (2015–2016). Using instrumental variable probit and two-stage residual inclusion techniques they estimate fertility reduces labor participation by 1.1–13 percent. Participation is determined by household size, education, the use of contraceptives and self-employment of husbands. This research advocates family planning, educating women, self-entrepreneurship, and enhancing the rural infrastructure to be able to participate in a sustainable way [16]. In their research paper,examine the World bank data regarding the FLFP in India (2000–2022). Using the Ordinary Least Squares regression, they explore the structure between the FLF and fertility scores as well as the marriage scores. FLF was on an upwards trend (2001–2005) but since then it has been on a downward trend and a new low because of COVID-19 in 2020. The compound annual growth rate (–0.960) indicates the overall FLF decrease that is caused by cultural norms and socioeconomic fluctuations. The scores of fertility and marriage have a positive correlation with FLF [17]. Altaf (2019) empirically tests the FLFP and governance in 62 developing countries between the years 1996 and 2016. In the study, there is an effort to approximate the correlation between governance and women labor force participation through GMM estimation and the result is positive. Education, GDP per capita and globalization are two factors that influence governance since the latter determines higher governance versus income inequality which is a weaker measure of better governance. Education, fertility rate and rural population reduce the contribution of females negatively but globalization positively influences female participation. One of the essential features which are crucial to the economic and societal development is the governance and female deception of the working force [18]. It analyzes macroeconomic indicators of female labour force participation (FLFP) in D-8 countries (1980–2018). The study indicates that GDP and tourism have a positive influence on FLFP based on PMG and ARDL modeling, whereas there are mixed feelings about trade openness, FDI, and urbanization. The influence of the economy on FLFP through primary education, ICT and transport suppresses impact. Nevertheless, the development is hindered due to ethnolinguistic and religious diversity, political situation, and higher education. The article arrives at the conclusion that FLFP in D-8 countries needs to be improved using inclusive macroeconomic policies [19]. Applying bootstrap panel Granger causality, Wei Su, Zheng-Zheng Li, Ran Tao, and Oana-Ramona Lobon (2019) examined temporal dependency between economic growth and women labor force participation (FLFP) among the set of nations in Asia. What they have determined is the hypothesis of U-shaped relationship as they have discovered that, the relationship between GDP per capita and FLFP varies with country, as well as country level of development. At the early stages of development, FLFP goes lower due to the effects of income, whereas at mature levels, the effects of substitution and education are the determinants of participation. The paper emphasizes the importance of context friendly policies in order to harness the economic capacity of women [20]. The critical study of the concerned scholarly refuted the usual hypothesis of the U-shape curve of the female participation in the labor force and economic development with references to the growth of the GDP. He pointed out that the social customs, development trends, levels of education

all play significant roles in economic determination of women activity level in the countries. Venturing further into the study, the policymakers are called upon to cease the use of participation rates and focus on the access of quality employment to women. This understanding expands the discussion on the topic of gender development and labor markets [21]. In a study conducted by Kerry Joyce, Dobdinga Cletus Fonchamnyo and Vukenkeng Andrew Wujung (2024), it was found out that there is no existing statistically significant relationship between maternal mortality and FLFP in Cameroon. They used Multiple Correspondence Analysis and LRETEM model and resultantly found a significant positive correlation was found — an increase of 12.9 percent in maternal mortality was found per 1 percent increase in FLFP. Education was also found to diminish maternal deaths irrespective of the level obtained. Evidence-based health policies and assisting healthcare providers are the options that the study suggests in order to reduce these impact [22]. Cross-checked the effects of political empowerment of women among women in India on female labor participation (FLFP). With the mandated female political representation as an example, they discovered that the duration of exposure to female leaders played a large role as it boosted FLFP considerably. This was done both by direct job provision itself in MGNREGA program and by enhanced access of people to public goods. Their findings emphasize that labor provision as well demand can be rejuvenated through political representation, which presents a possible policymaking tool against the negative trends in FLFP [23]. In the report, Women, Business and the Law 2020 by Tea Trumbic, legal and regulatory restrictions to economic inclusion of women have been examined in 190 economies on the basis of the Women, Business and the Law Index. Addressing eight major indicators comprising mobility, pay, entrepreneurship, and parenthood, the report depicted a high correlation between legal gender equality and the participation of women in the labor market. In the study, it is stressed that despite the mention of reforms, there exist major gaps legally that can make women not fully empowered economically around the world [24]. Retno Muslinawati, Khalid Fauzi Aziz, and Siskha Trifandha examined the effect of the size of female workforce, population, and open unemployment to the FLFP (FLFP) in East Java with the use of secondary statistical information and descriptive statistics analysis. They established that the percentage of population and workforce was a positive and significantly attributed factor to FLFP whereas female open unemployment was negative. The F-tests and t-tests indicated that such relationships were significant. The paper draws attention to labor relations at the macro level as the concept defining the labor market involvement of women [25]. Anna Fruttero, Daniel Gurara, Lisa Kolovich, Vivian Malta, Marina Mendes Tavares, Nino Tchelishvili and Stefania Fabrizio stated in *Women in the Labor Force* that even though improvement has been made, there is still an over 20 percentage point gap between female participation in labor force (FLFP) and male participation worldwide in 2008. Women have not been integrating into the economy due to persistent gender wage gaps and inequality in access to education. The paper highlights that advanced gender equality helps industry growth and facilitates the priority UN Sustainable Development Goals (SDGs). It is in line with the earlier IMF results on empowerment development of women economically.

