DO MORE WOMEN FIND EMPLOYMENT AS THE URBAN POPULATION GROWS?

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Abstract
The effect of the female labour force participation rate on urbanization, which is the question of reverse causality, was not investigated in the earlier literature despite the widespread belief that urbanization leads to modernization and social transformation. The paper used World Bank data from 217 countries from 1991 to 2022 to address this issue. The Random Effect (RE) Two-Stage least squares (2SLS) regression analysis suggests that urbanization has a detrimental effect on the ratio of female to male labour force participation. On the other hand, the proportion of women to men participating in the labour force positively influences urbanization. The GDP growth rate and the proportion of female employers favourably influence the participation rate of women in the labour force. However, the estimated results do not support the idea that long-term economic growth and the percentage of women in the labour force follow a U-shaped pattern. The results do not support a U-shaped association between the female labour force participation rate and urbanization. However, a causal and long-term stable association exists between female labour force participation rate and urbanization. Finally, we suggest several policies that will benefit women's labour force participation rate during the process of economic growth.

Keywords: Female workforce participation; urbanization; economic growth; Granger causality; cross-country

1. INTRODUCTION

In order to enhance women's economic and social well-being, they should enter the workforce and fully utilize their credentials (refer to Sustainable Development Goal (SDG5)). There will likely be improvements in the economic, social, political, educational, and health domains, as well as in women's demographic status when there is greater equality between men and women in the labour market regarding work opportunities and other employment characteristics. Greater economic participation of women can be a source of empowerment (Mitra 2005), and it may provide several business benefits as women can bring invaluable skills and diversity of thought and utilize time efficiently and productively. Countries can reap benefits from increased participation in the female labour force. For example, India may realize its 'demographic dividend' as young women would join the labour market; Japan can benefit as labour supplies will be augmented in the face of declining fertility and population in the younger age cohorts, and this will provide an alternative approach to OECD countries to deal with the problem of ageing population (Joshi 2018).

It is important to know why it is anticipated that urbanisation would increase the percentage of female labour force participation. Female-dominated home-based production may shrink as a result of urbanisation and industrialization, which could also result in a decline in female labour participation (Boserup 1970). However, as opportunities grow quickly due to increased economic development and urbanisation, it is anticipated that women's labour force participation would rise. Women from low-income homes enter the labour force out of need, which could lead to a positive correlation between poverty and the percentage of women who work. Moreover, a negative correlation between development and female labour force participation suggests that either growth is exclusive and unable to generate employment possibilities, or there is a backward sloping supply curve of women at greater levels of per capita income. The problem of "discouraged dropouts" is also a result of long-term unemployment from occupations of desirable status. According to the neoclassical approach, gender disparities in terms of earnings, work conditions, and access to employment opportunities tend to decrease with economic growth (Forsythe et al. 2000). This could lead to an increase in women's work participation rates and a decrease in "discouraged dropouts."

On the other hand, the female labour force participation rate also has an impact on urbanization directly or via contributions to economic growth. According to Na-Chiengmai (2018), the availability of female's workforce is a crucial component of growth as increased employment of women accelerates economic growth. With a rise in the female labour supply wages, manufacturing costs, and output prices tend to decline and lower prices, in turn, boost spending, export competitiveness, investment, and the overall economic growth. It also progresses women's empowerment which boosts productivity, broadens the economy, and promotes income equality. So, higher women's employment increases economic growth.

In the context of urbanization, though the "Williamson hypothesis" suggested that agglomeration boosts GDP, Henderson (2003) showed that there is no evidence that urbanization promotes economic expansion. Numerous studies in this field have discovered that an increase in GDP causes an increase in urbanization (e.g., Hofmann and Wan 2013; Tripathi 2021; Shaban et al. 2022), and large urban spaces raises the returns to investment and technical efficiency (Mitra 2019). As a result, increasing the number of women in the labour market may accelerate urbanization by promoting economic growth. We also anticipate that women's work will directly affect urbanization. Increased financial security for women's families leads to improved educational attainment and greater employability for their children. Hence, increased income raises the household demand. New businesses and workers settle in the urban region, accelerating the pace of urbanization. On the whole, the business environment in the urban areas may benefit from an increase in women's employment, and urbanization may advance at a faster pace. Also, greater participation of women in the labour market may result in urban-ward migration, which contributes to faster urban growth.

In the backdrop of this, the current study, using the cross-country panel data, examines the relationship between female labour force participation and urbanization. However, urbanization itself is an endogenous variable. Hence, the endogeneity issue needs to be addressed while assessing the response of female labour force participation to urbanization. Investigating the causal relationships and patterns of correlation between these two variables is highly helpful. The investigation of long-run relationship between the variables is crucial. Most importantly, testing the U-shaped relationship between the female labour force participation rate, GDP, and urbanization is pertinent. By taking into account 217 nations from the years 1991 to 2022, we address these issues. Given that urbanization is the most significant phenomenon now in the 21st century, the study will be helpful in understanding the relationship between urbanization and the rate of female labour force participation from an empirical point of view. Especially in emerging countries, increased urbanization may act as a catalyst for inclusive and long-term economic growth.

The rest of the paper is structured as follows. The associated literature is reviewed in the following section to determine the research gap. The estimating approach, the model, and the data are introduced in Section 3. The estimated results are presented in Section 4. The discussion and policy recommendations follow in Section 5. The main conclusions are highlighted in Section 6.

2. BRIEF REVIEW OF LITERATURE

2.1. Impact of economic growth, urbanization on women's employment

Economic growth and urbanization are considered to be important determinants of the women's workforce participation rate (WFPR) among a variety of supply and demand side factors (see Agarwal 1985; Durand 1975; Mathur 1994; Sinha 1965). WFPR is initially found to be negatively impacted by growth, but as growth levels rise, WFPR tends to rise, resulting in a U-shaped connection. According to Cagatay and Ozler (1995), there may be a U-shaped relationship between long-term development and the proportion of women in the labour market. Even the historical evidence from wealthy countries points to a correlation between economic growth and the rate of female labour force participation (Goldin 1994).

According to the neoclassical perspective, as the economy grows, gender disparities in access to employment opportunities, working conditions, the nature of the labour, and incomes tend to decrease

(Forsythe et al. 2000). Since discouraged dropout rates tend to decline, this suggests a rise in the rate of women who participate in the workforce. Women are encouraged to engage in the labour force because of their better and equal status in the workplace (Mitra 2005). In addition to that, as markets and economic growth advance, fertility rates fall, women's education and skill levels rise, and household chores become more mechanised, all of which encourage women to participate more actively in the labour market.

One of the key drivers of economic expansion and development is urbanisation. Several empirical studies (e.g., Glaeser et al. 1995; Brülhart and Sbergami 2009; Tripathi 2013; Tripathi and Mahey 2017) that consider both developed and developing countries have demonstrated a positive correlation between urbanisation and economic growth. According to Mitra (2019), the women's workforce participation rate (WFPR), which is highly susceptible to social and cultural influences, is impacted by urbanisation as a modernization strategy.

It is expected that as cities and industries grow, female-dominated home-based production would decrease because factory output produced by men will mostly replace it (Boserup 1970). The U-shape curve's declining section is consistent with Boserup's assessment of women's contribution to domestic production. However, as economic development continues, it is expected that women's labour force participation will increase. This is because women workers will be able to participate more explicitly in the labour market due to improved urbanisation and industrialization, higher levels of education for women, the commoditization of domestic work, and declining fertility rates (Boserup 1970; Oppenheimer 1970).

However, several studies found negative relationship between urbanization and WFPR. Mitra (2019) found that there is an opposite relationship between urbanization and women's labour force participation in both rural and urban areas in India, despite the fact that, ideally, urbanization should increase employment prospects. For Turkey, Mustafa Kemal and Naci (2009) noted that women's labour force participation rates (LFPRs) in metropolitan areas have significantly decreased from the 1950s to the present. Along with other variables, continued migration from rural to urban regions appears to be the main contributor to the decrease in women's LFP in urban areas. There seems to be no jobs for rural female workers in the city as a result of migration.

According to Lama's (2021) analysis, India's urban female labour force participation is significantly but unfavourably impacted by urbanization. The majority of studies, however (Das and Desai 2003; Mitra 2019), point out that this U-shaped theory is untrue in India. The U-shaped hypothesis was false by Lahoti et al. (2013) in their thorough investigation of state-level panel data from 1983 to 2010. The reality is that, despite India's remarkable and continuous GDP development and increasing rates of urbanization over the past three decades, women's labour force participation has decreased.

The findings hold true for being close to an urban centre as well. Sikarwar et al. (2020) found an inverse relationship between female work participation (FWP) and urban proximity, i.e., FWP increases with distance from the main city in villages. Over 40% of women continue to labour in marginal jobs. In addition, a sizable portion of women in the major worker category are employed as farm workers.

From a demand perspective, it can be explained by the gender segregation of industries and occupations that exists in India, and the low participation rate that results from a lack of growth in the labour market demand in industries where women are the majority (Kapos et al. 2014). As a result, it implies that both the quantity and nature of work are important [Das and Desai 2003]. A lot of women left the labour force because employment in fields suitable for or favoured by educated women developed slower than the supply of educated employees (Klasen et al. 2021). Additionally, because our economy is dominated by high-skilled services rather than labor-intensive industry, there is a relatively low overall need for labour, and the majority of women lack the high skills required by this sector.

