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What are the drivers of female labour market participation in North Africa?

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Background: The participation of female labour is essential for promoting industrialisation. North African economies are plagued by low levels of female labour force participation (FLP) and high gender inequality gaps. Low levels of FLP are detrimental to the attainment of the Sustainable Development Goals, such as gender equality, decent work, and economic growth, as well as reduced inequalities.

Aim: This research aimed to establish the determinants of FLP in North Africa.

Setting: North Africa.

Method: The research adopted the Panel Auto Regressive Distributed Lag. Data were sourced from the World Bank for the period 1991–2021.

Results: The empirical findings showed that the lack of gender-sensitive policies, limited investment in education and institutional barriers limit the capacity of women to participate in the labour market. Primary research findings depicted that the Human Development Index (HDI), fertility rate and life expectancy had a positive impact on FLP in the long run. Economic growth had a positive effect on FLP in the short run.

Conclusion: It was concluded that North African governments need to develop policies that advance the interests of women, as well as the implementation of women empowerment programmes.

Contribution: The findings of the study imply that addressing FLP requires collaborative efforts from the governments and other stakeholders and this helps in reducing gender inequality.

Keywords: female labour force participation; gender inequality gap; industrialisation; labour market; poverty; sustainable development goals.

Introduction

Female labour force participation (FLP) varies systematically between continents and economies; for example, South Asia recorded a low FLP of 12.5% in 2020 (World Bank 2023a). It is defined as the prime indication of the extent to which females participate in the economic activities of society (Yakubu 2008). The European Union and North America recorded FLP rates of 36.1% and 55.4%, respectively (World Bank 2023b). Australia recorded a FLP rate of 69% in 2021 (World Bank 2023c). All these statistics indicate the imbalances in the labour markets, and these differences are caused by diverse factors.

The North African region is plagued by low FLP rates, high poverty levels and wide gaps in gender inequality (Adeleye et al. 2020; Chapman 2015). For example, labour force participation in Algeria is 19.4%, Egypt is 18.6%, Libya is 35.8%, Morocco is 25.7%, Sudan is 30.1%, and Tunisia is 28.3% (World Bank 2023d; World Bank 2023h). These values reflect low FLP while males continue to dominate the labour market.

Egypt recorded a male labour force participation (MLP) of 67% in 2020; Libya 61% in 2012; Algeria had a rate of 66%; Tunisia 68% in 2017; and Morocco recorded a MLP rate of 71% in 2021 (World Bank 2023g). These labour market participation rates are higher for males relative to females in all these economies. This indicates that males dominate the North African labour market while females are very few. Thus, these inequalities are cause for concern and should be addressed to ensure equality is achieved in the labour market.

In addition, the main cause for concern is that some of the North African economies have been recording a sharp decrease in FLP. For example, Morocco recorded a decrease in FLP from 27% in

2008 to 22% in 2022 (World Bank 2023d). This drop in FLP implies a widening gender inequality gap as far as participation in the labour market is concerned. Egypt recorded a FLP rate of 23% in 2007 but at the end of 2021 it had a rate of 15% (World Bank 2023d).

Although some economies, such as Libya, recorded a 2% decrease in FLP between 2016 and 2021, that percentage looks small but its effect on the total labour force is huge (World Bank 2023d). The 2% translates to 83 962 females who left the labour market. In other words, if no alternative sources of income are made available to those who exited the labour market, they may be exposed to high poverty levels as they will be without employment. All the economies of North Africa are signatories to the United Nations, which crafted the Sustainable Development Goals (SDGs). Some of the SDGs are aimed at reducing gender inequality, achieving decent work, and economic growth for all. Given the above statistics, the probability of North African economies attaining these SDGs is between slim and next to nothing (United Nations 2023). The continuous decline of female participation in the labour market cripples the capacity of North African economies to attain these goals by 2030. In addition, this adversely affects the labour supply needed for industrialisation initiatives and economic development.