Several theories help explain the complex factors that influence FLFP. Labor Supply Theory suggests that women's participation in the workforce is determined by comparing the benefits of working (such as income) with the costs. Human Capital Theory emphasizes that education and health are crucial investments that increase an individual's productivity and employability, making it especially relevant when analyzing the effects of public expenditure on education and maternal health. Gender Development and Empowerment Theory highlights the importance of gender parity and political representation in promoting equal opportunities and supportive policies for women's participation in economic activities. Together, these theories provide a multidimensional understanding of how economic, social, health-

related, and institutional factors affect women's decision to enter the labor market. Among these, Human Capital Theory is the most appropriate theoretical foundation for this study. It provides a broad and cohesive explanation for all the key variables under consideration—education spending, maternal health, gender parity, and political representation—by treating them as forms of capital that enhance women's ability and willingness to participate in the labor force. In Pakistan's context, where access to education, healthcare, and political voice remains uneven for women, Human Capital Theory effectively links these factors to labor market outcomes. This theory enables the study to focus on how investments in women's development can increase their economic participation, thereby offering valuable insights for policy and planning.

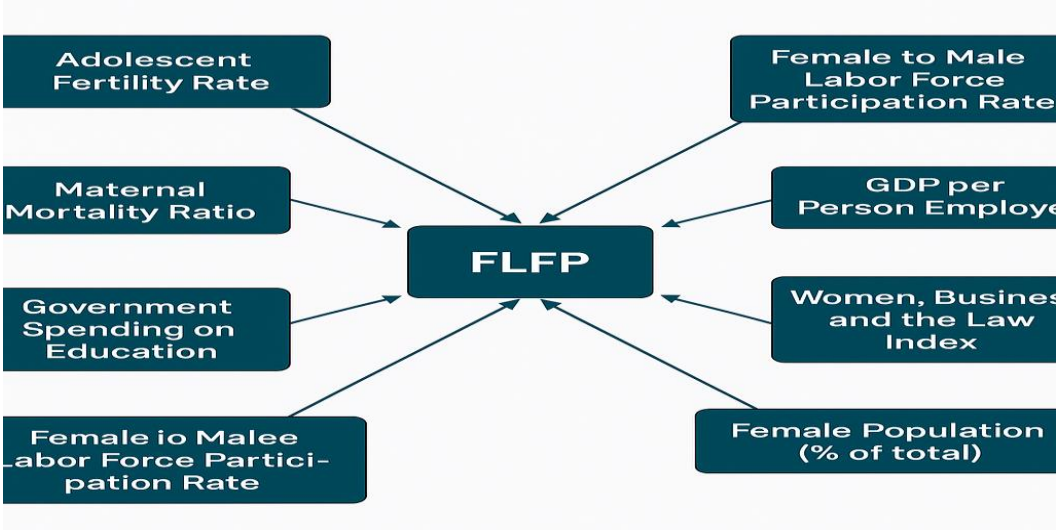


**Fig :1 Conceptual Framework**

## METHODOLOGY

In this research paper, study design is Quantitative and time series econometric analysis of the relationship between the determinants of Female Labor Force Partake (FLFPR) in Pakistan. Due to the dynamics of the labor market participation and economic development, the time series approach would be appropriate because it enables one to consider long-run patterns, variability, and interaction between FLFPR and the selected socio-economic, demographic factors, and institutional variables. The study is a causal study expected to examine determining the causalities between FLFPR and its major determinants, which include adolescent fertility rate, governments expenditure on education, GDP per person in employment, maternal rates of death, political representation, gender-inclusive legal systems, as well as population demographics (rahag, 2020). It applies an econometric strategy to guarantee statistical understanding in examining the aspects that impact on the presence of women in the Pakistani workforce. In the research, the economy of Pakistan is considered as a whole so as to adopt the national trend and macro-level factors that define women labor force participation. There is a strong need to conduct an analysis on national level to create the policy-relevant findings that can be generalizable across the various socio-economic and demographic socio-economic and demographic settings within Pakistani contexts (Altaf, 2019). This larger frame will enable quality evidence that can be used in policy-making within the countries and at the institutional level since the participation in the labor market in Pakistan can be influenced by structural, cultural, health-related, and policy-based factors at the macro level. A longitudinal outlook of the changing relationship between FLFPR and its determinants is based on the use of secondary time series data

between the years 2000 to 2023 and is used in the study. The past statistics can be used to thoroughly explore the role that changes to the main indicators played in affecting the economic activity of women over the years (Emran, 2021).The statistical data used in the paper is compiled, mainly, using the World Development Indicators (WDI) of World Bank, thus allowing the study to be consistent, reliable, and internationally comparable on all the indicators of the paper, including uses of labor force, economic conditions, health results, political inclusiveness, and legal status of gender declarations.