On the other hand, supply-side factor such as increasing household income causes women to voluntarily leave the workforce (Rangarajan et al. 2014; Himanshu 2011), and other studies (Chowdhury 2011; Olsen & Mehta 2006) have made the same claim, contending that social and cultural barriers prevent women from working outside the home. Nevertheless, women only join the work force when forced to do so by poverty, and they leave it once their household's income rises above a certain threshold. Bhalla and Kaur (2011) argued that expanding educational opportunities is seen to be a major factor in the low rate of female labour force participation in India. However, women are underrepresented in the labour force throughout all age groups, not just the 15 to 30 age range. Furthermore, the notion that economic empowerment is crucial for women's success is refuted by attributing women's low labour force participation to a choice retreat from the workforce [Lama 2021].

Broad patterns to compare, we normalize data to 0-1 range by using the distance (dist) formula (value - minimum)/(maximum - minimum). Figure 1 shows the trends of variables. Ratio of female to male labor force participation rate (FMLFPR) is used to measure the relative female labour force participation rate. To capture the dynamics of urbanization we use three measures: population in urban agglomerations of more than 1 million as a % of total population (PUA1), urban population as a % of total population (PUP), and Total urban population (TUP). Given that the values are scaled via the distance formula, the minimum appears to be at the beginning of the period (1995) and the maximum appears at the end (2019) for all the series. While PUP and ln_TUP show a linear trend, FMLFPR initially grows faster at first but then grows more slowly than the others towards the end of the period. On the other hand, PUA1 initially follows the linear trend, but grows more slowly between 2005 and around 2012, and then grows faster until the end of the period to compensate (Fig 1).

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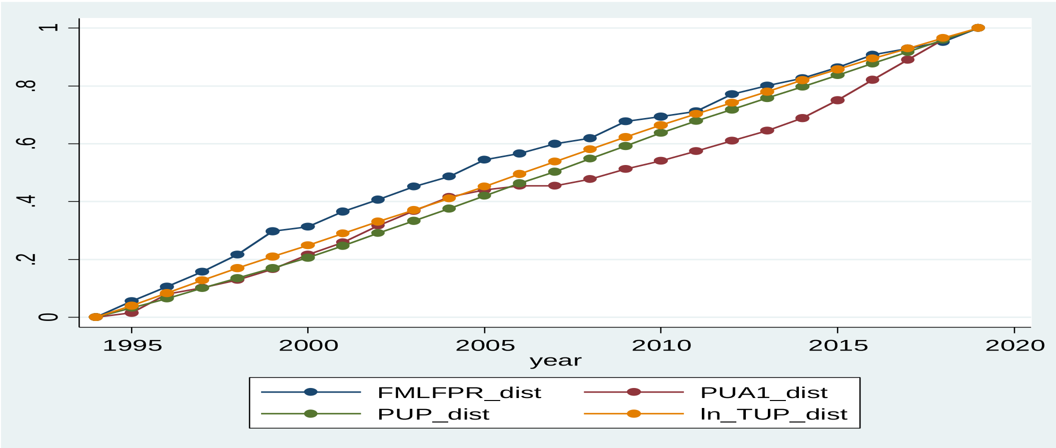

FIGURE 1 - TRENDS OF URBANIZATION AND RATIO OF FEMALE TO MALE LABOR FORCE PARTICIPATION RATE

The rate of female labour force participation and per capita income around the world exhibit U-shaped connections, according to Boserup (1970), Goldin (1990, 1995), and Mammen and Paxson (2000). Figure 2 shows a U-shaped relationship between gross domestic product (GDP) and ratio of female to male labor force participation rate (FMLFPR) for a cross-section of 207 countries in 2018. That is, women's labour force participation rates first fall and then start increasing again during the process of economic development. The female participation rates are relatively high in low-income countries (e.g., Burundi, Madagascar, Mozambique), relatively low in middle-income countries (e.g., India, Tunisia, Lebanon), and then relatively high in both upper middle (e.g., China, Armenia, Brazil) and high (e.g., Norway, Iceland, Finland) income countries.

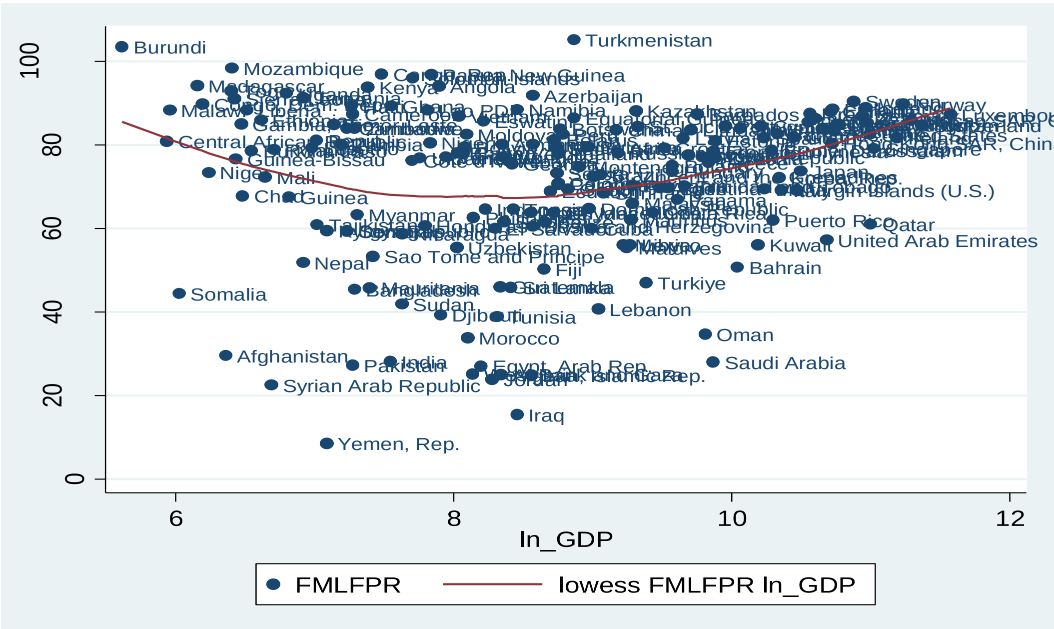

FIGURE 2 - GDP PER CAPITA AND FEMALE LABOUR FORCE PARTICIPATION, 2018

According to Boserup (1970) and Oppenheimer (1970), the rates of female labour force participation and urbanization also exhibit a U-shaped pattern. The main idea is that with urbanization and industrialization, male-dominated factory output would increasingly replace female-dominated home-based production. However, as economic growth continues, it is anticipated that women's labour force participation rate will increase as higher urbanization and industrialization, higher levels of female education, the commoditization of domestic work, and declining fertility rates enable women workers to participate in the labour market more explicitly. Figure 3 shows that though there is no clear-cut U-shaped relationship between the percentage of urbanization (PUP) and FMLFPR, the relationship is not linear.

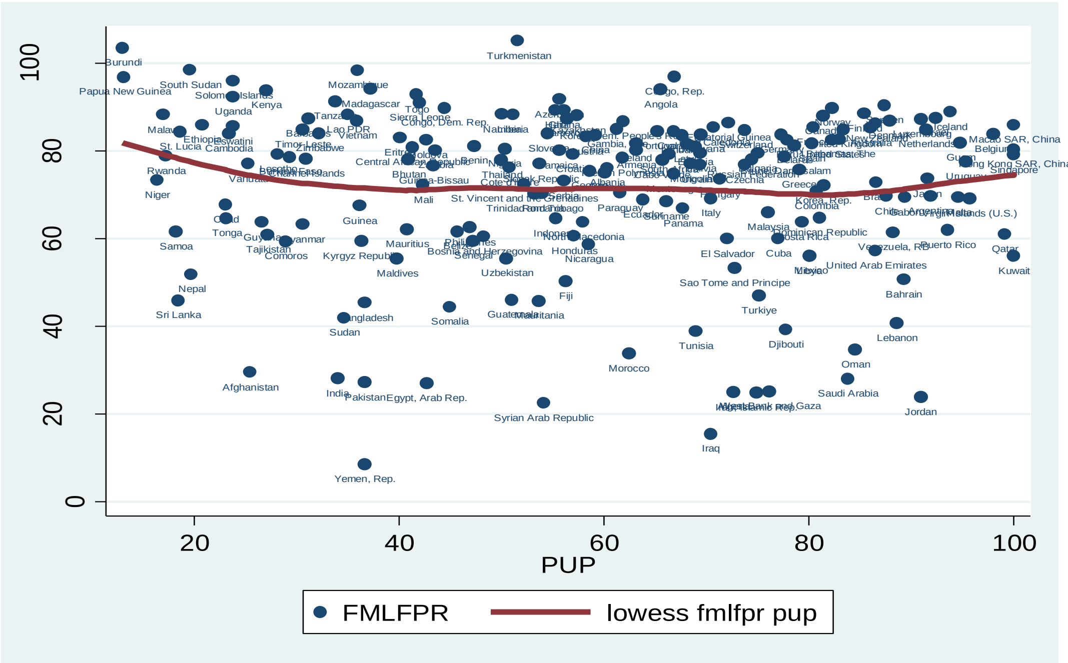

FIGURE 3 - PERCENTAGE OF URBAN POPULATION AND FEMALE LABOUR FORCE PARTICIPATION, 2018

2.2. Impact of women's employment on economic growth and urbanization

Economic growth is believed to be driven by higher female labour force participation. In this context, Na-Chiengmai (2018) argued that a key factor in growth is the availability of female labour. Economic growth is accelerated when more women work. Wages, production costs, and output prices decrease when labour supply increases. Reduced cost increases investment, export competitiveness, consumption, and ultimately economic growth. In addition to the economic empowerment of women raises productivity, enhances economic diversification, and increases income equality (International Monetary Fund 2018). For instance, raising female employment rates to Sweden-like levels in OECD nations might increase GDP by over USD 6 trillion (PwC 2018).