The importance of female participation in the labour market cannot be underestimated. Studies proved that the participation of females in the labour market helps to reduce the gender inequality gap, improve economic efficiency, expand industries through women-led businesses, and also attain high economic growth levels (Betray, Dordevic & Server 2020; Eibich et al. 2022; International Monetary Fund 2013; Pimkina & De la Flor 2020). Several researchers examined female labour market participation, but no research has tackled the determinants of FLP in North Africa (Idowu 2019; Luci 2019; Nkoumou, Ngoa & Song 2021; Sangwan & Kumar 2021; Thaddeus et al. 2022). This research was conducted by adding supply side and demand side factors in an econometric model to ascertain the exact determinants behind low FLP in North Africa.

Female labour force participation is a key ingredient for economic development in that it helps to increase income for households, reduce poverty levels, and the labour is essential for supporting industrialisation initiatives (Verick 2018). Without labour supply, industries cannot operate or even expand. Therefore, if economies do not use a female labour force, they lose the benefits to some extent. Thus, North Africa needs to create industrial opportunities that enable FLP to achieve high levels of economic growth and economic development.

In addition, the coronavirus disease 2019 (COVID-19) pandemic had a negative influence on women's salaries, career opportunities, employment, access to education and the alleviation of poverty, while also increasing unpaid labour and caregiving that must be undertaken (Ali &

Ullah 2021). The effects of COVID-19 left scores of women unemployed and North African economies are not an exception to this (World Bank 2021).

The research was worth pursuing because of the fact that the female labour force is an essential factor for economic growth and economic development (Verick 2018). Thus, without such a labour force, it can take an extended time for North Africa to achieve some of the SDGs, such as poverty reduction, decent work and economic growth (Masuda et al. 2022). The central aim of the study was to determine the drivers of low female labour market participation in North Africa. To achieve this, the following research objectives were used in this study to determine the factors contributing to women's low economic participation in the labour markets in North Africa, and to examine the effects of women's low economic participation in the labour markets in North Africa. Finally, the study offered policy recommendations on ways to improve female labour market participation in North Africa.

The article is structured as follows: the next section discusses the theoretical and empirical literature review. The human capital theory (HCT) and the U-shape theory form the theoretical literature review. These theories explain the relationship between FLP and economic development, as well as the importance of education as a tool that enhances high FLP. The research methodology, results and conclusion follow. In terms of the research methodology, the research adopted the Panel Auto Regressive Distributed Lag, and the data cover the years 1991–2021.

Literature review

This section presents the literature review. The discussion is centred on the two key theories that support the topic under study; these are the U-shape theory and the HCT. The empirical literature review is discussed as well.

Theoretical framework
U-shape theory

This theory explains the relationship between the female labour force and economic development in an economy (Fatima & Sultana 2009). Erinc (2017) pointed out that the rate of participation by females in the labour market follows a U-shape as an economy goes through the economic development process which is partially achieved because of economic growth. This implies that the rate of female participation in the labour market is believed to be low at first and later increases (Verme 2015). The fluctuations in the rate of FLP have implications for economic growth. Low rates of participation may lead to low rates of economic growth and vice versa (Verick 2018). Thus, economic growth is an integral component of economic development, and the role of women in labour force participation cannot be underestimated.

North African economies have been facing diverse rates of economic growth, and the levels of female participation in the labour market remain very low too. Saleh (2022) pointed out that the gross domestic product (GDP) levels of North Africa dropped in 2020 by 1.4%; however, in 2022, the GDP levels increased by 4.3%. On the other hand, from 2016 to 2022, the rate of FLP in North Africa has been decreasing from 21.1% to 19.6% (World Bank 2023c). Thus, the current FLP status in North Africa is the direct opposite of the U-shape theory which requires further investigation. This research sought to examine the supply and demand factors behind the low levels of female participation in North Africa.