**Table 1: Description of Variables Used in the Study**

| *S. No.* | *Variable Name* | *Type* | *Description* |
|---|---|---|---|
| *1* | FLFP Rate (FLFPR) | Dependent Variable | % of women aged 15–64 participating in the labor market |
| *2* | Adolescent Fertility Rate (AFR) | Independent Variable | Births per 1,000 women aged 15–19 |
| *3* | Government Spending on Education (EDU_EXP) | Independent Variable | % of GDP spent on education |
| *4* | GDP per Person Employed (GDP_PE) | Independent Variable | Productivity-based measure of economic output per employed person |
| *5* | Maternal Mortality Ratio (MMR) | Independent Variable | Maternal deaths per 100,000 live births |
| *6* | Women in National Parliaments (WOM_PARL) | Independent Variable | % of seats held by women in national parliament |
| *7* | Women, Business and the Law Index (WBL_SCORE) | Independent Variable | Index measuring legal/institutional support for women's economic inclusion |
| *8* | Female Population (% of total) (POP_FEM_PCT) | Independent Variable | % of total population that is female |
| *9* | Female to Male LFPR Ratio (FMLFPR_RATIO) | Independent Variable | Ratio of female to male labor force participation |

In attempting to determine the effects of these independent variables on FLFPR, the research uses the econometric model below:

$$FLFPR_t = \beta^0 + \beta^1(AFR_t) + \beta^2(EDU_{EXPt}) + \beta^3(GDP_{PEt}) + \beta^4(MMR_t) + \beta^5(WOM_{PARLt}) + \beta^6(WBL_{SCOREt}) + \beta^7(POP_{FEM_{PCT}t}) + \beta^8(FMLFPR_{RATIOt}) + \mu.t \dots (1)$$

As given above, the provided equation is aimed at clarifying the factors that had an impact on FLFP over the period. In this model, FLFPR t refers to the rate of FLFP at one particular time t as the dependant variable. The constant, 20 is the level of participation when all other variables are set to zero. The coefficients one by one, 18-8, determine the particular influence of the explanatory variable on FLFP. Lastly, there is the error term, which is the term denoted by $\mu_t$ acts as a collective of the externally or unobserved factors that may directly influence the dependent variable but do not directly contribute to the model (Junaid, 2019).

**Table 2:Techniques of Estimation:**

| *S.No.* | *Econometric Technique* | *Purpose/Description* |
|---|---|---|
| *2.1* | Descriptive Statistics | Used to summarize the data by capturing the central tendencies, dispersions, and patterns or trends within the dataset. |
| *2.2* | Unit Root Tests (ADF, PP) | Applied to test the stationarity of the time series data, ensuring the variables are suitable for regression analysis and do not follow random walks. |
| *2.3* | Johansen Cointegration Test | Determines whether a long-term equilibrium relationship exists among the selected variables in the model. |
| *2.4* | Ordinary Least Squares (OLS) | Estimates the linear impact of independent variables on the dependent variable, assuming classical linear regression assumptions are met. |
| *2.5* | Error Correction Model (ECM) | Captures both short-run dynamics and long-run equilibrium by correcting deviations in the short run. |
| *2.6* | Diagnostic Tests | Evaluates the reliability of the regression results by testing for problems like autocorrelation, heteroscedasticity, and non-normality of residuals. |

This methodology is suitable because it reflects the time-dependent nature of the data and the evolving socio-economic conditions of Pakistan. By applying techniques like cointegration, unit root tests, ECM, and diagnostic checks, the study ensures validity and robustness. This approach not only strengthens the reliability of the findings but also supports the development of gender-sensitive labor market policies by uncovering long-term structural and institutional influences on FLFP (Gomes, 2024).

On the bases of the unit root analysis findings offered in Section 4.5, it is proposed in this paper to investigate the dynamic association between the FLFP Rate (FLFPR) and a group of socio-economic determinants based on the ARDL (ARDL) model. The approach used by Pesaran, Shin and Smith (2001) given by the ARDL methodology is flexible to use both in the integrated of order zero and order one regressors, I(o) and I(1) respectively, hence pre-testing cointegration is not required under strict I(1) assumptions. Nevertheless, there is no possible inclusion of variables of order I(2) in the framework. In that way, GDP per capita (GDP_PE), which can be determined as I(2), will not be considered in the process of estimation. Variables maintained in the estimation of the model include, public expenditure per capita on education (EDU_EXP), ratio of maternal mortality (MMR), Women in parliament (WOM_PARL) and the ratio of females and males in the labor force (FMLFPR_RATIO) and all these variables align to the stationarity criterion that must be met by the ARDL estimation (Elhadary, 2024).