On the other hand, though urbanization causes economics growth, the relationship could be reverse. The "Williamson hypothesis"—according to which agglomeration increases GDP growth only up to a certain level of economic development—is supported by data (Brülhart and Sbergami 2009). However, Henderson (2003) showed that there is no evidence that urbanization leads to growth. On the other hand, according to Hofmann and Wan (2013) and Tripathi (2021), the causal relationship runs from growth to urbanization. Shaban et al. (2022) noted that majority of the states in India unravel a unidirectional Granger causality from economic growth to urbanization. Therefore, higher women's employment via economic growth is expected to raise urbanization.

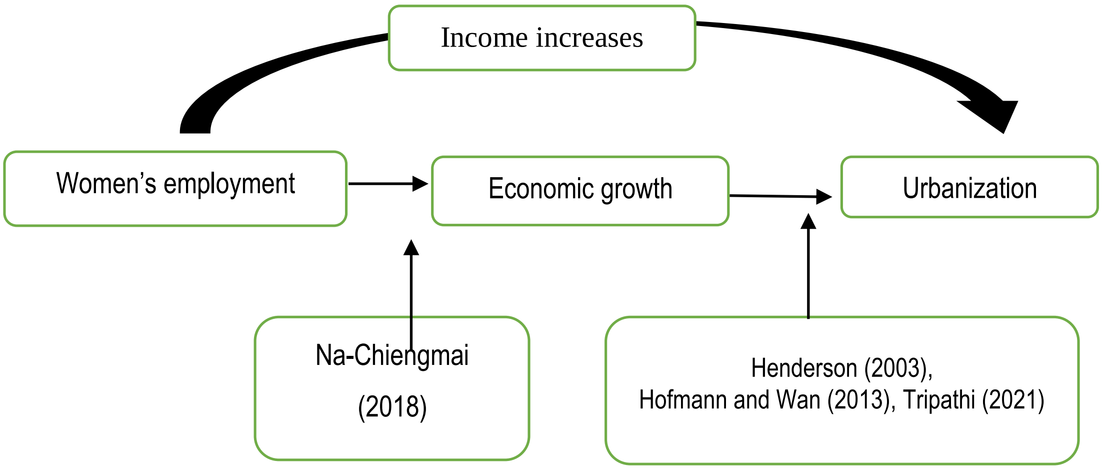

FIGURE 4 - LINKING BETWEEN WOMEN EMPLOYMENT AND URBANIZATION

We can also expect a direct positive impact of women employment on urbanization. Working women bring in income that improves the financial situation of their family. Children benefit when working mothers are present. Daughters of working mothers "are 1.21 times more likely to be employed, 1.29 times more likely to supervise others, spend 44 additional minutes at work per week, and have higher annual earnings" compared to their counterparts who were raised by stay-at-home mothers, according to research done in 29 countries with 100,000 participants (Prabhu 2024). As a result, there is increased demand for domestic items, financial services, and educational opportunities for their children. To achieve this, there must be more productions and jobs in the urban areas. This will inevitably lead to a rise in businesses and employment in urban areas, which will result in higher levels of urbanization. Figure 4 presents the main conceptual framework for linking women employment with urbanization.

2.3. Other important factors impact on women's employment

In case of India, due to their lower levels of education, women are less equipped to compete for jobs due to the growing need for trained labour in the manufacturing and non-manufacturing sectors as well as in modern services (Mehrotra, 2014; Mehrotra and Parida 2017). According to research (Bhattacharya et al. 1995; Winegarden and Bracy 1995), infant death rates and fertility rates are highly correlated. Siah and Lee's (2015) study showed that women's decisions about having children are unaffected by their job condition and that mortality changes have a large and favourable long-run impact on fertility rate in Malaysia. Narayan and Smyth (2006) found that in the long run the lower infant mortality rate Granger cause female labour participation in Australia.

TABLE 1 - FACTORS DETERMINANTS OF FEMALE LABOUR FORCE PARTICIPATION RATE (FLPR)

Main theoretical and empirical studies	Variables of the conceptual framework	Estimated relationship with FLPR from conceptual framework	Variables used in the empirical work
Goldin, (1994), Cagatay and Ozler (1995), Forsythe et al. (2000), Mitra (2005)	Economic growth	Negative or positive	GDP growth rate
Oppenheimer (1970), Boserup, (1970), Mustafa Kemal and Naci (2009), Lahoti et al. (2013), Mitra (2019), Sikarwar et al. (2020), Lama (2021)	Urbanization	Negative or positive	Population in urban agglomerations of more than 1 million (% of total population); urban population (% of total population); Total urban population
Boserup, (1970), Oppenheimer (1970), Kapos et al. (2014)	Industrialization	Negative	Female employment in industry, Employment in industry
Rangarajan et al., (2011), Himanshu (2011)	Increasing household income	Negative	GDP per capita
Chowdhury (2011), Olsen and Mehta (2006)	Social and cultural barriers	Negative	Female employers
Lama (2021)	Economic empowerment	Negative	Female wage and salaried workers
Control variables			
Mehrotra (2014), Mehrotra and Parida (2017)	Service sector employment	Negative	Female employment in services
Bhattacharya et al., (1995), Winegarden and Bracy (1995), Narayan and Smyth, (2006), Siah and Lee (2015)	Lower Infant mortality rate	Negative or Positive	Female infant mortality rate
Mammen and Paxson (2000), Grey et al., (2006), Bussmann (2009)	Life expectancy	Negative or positive	Life expectancy at birth
Choudhry and Elhorst (2018)	Age structure	Negative or positive	Population ages 15-64

According to Altuzarra et al. (2019), the relationship between life expectancy at birth and the rate of female labour market participation is unclear (Mammen and Paxson 2000). According to Bussmann (2009) and Grey et al. (2006), this variable can be used as a stand-in for adequate health care because it captures components of physical well-being. The reverse result would occur if the retirement age did not rise as life expectancy did. Finally, in the context of relationship between age and female labour force participation rate, Choudhry and Elhorst (2018) observed that there was support for the U-shaped connection. A specific moment is identified where the regime of declining participation rates shifts into a regime of rising participation rates for each age group and explanatory variable (such as education) in the model.

Table 1 presents a summary of some of the theoretical and empirical studies on the female labour force participation rate. Variables used in the conceptual framework and in the empirical work are presented. It shows that economic growth, urbanization, infant mortality rate, life expectancy rate, and age structure of the population have a nonlinear relationship with female labour force participation rate (FLPR). On the other hand, industrialization, increasing household income, social and cultural barriers, and economic empowerment have a negative effect on it.

3. DATA AND METHOD

3.1. Data

Due mostly to data availability, the cross-country level data for all variables are taken from the World Development Indicators (WDI) from 1991 to 2021 for all 217 countries in the world. We use the GDP growth rate to measure the economic growth of a country. Industrialization is proxied by female and total employment in the industry. Per-capita GDP stands as a measure of household income. Social and cultural barriers are proxied by the percentage of the female employer. Economic empowerment is measured by the percentage of female wage and salaried workers. We also use female employment in services, female infant mortality rate, life expectancy at birth, and population ages 15-64 as control variables.

On the other hand, there are three ways to assess urbanization: total urban population, urban populations as a proportion of overall populations, and populations in urban agglomerations with a million or more people as a percentage of total urban populations. The following are the justifications for taking urbanization into account in three different ways: different nations are experiencing varying degrees of urbanization. For determining how urbanization affects economic growth, studies by Henderson (2003) and Brülhart and Sbergami (2009) also took into account various indicators of urbanization. Urbanization as a percentage of the global population has been steadily rising between 1960 through 2020. However, if one looks at the yearly growth rate of the urban population over the world, it was 2.8% in 1961 and it decreased to 1.8% in 2020. On the other hand, in emerging nations, a sizable share of the urban population is confined to cities with a population of more than a million. Comparatively speaking, industrialised nations may have a faster rate of urbanization, but in China and India their total urban population is still quite small. The simple answer is that, whether a country is developing or developed, the degree of urbanization differs from one to the next. As a result, we take into account three different measures of urbanization to fully understand the dynamics of urbanization.

3.2. Method

To analyze the impact of female labour force participation rate on urbanization, we use simultaneous equation model which is estimated by combining the Random Effect (RE) technique with Two-Stage least squares (2SLS) regression analysis. To employ the robust reverse causality test between urbanization and female labour force participation rate, bias-corrected Least-squares dummy variable (LSDV) regression model is used. The Granger causality test is performed to estimate the dynamic correlation between female labour force participation rate and the urbanization. To scrutinize the stable and long-run relationship between these two variables panel cointegration technique is used. Figure 5 presents the methodological flowchart.