Human capital theory

According to the HCT, investing in education is vital to developing one's abilities and improving one's personal wealth (Becker 1993; Kozioł et al. 2014; Mincer 1974). To add to that, the theory is predicated on the idea that a population's ability to produce more goods and services may be greatly improved by investing in formal education (Wuttaphan 2017). More importantly, the HCT predicts that investing in human capital will increase economic output (Kozioł et al. 2014). Education is, therefore, an important variable as far as FLP is concerned. However, in practice, increased human capital investment does not necessarily guarantee high economic growth levels or improved wealth. This is so because other factors, such as poor industrial policies or political instability, can affect production levels.

In North Africa, there are varying levels of investment in human capital. For example, based on the latest statistics the following North African economies recorded varying government expenditure on education. Libya recorded an increase from 27% to 53% between 1976 and 1999; Algeria recorded an increase from 13% to 27% between 1979 and 2008; and Egypt recorded an increase from 22% to 39% between 1971 and 1996 (World Bank 2023f). Morocco recorded an increase from 8% to 21% between 1973 and 2009 (World Bank 2023f). The increase in government spending on education should lead to an increase in both males and females being active in the labour market. In addition, because of globalisation and the adoption of the SDGs, education is a fundamental goal and increases labour market access for both genders through an improvement in skills accumulation. This study sought to examine the factors determining FLP in North Africa.

Empirical evidence

Research shows that most of the North African nations, such as Egypt, Morocco, Libya, Algeria and Tunisia, have practices that limit FLP. The extent to which religion affects the respective labour markets has a bearing on its effectiveness as far as employment is concerned (Bayanpourtehrani & Sylwester 2012; Joslin & Nordvik 2021). The practices that limit high FLP are social norms in society that limit women from entering the labour market and some men who prohibit their spouses from working outdoors, as well as societal discrimination (Egar 2020). In Morocco, it was realised that society views women who go to work as uncultured, shameful, valueless, lacking self-control and a misfit to the society at large (Egar 2020:18).

Studies also show that some cultural values are designed to promote educational access to men so that they get better jobs so that women should be dependent on men (Babar 2020; Egar 2020; Malik 2021). The Islamic marital contract outlines the duties of the man and woman; a woman's right to work is prohibited by such marriage agreements (Egar 2020:8). This reveals that such cultural values limit FLP. In terms of discrimination, women who work are shamed and discriminated by the society and this limits FLP (Egar 2020).

Some factors cause the deterioration of the labour market in the North African region. In Libya, research indicates that cultural beliefs, violence and political conflict have affected women's potential to participate in the labour market, as well as limiting their ability to achieve economic, political and social rights (United Nations Development Programme 2023). In terms of culture, research points out that males in Libya are given top priority to access education compared to females; this limits women's capacity to be active in the labour market (Elazhari 2021). The factors cited above adversely impact the FLP of Libya as females continue to be under-represented, hence the country has low rates, as discussed previously. The Libyan labour market has been underperforming because of poor employment policies, a skills gap, an underdeveloped private sector, as well as high immigrant labour from neighbouring economies in Africa (Ajaali & Abuhadra 2014). These factors led to a large number of Libyan workers opting to work in the informal sector (Ajaali & Abuhadra 2014).

Lassassi and Tansel (2020) examined FLP in Algeria, Egypt, Tunisia, Jordan and Palestine. Of these five economies, Tunisia, Algeria and Egypt fall within the North African region. Research findings proved that for women with educational levels below secondary school level, their participation in the labour market was limited (Lassassi & Tansel 2020). This indicates that higher levels of education can be useful for encouraging female participation in the labour market. It was also observed that women who stay in rural areas leave the labour market before their retirement age (Lassassi & Tansel 2020).