The ARDL model adopted in this study can be expressed in the following general form:

$$\Delta FLFPR_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \Delta FLFPR_{t-i} + \sum_{j=0}^{q_1} \gamma_j \Delta EDU\_EXP_{t-j} + \sum_{k=0}^{q_2} \delta_k \Delta MMR_{t-k} + \sum_{l=0}^{q_3} \theta_l \Delta WOM\_PARL_{t-l} + \sum_{m=0}^{4} \phi_m \Delta FMLFPR\_RATIO_{t-m} + \lambda_1 \Delta FLFPR_{t-1} + \lambda_2 EDU\_EXP_{t-1} + \lambda_3 MMR_{t-1} + \lambda_4 WOM\_PARL_{t-1} + \lambda_5 FMLFPR\_RATIO_{t-1} + \varepsilon_t \ldots.(2)$$

Where Delta is the operator of first difference, alpha0 is the constant term and epsilon t is the error term. The short-run dynamics are indicated by the coefficients $\beta$, $\gamma$, $\delta$, $\theta$, $\phi$ whereas the long-tailed relationships of FLFPR with the explanatory variables are represented by lambda 1 to lambda 5 (al s. e., 2024).

According to the Akaike Information Criterion (AIC), the best lag structure is ARDL(1,1,1,1,1) which implies the consideration of one lag to each

of the variables. Such a specification is especially applicable when sample size is small so as to be parsimonious without being too primitive to enshrine dynamic interrelationships (Annal, 2019).

## DATA PROCESSING AND ANALYSIS

In the paper, the factors of FLFP in Pakistan have been illuminated based on the annual data between 2000 and 2023. All the variables were available in the World Development Indicators or (WDI). As stated in Table 1, each variable has been explained in respect to its full variable name, short hand and the role of the variable in the analysis (as the dependent variable or the independent variable).

**Table 3: Variables, Abbreviations, and Roles in the Study (2000–2023)**

| Variable Name (Full) | Abbreviation | Role |
|---|---|---|
| Labor force participation rate, female (% of female population ages 15–64) | FLFPR | Dependent |
| Adolescent fertility rate (births per 1,000 women ages 15–19) | AFR | Independent |
| Government expenditure on education, total (% of GDP) | EDU_EXP | Independent |
| GDP per person employed (constant 2021 PPP $) | GDP_PE | Independent |
| Maternal mortality ratio (per 100,000 live births) | MMR | Independent |
| Proportion of seats held by women in national parliaments (%) | WOM_PARL | Independent |
| Women, Business and the Law Index Score (scale 1–100) | WBL_SCORE | Independent |
| Population, female (% of total population) | POP_FEM_PCT | Independent |
| Ratio of female to male labor force participation rate (%) | FMLFPR_RATIO | Independent |

In Table 3, the percentage of missing of the observations of each variable is illustrated, with the number of missing values being provided as well.



**Table 4: Summary of Missing Observations (2000–2023)**

| Variable | Missing Values | Total Values | Missing (%) |
|---|---|---|---|
| FLFPR | 0 | 24 | 0.00 |
| AFR | 1 | 24 | 4.17 |
| EDU_EXP | 3 | 24 | 12.50 |
| GDP_PE | 0 | 24 | 0.00 |
| MMR | 3 | 24 | 12.50 |
| WOM_PARL | 2 | 24 | 8.33 |
| WBL_SCORE | 0 | 24 | 0.00 |
| POP_FEM_PCT | 0 | 24 | 0.00 |
| FMLFPR_RATIO | 0 | 24 | 0.00 |

The table 4 indicates the number of missing cases by variable. The gaps in AFR and WOM_PARL are filled by means of the linear interpolation. These procedures are applicable in cases of their low missing rates (4.17% and 8.33%) and maintain continuity of time series. In the case of EDU_EXP and MMR with a high level of missing values (12.5 percent), multiple imputation is applied. It picks out the trends of time and minimizes prejudice.

**Table 5: Summary Statistics of Variables (2000–2023)**

| Variable | Min | 1st Qu. | Median | Mean | 3rd Qu. | Max | Std. Dev. |
|---|---|---|---|---|---|---|---|
| FLFPR | 16.40 | 19.47 | 23.10 | 21.87 | 24.31 | 25.79 | 3.17 |
| AFR | 42.30 | 46.98 | 51.88 | 54.55 | 59.26 | 76.60 | 9.83 |
| EDU_EXP | 1.44 | 1.80 | 2.03 | 2.01 | 2.22 | 2.42 | 0.27 |
| GDP_PE | 12385 | 13759 | 14313 | 14853 | 16610 | 17749 | 1792.99 |
| MMR | 154.0 | 201.5 | 230.0 | 253.0 | 309.2 | 387.0 | 72.54 |
| WOM_PARL | 20.18 | 20.56 | 21.05 | 21.12 | 21.42 | 22.51 | 0.78 |
| WBL_SCORE | 38.12 | 38.12 | 44.38 | 45.23 | 50.62 | 58.75 | 7.31 |
| POP_FEM_PCT | 48.37 | 48.53 | 48.74 | 48.72 | 48.88 | 49.20 | 0.23 |
| FMLFPR_RATIO | 19.55 | 23.56 | 28.12 | 26.35 | 29.48 | 30.41 | 3.85 |