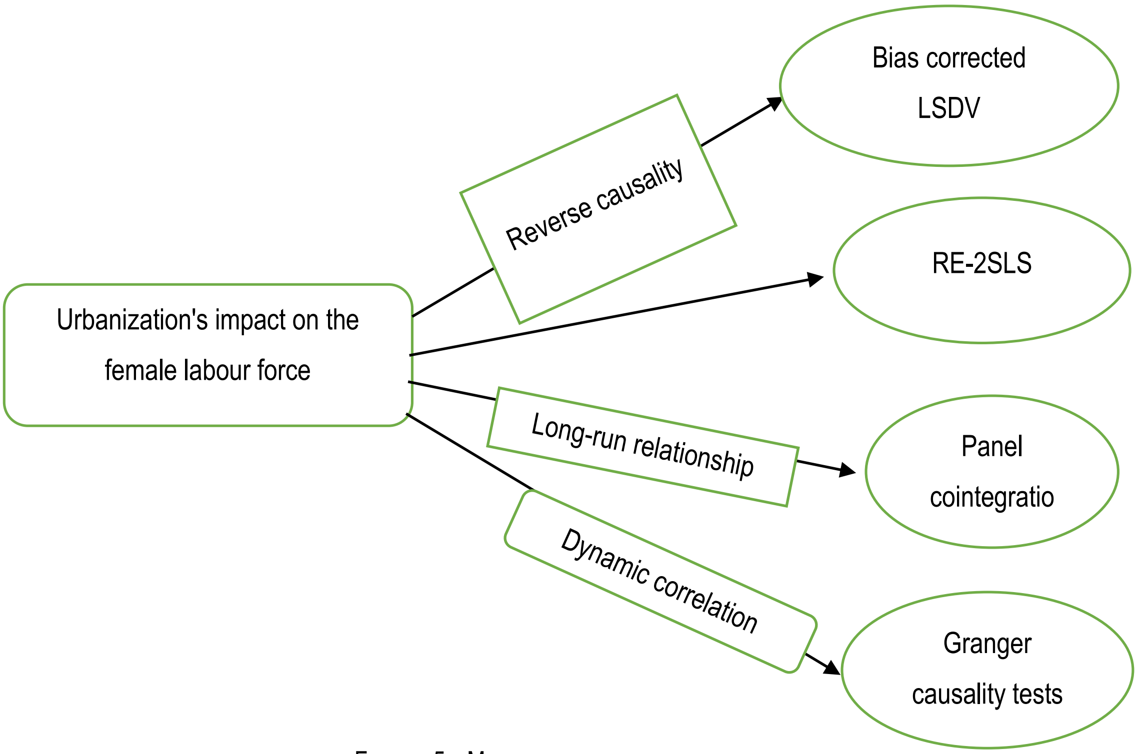

FIGURE 5 - METHODOLOGICAL FLOWCHART

A simultaneous equation model is specified using the analytical relationships that were previously discussed:

Ratio of female to male labor force participation rate = f (Urbanization, Female employment in industry, Female employers, Female wage and salaried workers, Female infant mortality rate) …………(1)

Urbanization = f (Ratio of female to male labor force participation rate, per capita GDP, Life expectancy at birth, GDP growth rate, Employment in industry, Population ages 15-64) ……….. (2)

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In the labour force participation rate equation, the exogenous variables included were female employment in industry, female employers, female wage and salaried workers, and female infant mortality rate. In the urbanization equation, per capita GDP, life expectancy at birth, GDP growth rate, employment in industry, and population aged 15-64 are included as exogenous variables. Since the model is based on panel data, and each observation is not independent of the other, particularly relating to those representing a given unit (state), a random effects (RE) model is used to control for the group effects. Initially, random RE regression models were used to estimate the reduced-form equations. In the subsequent phase, the structural equations were subjected to the RE models once more, following the substitution of estimated values for the observed values of the endogenous variables on the right-hand side of the equations. Overall, RE 2SLS has been used to address the endogeneity problem brought on by the simultaneous equation structure and the group effect associated with panel data. Additionally, we used a number of robust regression techniques, including Granger causality, panel cointegration testing, and bias-corrected LSDV regression models.

There may be a reverse causal relationship between the variables in the reduced-form equation model that are used to determine the urbanisation and female labour force participation rate. For instance, it is true that urbanisation contributes to GDP, but it is also true that GDP growth positively impacts urbanisation (Tripathi 2021). Likewise, there exists a correlation between the GDP and the rate of female labour force participation. As a result, the model definition may have a significant endogeneity and reverse causality issue. Therefore, the generalised method of moments (GMM) estimators, such as difference GMM and system GMM, can be employed to prevent endogeneity and reverse causality. There will be significant mistakes in predicting a longer sample interval, and the GMM is better suited for estimating sample intervals with shorter periods. Given the length of our data collection, using GMM will result in results that are skewed and inconsistent (De Vos et al. 2015). As a result, we employ an LSDV estimator that Anderson and Hsiao (1982) first suggested.

4. EMPIRICAL RESULTS

Table 2 presents the definition of variables and transformation of variables for the analysis.

The descriptive statistics for each variable used in the regression analysis are shown in Table 3. Table 4's correlation coefficients between the independent variables are not overly high. Furthermore, Table 3 indicates that the VIFs for the independent variables are less than 10 and extremely low. This implies that our regression analysis lacks multicollinearity.

TABLE 2 - DEFINITIONS OF VARIABLES AND TIME SERIES TRANSFORMATIONS

Abbreviation	Variable	Definitions of variables are taken from World Development Indicators, World Bank	
FMLFPR	Ratio of female to male labor force participation rate (%)	The percentage of the population older than 15 who is employed is known as the labour force participation rate.	
PUA1	Population in urban agglomerations of more than 1 million (% of total population)	The percentage of a nation's population that lives in metropolitan regions with a population of one million or more as of 2018 is known as the population in urban agglomerations of more than one million.	
PUP	Urban population (% of total population)	The term "urban population" describes the people who, according to national statistical authorities, reside in urban regions. The United Nations Population Fund gathers and smooths the data.	
TUP	Total urban population (in million)	The term "urban population" describes the people who, according to national statistical authorities, reside in urban regions.	
EIF	Employment in industry, female (% of female employment)	People of working age who have engaged in any activity to create things or provide services for compensation or profit are considered to be employed, whether while	
EF	Employers, female (% of female employment)	Employees who work for themselves or with one or more partners and have jobs that fall under the definition of "self-employment jobs" are considered employers.	
ESF	Employment in services, female (% of female employment)	People of working age who have engaged in any activity to create things or perform services for compensation or profit are considered to be employed.	
MRI	Mortality rate, infant, female (per 1,000 live births)	The number of female newborns that die before becoming one year old per 1,000 live female births in a particular year is known as the female infant mortality rate.	
GDP	GDP per capita (constant 2015 US$)	The gross domestic product divided by the population at midyear yields GDP per capita.	
WSWF	Wage and salaried workers, female (% of female employment)	Workers who have positions classified as "paid employment jobs" are wage and salaried workers, or employees.	
LEB	Life expectancy at birth, total (years)	The life expectancy at birth represents the number of years that a newborn would live in the event that the mortality rates that were in place at the time of the infant's birth remained unchanged.	
GDPG	GDP growth (annual %)	GDP growth rate expressed as a percentage per year at market prices using constant local currency.	
EI	Employment in industry (% of total employment) (EI)	People of working age who have engaged in any activity to create things or perform services for compensation or profit are considered to be employed.	
PA1564	Population ages 15-64 (% of total population)	The proportion of the entire population that is between the ages of 15 and 64. The de facto definition of population, which includes all inhabitants regardless of citizenship or legal status, serves as the foundation for population estimates.	
Transformation	**Definitions of transformations**	**Transformation**	**Definitions of transformations**
DFMLFPR	First difference of FMLFPR	DEF	First difference of EF
DPUA1	First difference of PUA1	DESF	First difference of ESF
D(PUA1 square)	First difference of PUA1 square	DGDP	First difference of GDP
DPUP	First difference of PUP	D (GDP square)	First difference of GDP square
D(DPUP)	Second difference of PUP	DWSWF	First difference of WSWF
D(PUP square)	Second difference of PUP square	DLEB	First difference of LEB
DTUP	First difference of TUP	DEI	First difference of EI
D(DTUP)	Second difference of DTUP	DPA1564	First difference of PA1564
D(TUP square)	Second difference of TUP square	D(DPA1564)	Second difference of PA1564
DEIF	First difference of EIF		

TABLE 3 - DESCRIPTIVE STATISTICS

Variable	Observation	Mean	Standard Deviation	Minimum	Maximum	VIF
Ratio of female to male labor force participation rate (%) (FMLFPR)	5,978	68.91837	19.98816	8.478842	108.3935	
Population in urban agglomerations of more than 1 million (% of total population) (PUA1)	3,872	24.37982	17.35553	2.095016	100	
Urban population (% of total population) (PUP)	6,665	57.32051	24.47526	5.491	100	
Total urban population (in million) (TUP)	6,665	1.54E+07	5.38E+07	3928	8.83E+08	
Employment in industry, female (% of female employment) (EIF)	5,795	12.45371	7.966086	0.20603	58.95623	1.12
Employers, female (% of female employment) (EF)	5,795	1.796469	1.449527	0.016361	10.82279	2.61
Employment in services, female (% of female employment) (ESF)	5,795	59.39018	25.99396	2.364672	98.10313	4.16
Mortality rate, infant, female (per 1,000 live births) (MRI)	6,076	29.15291	27.9737	0.9	182.5	8.49
GDP per capita (constant 2015 US$) (GDP)	6,087	13919.69	21029.17	189.2822	204190.2	2.07
Wage and salaried workers, female (% of female employment) (WSWF)	5,795	55.5854	32.45227	0.767153	99.97007	6.54
Life expectancy at birth, total (years) (LEB)	6,506	69.16778	9.45343	14.098	85.49756	8.51
GDP growth (annual %) (GDPG)	6,106	3.25681	6.378003	-64.0471	149.973	1.02
Employment in industry (% of total employment) (EI)	5,795	19.76352	8.569323	1.067901	59.5787	4.76
Population aged 15-64 (% of total population) (PA1564)	6,727	62.28866	7.051186	46.09701	86.07925	3.21

TABLE 4 - CORRELATION COEFFICIENTS

	FMLFPR	PUA1	PUP	TUP	EIF	EF	ESF	MRI	GDP	WSWF	LEB	GDPG	EI	PA1564
FMLFPR	1.00													
PUA1	-0.07	1.00												
PUP	-0.09	0.66	1.00											
TUP	-0.03	0.05	0.02	1.00										
EIF	-0.24	0.03	0.22	0.20	1.00									
EF	0.09	0.13	0.24	-0.01	0.08	1.00								
ESF	-0.10	0.52	0.88	-0.03	0.15	0.31	1.00							
MRI	0.14	-0.40	-0.74	-0.09	-0.38	-0.23	-0.75	1.00						
GDP	0.16	0.38	0.61	0.02	-0.06	0.17	0.65	-0.54	1.00					
WSWF	-0.17	0.42	0.84	0.02	0.31	0.23	0.87	-0.82	0.66	1.00				
LEB	-0.17	0.45	0.78	0.12	0.32	0.28	0.78	-0.93	0.64	0.82	1.00			
GDPG	-0.04	-0.03	-0.13	0.06	-0.03	-0.03	-0.12	0.06	-0.09	-0.13	-0.07	1.00		
EI	-0.32	0.29	0.62	0.15	0.73	0.20	0.58	-0.72	0.33	0.74	0.69	-0.09	1.00	
PA1564	-0.05	0.44	0.69	0.19	0.36	0.21	0.64	-0.79	0.50	0.74	0.80	-0.06	0.70	1.00

Note: See Table 2 for variable definitions. The correlation coefficients are based on 3,543 observations.

Panel data analysis begins with a test of the panel dataset's stationarity. Here, the Fisher-type Phillips-Peron unit root test is used to test for stationarity. Only this test was possible because of the significant imbalance in our data. Inverse chi-squared, inverse logit, inverse normal, and modified inverse chi-squared all yield comparable findings. But since the inverse normal Z statistic provides the optimal balance between size and power, as indicated by Choi's (2001) simulation results, we only include the inverse normal Z statistic in our findings. Findings indicate that all variables (with the exception of newborn mortality rate) are steady at first difference, with the exception of the proportion of the population living in urban areas, the total urban population, and the population aged 15 to 64. Consequently, in our analysis, we take these three factors into account using the second difference form. On the other hand, we take the infant mortality rate in level form since it is stationary at that level. Table 5 presents the findings.

TABLE 5 - FISHER-TYPE PHILLIPS-PERON UNIT ROOT TEST

	Levels		First differences		Levels		First differences	
	Constant only		Constant only		Constant and trend		Constant and trend	
Variable	inverse normal Z statistic	p-value	inverse normal Z statistic	p-value	inverse normal Z statistic	p-value	inverse normal Z statistic	p-value
FMLFPR	1.9913	0.9768	-18.8253	0.0000	1.5069	0.9341	-13.7315	0.0000
PUA1	6.0000	1.0000	-6.6644	0.0000	1.0351	0.8497	-2.1868	0.0144
PUP@	6.7377	1.0000	2.7206	0.9967	-1.2260	0.1101	5.0592	1.0000
TUP@	16.6253	1.0000	3.4121	0.9997	5.1556	1.0000	1.7049	0.9559
EIF	4.7916	1.0000	-16.4657	0.0000	4.7916	1.0000	-11.7117	0.0000
EF	2.3379	0.9903	-22.6133	0.0000	2.3586	0.9908	-16.6936	0.0000
ESF	6.1680	1.0000	-15.2922	0.0000	5.8753	1.0000	-9.5104	0.0000
MRI	-12.8808	0.0000			-10.2499	0.0000		
GDP	8.6117	1.0000	-18.5894	0.0000	4.3202	1.0000	-11.4505	0.0000
WSWF	5.9480	1.0000	-17.8098	0.0000	3.5143	0.9998	-11.5968	0.0000
LEB	-2.6069	0.0046	-5.4075	0.0000	9.9089	1.0000	-2.3390	0.0097
GDPG	-18.9937	0.0000			-13.5812	0.0000		
EI	5.0647	1.0000	-14.7088	0.0000	1.0795	0.8598	-8.5439	0.0000
PA1564@	2.2949	0.9891	0.6262	0.7344	7.5097	1.0000	3.0139	0.9987

Note: See Table2 for variable definitions. The stationarity is tested by the Fisher-type Phillips-Peron unit root test. Its statistics refer to inverse normal, and H0 is: all panels contain unit-roots. To mitigate the effect of cross-sectional correlation which may appear because some countries share some similarities, the version of the test with the removed cross-sectional means was employed. @ indicates stationary at 2nd differences. Second lags are considered to perform the test.

4.1. Simultaneous equation model

As per the RE panel estimates of the structural model the RE two-stage least-squares estimates show that female employment in industry, female employers, female employment in services, female wage and salaried workers, and infant mortality rate influence the ratio of female to male labor force participation rate (Table 6). While a higher share of female employers increases the ratio of female to male labour force participation rate, all other independent variables tend to reduce it. Most importantly, three urbanization variables: population in urban agglomerations of more than 1 million, percentage of the urban population, and total urban population, have a negative and statistically significant effect on the ratio of female to male labor force participation rate. This indicates that urbanization is not supportive of the promotion of the labour force participation rate.

On the other hand, the ratio of female to male labour force participation rate has a mixed effect on urbanization. In Table 6, regression models 4-6 show that the female labour force participation rate

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positively influences the percentage of the population living in urban agglomerations of more than 1 million and the percentage of the urban population of a country. On the contrary, it has a negative effect on the total urban population. Urbanization taken in terms of increasing total urban population is not supportive of promoting female labour force participation rate. Per-capita GDP has a positive (or negative) effect on the percentage of the population living in urban agglomerations of more than 1 million (or the total urban population). Whereas life expectancy at birth has a positive impact on both the urbanization variables. The GDP growth rate negatively influences the percentage of the population living in urban agglomerations of more than 1 million and it has no statistically significant effect on the percentage of the urban population. Most importantly, higher employment in industry and a share of the population aged between 15 to 64 has a positive effect on the percentage of the population living in urban agglomerations of more than 1 million and total urban population.

TABLE 6 - RESULTS OF STRUCTURAL FORM EQUATIONS: RE MODEL

	DFMLFPR			DPUA1	D(DPUP)	D(DTUP)
VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
PUA1 fitted	-0.363**					
	(0.155)					
PUP fitted		-7.050**				
		(2.810)				
TUP fitted			-2.15e-06**			
			(9.48e-07)			
DEIF	-0.151***	-0.168***	-0.146***			
	(0.0209)	(0.0217)	(0.0209)			
DEF	0.279***	0.340***				
	(0.0573)	(0.0571)				
DESF	-0.104***	-0.143***	-0.0921***			
	(0.0141)	(0.0128)	(0.0138)			
DWSWF	-0.110***		-0.118***			
	(0.0129)		(0.0128)			
MRI		-0.00172**				
		(0.000818)				
FMLFPR fitted				0.0619*	0.00992*	-11,791**
				(0.0342)	(0.00541)	(5,009)
DGDP				0.000102***	1.89e-07	-7.933***
				(1.19e-05)	(1.83e-06)	(1.863)
DLEB				0.0533***		5,090***
				(0.00744)		(1,467)
DGDPG				-0.0149***	-7.95e-05	
				(0.00167)	(0.000228)	
DEI				0.0523***	0.00574***	
				(0.0126)	(0.00193)	
DPA1564				0.0315***	80,583***	
				(0.00831)	(9,353)	
Constant	0.371***	0.366***	0.325***	0.144***	-0.00174	6,256***
	(0.0344)	(0.0346)	(0.0258)	(0.0189)	(0.00194)	(1,923)
Observations	4,955	4,955	4,955	3,328	4,955	4,955
Number of groups	177	177	177	117	177	177

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.2. *Reduced form estimates*

The policy issues can be analyzed better from the reduced-form estimates (Table 7). The advantageous effect of the share of female employers and GDP growth rate on female labour force participation rate is evident. On the other hand, higher share of female employment in industry or services, infant mortality rate, share of female wage and salaried workers, and share of employment in industry has a disadvantageous or negative effect on the female labour force participation rate.