Table 5: shows average variability in the majority of the explanatory variables. There is a relatively high dispersion of AFR and MMR, which are indicators of considerable change in aspects of fertility and maternal health raising over the years. In their turn, POP_FEM_PCT and WOM_PARL are more consistent. The dependent variable FLFPR has low range and mean and median proximity which reveals that little and steady changes occur.

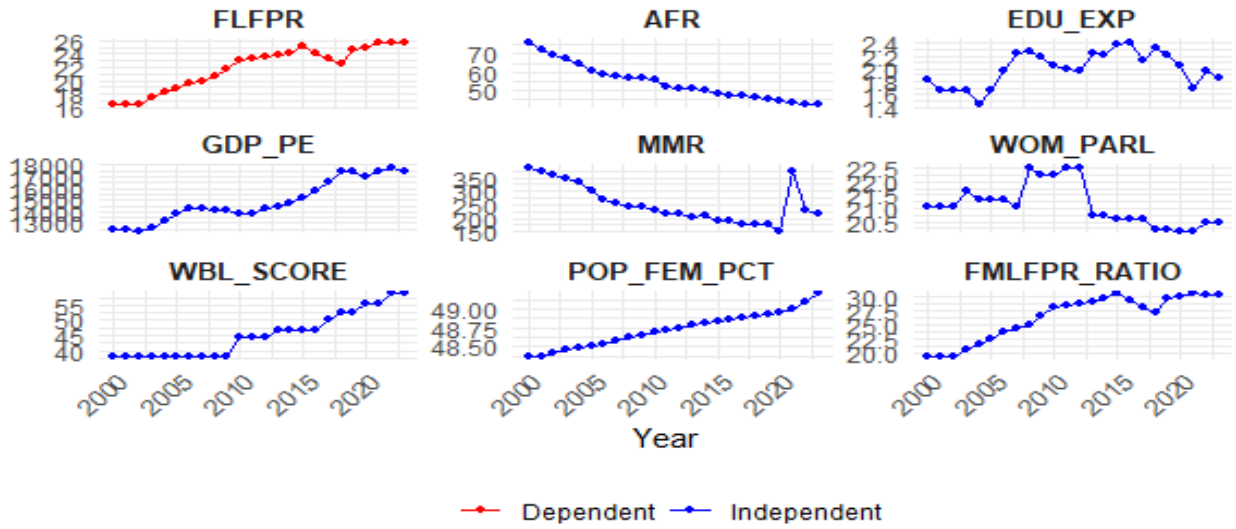


**Figure 2: FLFP Rate and Key Determinants in Pakistan (2000–2023)**

Figure 2: shows time-series developments in the period between 2000 and 2023 in the FLFP Rate (FLFPR) and other indicators. FLFPR depicts a steady rise, which implies the growing tendency to include females in the labor market. The Adolescent Fertility Rate (AFR) continues to decrease, and it implies better reproductive health. Education Expenditure (EDU_EXP) is variable and it has reached the highest in 2009 and the lowest in 2015 proving that it varies in its investment in human capital. GDP per Employed person (GDP_PE) increases dramatically after 2010 depicting an improvement in economic situations. There are gains in maternal health with the overall rate of Maternal Mortality Rate (MMR) decreasing, although there was a temporary increase in 2018. Participation of Women in Parliament (WOM_PARL) rises in an inconsistent

manner, which is an indication of sluggish political participation. The Women, Business, and the Law Score (WBL_SCORE) is significantly better after 2015, which means that legal rights are advancing. Female Share of Total Population (POP_FEM_PCT) is at a steady level as a form of control. Lastly, the Female-to-Male Labor Force Participation Ratio (FMLFPR_RATIO) is rising continuously indicating better gender balance in the labor force.

**Table 6: Results of Augmented Dickey-Fuller (ADF) Unit Root Test**

| Variable | ADF Test Statistic | p-value | Integration Order | Stationarity Conclusion |
|---|---|---|---|---|
| FLFPR | -4.303594 | 0.0133 | I(1) | Stationary at first difference |
| EDU_EXP | -4.747863 | 0.0011 | I(1) | Stationary at first difference |
| GDP_PE | -4.598411 | 0.0082 | I(2) | Stationary at second difference |
| MMR | -5.484316 | 0.0013 | I(1) | Stationary at first difference |
| WOM_PARL | -5.212251 | 0.0020 | I(1) | Stationary at first difference |
| FMLFPR_RATIO | -3.469549 | 0.0192 | I(1) | Stationary at first difference |

Table 6: it indicates the outcome of the Augmented Dickey-Fuller (ADF) unit root tests that were carried out to establish stationarity characteristics of the study variables. The findings reveal that all the variables, with precedence to GDP_PE hold stationarity at the first difference, a condition that signifies first order integrations of the given variables [I(1)]. Particularly, FLFPR, EDU_EXP, MMR, WOM_PARL, and FMLFPR_RATIO null hypothesis of the unit root is rejected at the 5 percent significance level after 1 st differencing. Nonetheless, GDP_PE is combined of second order [I(2)]. This offends one of the fundamental concept of the ARDL bounds testing method which can only be applied when the variables integrated are either of order zero [I(0)] and one [I(1)] and not of order two [I(2)]. The presence of I(2) variable would skew the asymptotic distribution of the F-statistics deployed in testing of cointegration thereby compromising the model validity. Hence, GDP_PE is not entertained any further in the analysis to have consistency in the methods of analysis and to have a statistical stable ARDL framework (Pesaran, Shin, & Smith, 2001).

**Table 7: ARDL (1,1,1,1,1) Estimation Results**

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| FLFPR(-1) | 0.7221 | 0.2561 | 2.8195 | 0.0145 |
| EDU_EXP | -0.1607 | 0.2751 | -0.5843 | 0.5690 |
| EDU_EXP(-1) | 0.1591 | 0.2430 | 0.6550 | 0.5239 |
| MMR | 0.0016 | 0.0010 | 1.7279 | 0.1077 |
| MMR(-1) | 0.0005 | 0.0010 | 0.5059 | 0.6214 |
| WOM_PARL | -0.1008 | 0.0673 | -1.4972 | 0.1582 |
| WOM_PARL(-1) | -0.0130 | 0.0786 | -0.1655 | 0.8711 |
| FMLFPR_RATIO | 0.8875 | 0.0419 | 21.1676 | 0.0000*** |
| FMLFPR_RATIO(-1) | -0.6235 | 0.2269 | -2.7483 | 0.0166** |
| C | 0.9814 | 1.9614 | 0.5003 | 0.6252 |

*Table : 7* The estimation values in table 7, however, reveal that the coefficient of the lagged dependent variable FLFPR(t- i) is positive and at 5 percent level significant and hence the evidence of strong persistence in the female lab force participation over time. The current coefficient of FMLFPR_RATIO_t is also significant and highly appreciable at level 1 percent implying that gender equivalence in participation in labor force causes an instant and significant effect on FLFPR. On the other hand, the negative, and statistically significant value of the coefficient of FMLFPR_RATIO_(t-1) suggests an existence of a short-term balancing mechanism that equally corrects any deviations in the disequilibrium with long-run path. Besides, coefficients corresponding to education spending on government, maternal mortality as well as female representation in parliament are statistically insignificant at the usual levels, be it contemporaneous or lagged. The latter can be taken to indicate that there is no direct effect of these variables in the short term on FLFPR by reason of the current model specification and the period. However, the marginal insignificance of the MMR coefficient (p 689| celebrity gossip 692 determines the possibility of indirect, or lagged effects that can be produced on a longer time scale or can be found under various specifications. R-squared of 0.9987 and adjusted-R square of 0.9979 also implies a good model fit, but care should be taken due to the small n (23), as these are likely to be artificial. It is quite important to note that the Durbin-Watson statistic value 2.6035 indicates non-existence of the first order autocorrelates in addition to the fact that the model is supported by fact that it is not weakened by apparent autocorrelates.

**Table 8: ARDL Bounds Test Results**

| Test Statistic | | Value |
|---|---|---|
| F-statistic | | 1.416 |
| k (number of regressors) | | 4 |
| **Significance Level** | **I(0) (Lower Bound)** | **I(1) (Upper Bound)** |
| 10% | 2.46 | 3.46 |
| 5% | 2.947 | 4.088 |
| 1% | 4.28 | 5.84 |

*Table 8:* In order to identify the existence of the long-run relationship between the dependent variable (FLFPR) and the explanatory variables (EDU_EXP, MMR, WOM PARL, FMLFPR RATIO), we will calculate the ARDL bounds test with assuming the restricted constant and no trend case. .Cointegration is tested by using the ARDL bounds test on table 8. The F-statistic of 1.416 that is lower than the lower bound critical values across the levels of significance shows that the hypothesis of long-run relationship between FLFPR and chosen exploratory variables has no evidence. Therefore, the null hypothesis regarding no cointegration could not be rejected.