The share of employment in industry negatively impacts the percentage of the population living in urban agglomerations of more than 1 million and the total urban population. On the contrary, the female infant mortality rate and life expectancy at birth have a positive effect on both urban variables. The higher GDP per capita negatively affects the total urban population whereas it has a positive effect on the share of the population living in urban agglomerations of more than 1 million. However, the GDP growth rate has a mixed effect on urbanization as it has a positive effect on the total urban population and it has a negative effect on the share of the population living in urban agglomerations of more than 1 million. Most importantly, the share of employment in the industry promotes urbanization measured by all three variables Population aged between 15 to 64 though encourages the percentage of the urban population and total urban population, it discourages the share of the population living in urban agglomerations of more than 1 million. The share of female employment in services has a negative effect on the share of the population in urban agglomerations of more than 1 million. However, the share of female employers and share of female wage and salaried workers do not have any statistically significant effect on urbanization.

TABLE 7 - ESTIMATES OF REDUCED-FORM EQUATIONS

VARIABLES	DFMLFPR		DPUA1		D(DPUP)		D(DTUP)	
	RE	LSDV	RE	LSDV	RE	LSDV	RE	LSDV
	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14
DEIF	-0.0560**	-0.0457	-0.0258*				-3,896*	-4,036*
	(0.0262)	(0.0563)	(0.0137)				(2,251)	(2,299)
DEF	0.265***	0.261**	0.0234	0.0195			-7,390	
	(0.0571)	(0.115)	(0.0279)	(0.0132)			(5,294)	
DESF	-0.0907***	-0.0868***	-0.0164**	-0.0130				
	(0.0139)	(0.0287)	(0.00665)	(0.0120)				
MRI	-0.00217***		0.000961**	0.000725	1.73e-05		158.7***	133.7
	(0.000819)		(0.000444)	(0.000728)	(4.76e-05)		(53.49)	(229.7)
DGDP	2.77e-05	1.31e-05	0.00010***	0.000116	7.50e-07		-11.28***	-12.50**
	(2.34e-05)	(1.75e-05)	(1.19e-05)	(0.000116)	(1.86e-06)		(2.082)	(5.717)
DWSWF	-0.110***	-0.111***	-0.000269			-0.00202	171.3	
	(0.0129)	(0.0272)	(0.00631)			(0.00173)	(1,093)	
DLEB	-0.000114	8.65e-05	0.0542***	0.0553**	-0.00136	-0.00137	3,592**	3,568
	(0.0161)	(0.0139)	(0.00744)	(0.0275)	(0.00134)	(0.00246)	(1,496)	(2,173)
GDPG	0.00736**	0.00827**	-0.0146***	-0.0153*	-1.83e-05		980.1***	964.2**
	(0.00292)	(0.00350)	(0.00168)	(0.00836)	(0.000234)		(263.6)	(379.0)
DEI	-0.154***	-0.143***	0.0560***	0.0334*	0.00365**	0.0053***	3,931*	4,106*
	(0.0251)	(0.0428)	(0.0138)	(0.0185)	(0.00160)	(0.00186)	(2,278)	(2,332)
D(DPA1564)	-0.0381	-0.0443	-0.122**	-0.114	0.0317***	0.0323*	77,63***	78,35***
	(0.1000)	(0.0799)	(0.0556)	(0.250)	(0.00836)	(0.0186)	(9,354)	(27,642)
Constant	0.352***	0.289***	0.135***	0.143***	0.000295	0.00185***	-4,241*	-3,234
	(0.0354)	(0.0160)	(0.0218)	(0.0232)	(0.00194)	(0.000657)	(2,196)	(7,104)
Observations	4,955	5,108	3,328	3,328	4,955	5,421	4,955	4,955
Wald chi2/ R-squared	318.65***	0.0528	158.76***	0.049	20.93***	0.003	148.78***	0.024
Number of countries	177	183	117	117	177	187	177	177

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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4.3. 'U' shaped relationship between FMLFPR, GDP, and Urbanization

As we discussed in sections 1 and 2, there is a U-shaped relationship between female labour force participation rate, GDP and urbanization. In this section we test this relationship using LSDV regression models. To test this relationship, we consider a square term of GDP and urbanization variables. Regression model 16 shows that GDP has a positive and its square term has a negative and statistically significant effect on the FMLFPR. This indicates an inverted U-shaped relationship instead of a U-shaped hypothesis. Most importantly, when we consider other explanatory variables in the Regression Model 16, the results hold good. We considered other dependent variables such as labor force participation rate of females aged 15-64, female labour force as a percentage of the total labour force, and female labour force participation rate in the age group of 15-24 years instead of FMLFPR. The results do not differ. Therefore, we examine the relationship between FMLFPR and GDP from the perspective of some of the individual countries. Figure 6 shows that except for China no other selected countries unravel the U-shaped hypothesis between per capita GDP and FMLFPR. Hence, we suggest based on our analysis that the relationship between female labour force participation rate and per capita GDP follows an-inverted U-shaped relationship.

TABLE 8 - ESTIMATED U-SHAPED RELATIONSHIP BETWEEN FMLFPR, GDP, AND URBANIZATION: LSDV REGRESSION RESULTS

VARIABLES	DFMLFPR							
	Model 15	Model 16	Model 17	Model 18	Model 19	Model 20	Model 21	Model 22
DGDP	0.000108**	0.000136***						
	(4.27e-05)	(4.96e-05)						
D (GDP square)	-7.88e-10***	-1.26e-09***						
	(2.98e-10)	(4.20e-10)						
DPUA1			-0.00516	-0.00913				
			(0.0381)	(0.0472)				
D(PUA1 square)			-0.000162	-6.37e-05				
			(0.000302)	(0.000304)				
D(DPUP)					0.0496	0.0792		
					(0.205)	(0.205)		
D(PUP square)					-0.00119	-0.00177		
					(0.00227)	(0.00238)		
D(DTUP)							-2.69e-07	-2.29e-07
							(2.15e-07)	(1.98e-07)
D(TUP square)							0	0
							(0)	(0)
DEIF		-0.135***		-0.0857		-0.127***		-0.127***
		(0.0491)		(0.0566)		(0.0477)		(0.0477)
DEF		0.260**		0.355**		0.257**		0.255**
		(0.121)		(0.158)		(0.120)		(0.119)
DESF		-0.0903***		-0.0708**		-0.0888***		-0.0885***
		(0.0286)		(0.0345)		(0.0283)		(0.0283)
DWSWF		-0.110***		-0.111***		-0.108***		-0.108***
		(0.0261)		(0.0314)		(0.0262)		(0.0262)
MRI		0.00322*		0.00276		0.00275		0.00273
		(0.00176)		(0.00177)		(0.00171)		(0.00171)
Constant	0.255***	0.216***	0.244***	0.193***	0.257***	0.230***	0.257***	0.230***
	(0.00418)	(0.0542)	(0.00299)	(0.0589)	(0.000520)	(0.0533)	(0.000395)	(0.0533)
Observations	5,262	5,105	3,745	3,568	5,421	5,189	5,421	5,189
R-squared	0.002	0.050	0.000	0.046	0.000	0.047	0.000	0.047
Number of country	183	177	121	119	187	179	187	179