**Table 9: Estimated Long-Run Coefficients (ARDL Model)**

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| EDU_EXP | -0.00578 | 1.16598 | -0.00496 | 0.9961 |
| MMR | 0.00778 | 0.00816 | 0.95334 | 0.3578 |
| WOM_PARL | -0.40934 | 0.25336 | -1.61564 | 0.1302 |
| FMLFPR_RATIO | 0.95010 | 0.11190 | 8.49085 | 0.0000 |
| Constant (C) | 3.53083 | 5.38050 | 0.65623 | 0.5231 |

Table 9 In spite of not having cointegration, to complete the picture, the estimated long-run coefficients are given below. Nevertheless, due to the fact that the test of the bounds of ARDL failed to affirm cointegration results in the interpretation of these coefficients are exploratory and must be taken with prudence since the effects may not constitute a valid equilibrium. presents a presentation of estimated coefficients of the ARDL model at long run. Despite the fact that there is no evidence of cointegration, the results show that female to male labor force participation ratio (FMLFPR_RATIO) has the only variable that is statistically significant and strongly and positively correlated with FLFPR at 1 percent level significant. EDU_EXP, MMR and WOM_PARL however, are not significant meaning that the model shows no significant effect in long run on FLFPR. Conditional Error Correction Model (ECM) is made of short-run dynamics. Error correction term must have negative sign and must be significant to the short run convergence to equilibrium. Though, in this model cointegration was not determined, so the error correction term is quite cautiously interpreted. Since no cointegration occurred, the error correction format does not speak of a formally valid adjustment mechanism. Results in this section are therefore to be taken with a pinch of salt as they are being provided in diagnostic value as opposed to providing any true deduction.

**Table 10: Short-run ECM Representation**

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| FLFPR(-1) | -0.27794 | 0.25610 | -1.08530 | 0.2975 |
| D(EDU_EXP) | -0.16074 | 0.27511 | -0.58430 | 0.5690 |
| D(MMR) | 0.00165 | 0.00095 | 1.72792 | 0.1077 |
| D(WOM_PARL) | -0.10077 | 0.06731 | -1.49721 | 0.1582 |
| D(FMLFPR_RATIO) | 0.88754 | 0.04193 | 21.16755 | 0.0000 |
| Constant | 0.98136 | 1.96143 | 0.50033 | 0.6252 |

Table 10: it presents the short term dynamics of the ARDL error correction model. As shown in the table the differenced variables of no greater importance demonstrate the existence of a significant relationship between D(FMLFPR_RATIO) and 1 percent level on one hand implying an immediate and strong positive impact on FLFPR. The remaining explanatory variables, including the lagged value of FLFPR, are insignificant, which translates into low level of short run effects. Error correction term (FLFPR(-1)) is not removal in so far that there is no cointegration and adaptation of the long run equilibrium.

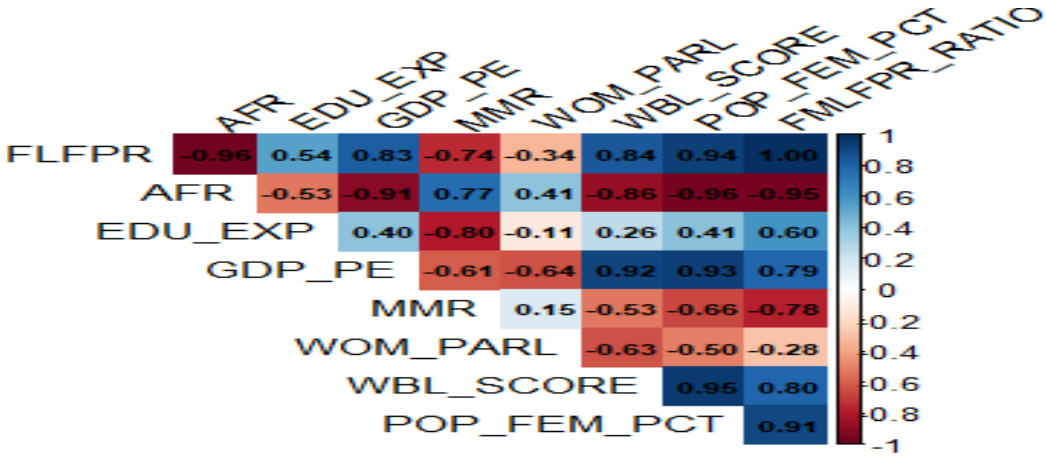


**Figure 3: Correlation Matrix of FLFP and Key Determinants (2000–2023)**

The correlation analysis which is seen in Figure 4.2 indicates that FLFP Rate is strongly positively related with Population Female Percentage (POP_FEM_PCT, r = 0.94), Women, Business, and the Law Score (WBL_SCORE, r = 0.84), GDP per person employed (GDP_PE, r = 0.83), and Female-to-Male Labor Force Participation Ratio (FMLFPR_RATIO, r = 1. On its part, FLFPR is highly Dir some with Adolescent Fertility Rate (AFR, r = -0.96), Maternal Mortality Ratio (MMR, r = -0.74) and Women in Parliament (WOM_PARL, r = -0.34). These results mean that increased participation of women in the labor force correlates well with improved economic situation, stronger legal recognition of women and improved reproductive health results. The 100 out of 100 positive association in the correlation between FLFPR and FMLFPR is a good signifier of the positive correlation between the two variables, as there is an inverse relationship between FLFPR and the FMLFPR which is 100 in our case. There are also a number of independent variables, the correlation between which are very strong, and that just may be influenced by some underlying factors, like WBL_SCORE, GDP_PE (r = 0.92), or POP_FEM_PCT (r = 0.95).