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

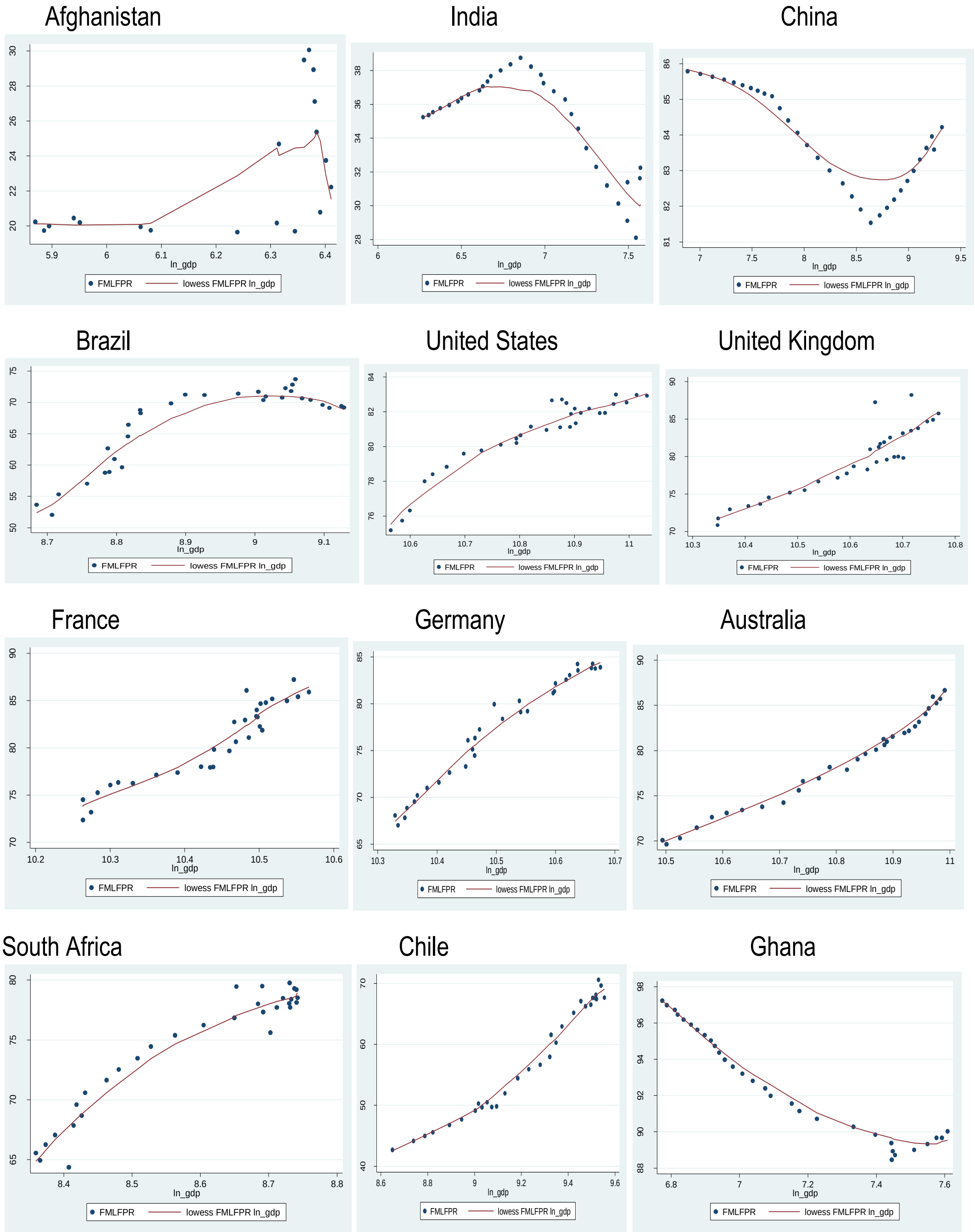

FIGURE 6 - COUNTRY LEVEL RELATIONSHIP BETWEEN FMLFPR AND GDP, 1991-2022

In this context, Choudhry and Elhorst (2018) argued that testing the U-shaped relationship is still challenging despite its widespread acceptance. A recent study by Gaddis and Klasen (2014) provides a nice illustration, in which the evidence supporting this relationship appears to be relatively weak and depends on the data utilised, the nations covered, and whether a cross-sectional or panel data technique is used. The earlier studies took into account a quadratic functional form of GDP per capita along with a number of additional control variables (see Fatima and Sultana 2009; Pampel and Tanaka 1986; Tansel

2002; Tsani et al. 2013), whereas the more recent studies lacked control variables and might be biased due to the omission of the relevant variables (Luci 2009; Tam 2011; Gaddis and Klasen 2014). However, in our case we used the most advanced econometrics model with relevant control variables and still the U-shaped relationship is not supported.

As per the discussion in section 1, we also assume that there is a U-shaped relationship between the female labour force participation rate and urbanization. Regression models 17-22 show that the U-shaped relationship does not exist. The three measures of urbanization variables have a statistically insignificant effect on the FMLFPR.

4.4. Granger causality test

Research on regional economics has recently seen a significant increase in the use of the Granger causality test. Shaban et al. (2022), for instance, employed this method to examine the connection between India's state-level economic growth and urbanisation. Examining the kinds of incidental links and correlation patterns between two variables is a very useful tactic. Predictability was the basis for Granger's (1969) definition of causation between two time series. With respect to a given information set I containing X and Y, a variable Y causes another variable X if, at time t, Xt+1 can be predicted more accurately (in the sense of mean square prediction error) by using the present and past values of Y than by not using them, with all other information in I (including the present and past of X) being used in either case (Triacca 2001). To put it another way, the relationship may only be understood as a dynamic correlation, meaning that while one variable may predict another, it does not always follow that one causes the other. Granger causality is a prerequisite for true causality. For this reason, Granger causality is based on prediction and precedent.

In order to analyse the causal linkages between the variables, Dumitrescu and Hurlin (2012)'s panel Granger causality test is used. The analysis is carried out taking into account the stationary values of the variables. Table 9 displays the findings of the causality analysis. To run the test, we use the STATA command "xtgcause". We could only take into consideration the total urban population and the percentage of the total population in cities with a population of one million or more as the measure of urbanization because we require a firmly balanced panel without gaps in order to run this model.

TABLE 9: DUMITRESCU VE HURLIN (2012) PANEL GRANGER CAUSALITY TEST RESULTS

H0-Hypothesis	W-Stat.	Z- Stat.
DPUA1 $\nrightarrow$ DFMLFPR	1.5082	3.9525***
DFMLFPR $\nrightarrow$ DPUA1	2.6281	12.6635***
DTUP $\nrightarrow$ DFMLFPR	2.0563	8.2162 ***
DFMLFPR $\nrightarrow$ DDTUP	0.8275	1.3420

Note: *** indicates that the statistic is significant at 1% level of significance. $\nrightarrow$ indicates "does not Granger-cause". H0: independent variable does not Granger-cause dependent variable.

The results reveal the presence of a causal relationship running from the percentage of the population living in agglomeration of more than 1 million to the ratio of female to male labor force participation rate. The result holds true for the total urban population too. Results also suggest that the ratio of female to male labor force participation rate has a causal relationship with the percentage of the population living in agglomeration of more than 1 million. The H0 hypothesis indicating that the ratio of female to male labor force participation rate is not the Granger cause of the percentage of the total population living in million-plus cities can be rejected at the significance level of 1%. However, the result is not true for the total urban population. Overall, the results suggest that there is a causal relationship between female labour force participation rate and some of the indices of urbanization.

4.5. Panel cointegration tests

Analyzing whether long-run equilibrium exists between the variables is encouraged by the presence of I (1) in the series. The variables of interest are subjected to three different test types: panel and group statistics by Pedroni (1999), Westerlund (2007), and Kao (1999). Each test is predicated on the null hypothesis that there is no cointegration among series, against the alternative that there is cointegration, and computes the statistics using various methods and assumptions. To run the test, we utilize the STATA command "xtcointtest."

TABLE 10 - COINTEGRATION TESTS

		Dependent variable					
		Ratio of female to male labor force participation rate	Population in urban agglomerations of more than 1 million (% of total population)	Ratio of female to male labor force participation rate	Urban population (% of total population)	Ratio of female to male labor force participation rate	Total Urban population
		Independent variable					
		Population in urban agglomerations of more than 1 million (% of total population)	Ratio of female to male labor force participation rate	Urban population (% of total population)	Ratio of female to male labor force participation rate	Total Urban population	Ratio of female to male labor force participation rate
	Cointegration test	**Statistics**					
Kao	Modified Dickey–Fuller t	6.5405***	2.6066***	6.8020***	4.7349***	6.3899***	5.8948***
	Dickey–Fuller t	4.7045***	0.7940	5.5935***	3.9788***	4.555***	6.9896***
	Augmented Dickey–Fuller t	5.4830***	1.0236	6.2076***	3.1427***	5.3171***	-1.905**
	Unadjusted modified Dickey–Fuller	5.7753***	4.9677***	6.0384***	9.3832***	6.0958***	10.5297***
	Unadjusted Dickey–Fuller t	3.6501***	3.0894***	4.4947***	11.1591***	4.1488***	16.5296***
Pedroni	Modified Phillips–Perron t	6.2799***	7.0897***			3.5065***	7.9838***
	Phillips–Perron t	3.589***	5.0749***			-0.1224	8.5275***
	Augmented Dickey–Fuller t	2.9847***	6.1109***			-0.4908	11.8423***
West-erlund	Variance ratio	0.0377	1.5010*	-4.1971***	2.6677***	-6.8221***	2.6947***

Note: @,*, **, and *** indicate that the statistic is significant at 11%, 10%, 5%, and 1% level of significance, respectively.

The estimated findings are presented in Table 10. "xtcointtest kao" by default employs a Bartlett kernel with the automatic lag selection approach described by Newey and West (1994). Overall, all test results support the alternative hypothesis that there is a cointegrating relationship between the ratio of female to male labour force participation rate and total urbanisation, rejecting the null hypothesis that there is no cointegration. Pedroni (1999) designates as "between-dimension tests" the tests based on AR parameters particular to a panel, and as "within-dimension tests" the tests based on the same AR parameters. The alternative hypothesis that the entire urban population, the population in urban agglomerations of more than a million, the percentage of the urban population, and the ratio of the female to male labour force participation rate are cointegrated is supported by all test statistics, which reject the null hypothesis that there is no cointegration. Two Variance Ratio (VR) test statistics were developed by Westerlund (2005) for the null hypothesis that there is no cointegration. The alternative that at least some panels are cointegrated is rejected by the VR test statistic from the null hypothesis that there is no cointegration. The findings presented in Table 9 suggest a stable and enduring correlation between urbanisation and the ratio of female to male labour force participation rate.