**Result and Discussion**

A time series study has been conducted on the primary factors that influence FLFP Rate (FLFPR) in Pakistan, administrative data based on yearly data between 2000 and 2023 were used to perform the investigation. Employing the ARDL model and correlation analysis, the research found that gender parity in labor (FMLFPR_RATIO) emerged as the most statistically significant determinant in both the short and long run, suggesting a strong connection between improved gender equality and increased female participation in the labor market. Maternal Mortality Ratio (MMR) showed marginal positive significance, implying that better maternal health outcomes could gradually encourage greater labor involvement. However, women's parliamentary representation (WOM_PARL) had a negative and statistically insignificant effect, highlighting that symbolic political representation alone is insufficient to influence labor outcomes without genuine policy-driven action. Similarly, government spending on education (EDU_EXP) did not significantly affect FLFPR, possibly due to deeper structural or cultural barriers disconnecting education and female employment. Other variables, such as GDP per capita, Women Business and Law Score (WBL_SCORE), adolescent fertility rate (AFR), and the percentage of female population (POP_FEM_PCT), were excluded from regression due to multicollinearity or integration issues, although they still revealed meaningful trends in the correlation analysis. Overall, the findings partially support the alternative hypothesis, confirming that while gender parity and maternal health play vital roles, other institutional and socio-cultural factors may

limit the impact of education and political representation on female labor participation.

This study explored the social, economic, health, and institutional factors influencing FLFP (FLFPR) in Pakistan. While the initial hypothesis suggested that all selected variables would significantly impact FLFPR, the findings revealed a more nuanced reality. Gender parity in labor (FMLFPR_RATIO) showed a strong and statistically significant positive effect, confirming its importance in boosting female participation. Maternal mortality (MMR) had a marginally positive impact, contrary to expectations, indicating that improved maternal health can support women's entry into the labor market over time. However, the hypothesized positive effects of education expenditure and women's political representation were not statistically confirmed, suggesting that these areas may not yet be translating into meaningful labor outcomes. Although macroeconomic (GDP per capita employed) and legal indicators (WBL_SCORE) demonstrated strong correlations with FLFPR, they could not be fully tested due to statistical constraints. Overall, the research highlights the need for policies that ensure equal access to labor opportunities and prioritize women's health, while reevaluating the effectiveness of current strategies in education and political inclusion for fostering economic empowerment. Based on the study's findings and supported by broader literature, several evidence-based and targeted policy recommendations are proposed to enhance FLFP in Pakistan. First, achieving gender parity in the labor market requires strict enforcement of equal pay and anti-discrimination laws, alongside incentives for private sector employers to hire and retain women, especially through vocational and digital skills training tailored to their needs. Second, maternal health services must be improved by investing in rural healthcare infrastructure, integrating health and labor insurance schemes, and ensuring gender-responsive budgeting in the health sector. Third, education policy needs reevaluation, focusing not only on female enrollment but also on aligning curricula with employability, soft skills, and market needs, along with bridging programs that facilitate smoother transitions from education to employment. Fourth, symbolic representation should translate into real policy power by institutionalizing gender quotas in key legislative committees and strengthening the capacity of women lawmakers in gender budgeting and advocacy. Fifth, addressing legal and data gaps is crucial; this involves regularly updating the Women, Business and the Law Index with regional specificity and integrating FLFPR metrics into national development plans and SDG tracking frameworks. Lastly, shifting cultural attitudes and enhancing public awareness are vital. Media campaigns should challenge deep-rooted gender norms and promote the visibility of working women, particularly in conservative regions, while financial support for community childcare centers can significantly reduce the time constraints that discourage women from participating in the workforce.

This study, while insightful, is not without its limitations. One key constraint lies in the relatively small sample size—limited to 24 annual observations—which may reduce the statistical power of the analysis and affect the generalizability of the results. Additionally, the exclusion of some theoretically significant variables, such as GDP per employed person (GDP_PE) and the Women, Business and the Law (WBL) score, due to statistical concerns, restricts the depth of inference and limits the study's utility for comprehensive policy-making. Future research should consider expanding the scope by incorporating provincial-level panel data, which could reveal regional disparities and trends more clearly. Moreover, the inclusion of qualitative methods would help to uncover sociocultural dynamics and contextual factors that quantitative models often overlook. Further policy insights could also emerge by exploring labor market segmentation more thoroughly, distinguishing between formal and informal sectors as well as urban and rural labor dynamics.

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