5. DISCUSSIONS AND POLICY IMPLICATIONS

5.1. Discussion

The result shows that urbanization which is measured by size of population in million plus agglomerations, percentage of urban population, size of urban population negatively impacts on the ratio of female to male labor force participation rate. This indicates that increasing urbanization is not inclusive as far as gender is concerned. The results are in the line with the recent World Bank study which also found that women have less opportunities to earn than males do across the world (World Bank 2022). Women are less likely to actively pursue employment or work for pay with increased urbanization as jobs of desirable status may not be forthcoming. Women are less likely to hold formal jobs and have less prospects for professional advancement or business growth, indicating that urbanization has not resulted in modernization of ideas and rigid cultural practices, contrary to Kuznets' (1966) expectation. For instance, Turkey experienced a decline in female workforce participation rate from 36.1% in 1991 to 23.3% in 2005. This is because of the rising urbanization and structural transformation: women's retreat from the labour force (showing women's increased involvement in domestic tasks) occurred as households relocated from rural to urban areas and husbands left the agricultural sector (Verick 2018). For example, many African countries (e.g., Liberia, Madagascar and Nigeria) are experiencing higher urbanization rate in spite of less jobs creation (Sanchez-Reaza et al. 2016). Most African cities struggle to create jobs at a rate that keeps up with population growth and urbanization, and many of these cities exhibit high unemployment rates. In the case of India, Lama (2021) argued that women who work after marriage are discouraged from doing so due to social stigma. The absence of sufficient labour demand in relation to supply at a particular level of education can also be blamed for the negative correlation between the female labour force participation rate and urbanization. They choose to stay outside the labour market due to their persistent unemployment. This is often referred to as the "discouraged drop-outs" phenomenon. As a result of this, urbanization, which is expected to create higher opportunities, demand, wages, and social acceptance, could not raise the rate of female labour force participation. In fact, the COVID-19 epidemic has widened the gender disparity in employment.

On the other hand, the female labour force participation rate is seen to positively impact on the share of population living in million plus urban agglomerations and the share of urban population of a country. On the whole, higher female work participation rate is seen to drive the rate of urbanization which has three implications. Increasing women's work participation pulls the rural labour force to the urban areas in search of better jobs and opportunities, which leads to an increased urbanization. On the other hand, women work participation contributes to economic growth, the base of which is largely located in the urban areas given the pro-active business environment. It facilitates industry and workers both. More business activities are also supported by the increasing demand generated by the urban women workers. Therefore, increased women labour force is beneficial for promoting urbanization and driving development and economic growth.

Okun's Law, which states that higher growth results in lower unemployment is supported by our empirical results. A 1 per cent gain in GDP is matched by an increase in employment of at least 0.6 per cent in South Africa, Australia, and Canada (iMFdirect 2016). In 2018, the global unemployment rate for women was 6%, which is 0.8 percentage points higher than the rate for men (International Labour Organization 2018). Therefore, it is predicted that higher economic growth creates more job opportunities for women and reduces the unemployment rate for women. On the other hand, the higher share of female employers increases female employment. Several benefits are noticeable being a woman in the workplace. Women inspire innovation, more adept at fixing problems and foster a sense of community. Women are more effective than men in creating teams. They collaborate well in groups for the advantage of the business. Women are better at making their teammates feel important and valued for their contributions. Employee comradery and sense of purpose are boosted by this. Women are, therefore, hired more frequently by female employers, which raises the percentage of women participating in the labour force.

Most importantly, though a theoretical U-shaped relationship is hypothesized between the GDP and female labour force participation rate, the relationship is not supported by the empirical results. Our results show an inverted U-shaped relationship instead of a U-shaped one. This indicates that a higher GDP growth rate occurred at the expense of the women workers, which is indeed exclusionary from gender point of view. When economic growth is largely capital intensive it does not lead to any increase in demand for labour. Hence, the need for additional labour being met by increasing participation of women in the labour market does not get materialized. Off late economic growth in most of the countries including the developing ones characterized by surplus labour, has been highly mechanized. Hence, the absence of the positive effect of growth on women labour force participation is reconcilable, unfortunately though. Granger causality results suggest that there is a causal relationship between female labour force participation rate and urbanization. The panel cointegration suggests that urbanization and the ratio of female to male labor force participation rate have a stable and long-run relationship. Cointegration is a method for determining potential long-term correlations between time series processes. Therefore, it is predicted that the female labour force participation rate and urbanization have a long-term relationship.

5.2. Policy implications

Both a cause and a result of development is the availability of female labour. The potential for economies to grow more quickly can be realized as more women join the workforce. By increasing household incomes and boosting consumption of products and services, women labour can help families escape poverty. Women's abilities often increase as nations grow, social restrictions loosen and allow women to work outside the home (Verick 2018).

The majority of emerging nations are going through a significant shift from a rural-based economy to an urban-based industry and services-led economy. This means that rural resources such as people, land, and capital all are concentrating in the urban areas. This transformation will most likely take place in the unorganised sector and in small to medium secondary cities, which might not have the requisite resources, infrastructure, or services needed to effectively handle these significant demographic and rural-urban shifts (Tripathi and Mitra 2022). On the other hand, developing countries are having dangerously low female labour force participation rate. For instance, in terms of female labour force participation (FLFP), India was 187th from the bottom in 2017, down 18 places from its position in the 1990s (Roy and Mukhopadhyay 2019). Therefore, immediate action is required if urbanization's advantages are to be properly managed to generate jobs (Sanchez-Reaza et al. 2016). One way to envisage this is to integrate the development process with female friendly environment.

With the exception of a few African nations, the majority of nations in the world have developed as a result of rising urbanization. This is fairly clear considering how much more productively an urban area uses resources than a rural area. Therefore, developing nations with low rates of urbanization, like Niger (17%), Sri Lanka (19%), Cambodia (25%), Zimbabwe (32%), and India (36%) in 2022, may like to raise their female labour force participation rate to achieve higher rates of urbanization which in turn would result in more equitable, and sustainable economic growth. The percentage of female employers is crucial for raising the participation rate of women in the labour force though it has been quite low in underdeveloped nations like Bhutan (0.025), Pakistan (0.10), Zimbabwe (0.17), and Haiti (0.24) in 2021. The ratio is higher for developed nations, including New Zealand (4.54), Australia (4.05), and Italy (3.55). So, in order to increase the number of female employees, it is crucial to raise the number of female employers.

For a long time, economists have focused on "growth accounting" as a way to quantify how various factors (physical capital, labor, technology, human capital) contribute to economic growth. Na-Chiengmai (2018) found that the female labour force contributes positively to growth though little lower than male. The question as to how economic expansion might increase the rate of female labour force participation is crucial. In this context, Na-Chiengmai (2018) suggested that women should be encouraged to enter the workforce with effective policy initiatives suggested by the policymakers. They ought to make it easier for women to get better occupations by giving them access to better educational and training opportunities, credit availability and support services like childcare, and by lowering the load of household responsibilities. The promotion of female participation in market activities requires carefully thought-out government policy.

6. CONCLUSIONS

Does the urbanization increase female labour force participation rate, or, does higher female labour force participation rate increases urbanization? The reality is possibly a mix of both. This paper based on the cross-country panel data addresses this unique issue of inter-relationship between urbanization and female labour force participation rate. Though the received theory suggested that urbanization results in modernization and transformation of the society, the impact of female labour force participation rate on urbanization was unexplored. The paper uses the World Bank data for 217 countries from the year 1991 to 2022 to address this issue. The relationship between female labour force participation rate and urbanization is the question of reverse causality. Therefore, we use the simultaneous equation model which is estimated on the basis RE-2SLS technique to investigate this relationship. To check the robustness of the results we estimate the Least Square Dummy Variable panel data model. The Granger causality test and cointegration method is used to examine the causal, stable and long run relationship between these two variables.

The simultaneous equation model shows that the ratio of female to male labour force participation rate is negatively impacted by urbanization, which is defined by size of population in million plus agglomeration, percentage of urban population, and size of urban population. On the other hand, the proportion of the population living in urban agglomerations of more than 1 million people and the proportion of a country's population living in cities are both favourably influenced by the ratio of women to men participating in the labour force. Hence, the findings with a silver lining suggest though urbanization might not have been successful in raising the female labour force participation, the latter has the potential to raise the level of urbanization. The policy initiatives will have to focus on the key variable which is female labour force participation. It is apparent that the GDP growth rate and the percentage of female employers have a positive impact on the participation rate of women in the labour force. The infant mortality rate, the proportion of female wage and salaried employees, and the employment in industry, on the other hand, have a disadvantageous or adverse effect on the proportion of women who participate in the labour force. In the context of the other determinants of urbanization measured as the proportion of the population living in urban agglomerations of more than 1 million people higher GDP per capita, and the proportion of employment in the industry are pertinent. The population aged 15 to 64 also raises the proportion of the urban population and the overall urban population.

Most importantly, the results suggest that GDP has a positive effect on the FMLFPR, and on its square term it has a negative impact. Instead of a U-shaped relationship, this suggests an inverted U-shaped relationship which does not support the predictions of Cagatay and Ozler (1995) and Goldin (1994). The results also do not support the U-shaped relationship between female labour force participation rate and urbanization which was predicted by Boserup (1970) and Oppenheimer (1970). Granger causality results suggest that there is a causal relationship running from female labour force participation rate to urbanization. Finally, the panel cointegration test establishes that this long-run relationship between these two variables is stable.

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