Furthermore, Etang Ndip and Lange (2019) investigated poverty and the labour market in Sudan. The study's findings indicated that there were significant gender gaps in Sudan's labour market, both in terms of income and employment prospects (Etang Ndip & Lange 2019). Also, it was found that only 33% of all working-age women and 75% of working-age men, participated in the labour force (Etang Ndip & Lange 2019). Such statistics are worrisome because these imply that 67% of women are excluded from the labour market. This anomaly means that the Sudanese economy has a potential labour force that can be rendered by females and remains

untapped. On the part of women, it also means that they remain exposed to poverty, and under development, as they are excluded from the labour market, which can provide an income for living.

On top of that, research results pointed out that women were more likely to be unemployed even if they participated in the work force (Etang Ndip & Lange 2019). The research also concluded that women are the majority who work in unpaid jobs and earn only 60% on average of what males do (Etang Ndip & Lange 2019). These gender disparities in the labour market make it difficult for Sudan, which falls within the North African region, to attain some of the SDGs, such as poverty reduction, gender equality and reduction of inequalities. Therefore, there is a need to carefully examine the demand and supply factors of female participation in the labour market in the North African region at large.

Mohamed (2022) used time series data from 1975 to 2021 to analyse the relationship between female human capital and economic growth in Sudan. These findings indicated that female participation in the labour market had a positive influence on economic growth. This implies that if most females are fully empowered with relevant skills to participate in different economic activities, higher levels of economic growth can be achieved. From this research, it was also found that effective female participation in the labour market can be improved by availing educational opportunities, increasing wages in the formal sectors, as well as improved access to healthcare.

However, the current political turmoil in Sudan may have an adverse impact on the provision of these services to females and the general populace. Thus, political issues that affect effective female participation in the labour market must be addressed too to ensure high rates of FLP in North Africa at large. This study examined the factors that impact female participation in the labour market.

In addition, Sudan has been affected by war and political instability; as a result, more women fled the country for safety reasons; hence, it is one of the contributing factors to the low FLP rates (Jamie 2013). Research also points out that the low FLP in Sudan has been attributed to women preferring to look after children and families rather than working in an unsafe environment characterised by political upheaval (Nyanga, Sibanda & Kruger 2019). Therefore, this explains the variation in FLP relative to other economies in North Africa.

In the case of Morocco, Lenoël and David (2019) pointed out that migration can lead to women being excluded from formal paying jobs in the labour market; they become exposed to unpaid family work. In this global village, migration is inevitable and many causes make people move to other countries. These include political instability, war, search for employment, just to mention a few. Such migration

was found to adversely impact females to actively participate in the labour market.

Mouelhi and Goaied (2017) conducted research on women's participation in the Tunisian labour market. Their findings suggest that marital status, low levels of education and limited access to positions of authority were the key obstacles to the poor participation of women in the labour market of Tunisia (Mouelhi & Goaied 2017). This implies that economies should ensure that the social, economic and political barriers are addressed to minimise gender inequality to maximise the skills provided by women for the attainment of high levels of economic growth.

Lopez-Acevedo et al. (2021) used a probit model and multinomial logit to explore the trends and determinants of FLP in Morocco. From the study, it was realised that marriage and the issue of gender roles decreased FLP (Lopez-Acevedo et al. 2021). In terms of gender roles, it was observed that the educational level of a male counterpart increases a low propensity to perform paid labour as opposed to unpaid domestic activities and this leads to low FLP rates (Lopez-Acevedo et al. 2021). These findings show that there are diverse factors that can lead to low FLP, and this study sought for the relationship between FLP and other factors, such as education, wages and salaries among other factors with a focus on the North African region at large.

Backhaus and Loichinger (2021) researched FLP in sub-Saharan Africa. The study's findings indicate a link between women's engagement in the labour force and their educational achievement across the working age range (Backhaus & Loichinger 2021). It was also discovered that female employment in the non-primary sector was favourably correlated with female education and early parenting, which in turn, was linked to lower levels of education for women and a rising gender gap in the labour market (Backhaus & Loichinger 2021).

From these research findings, it can be concluded that poor or limited investment in education is a huge stumbling block that also creates low FLP rates in the labour market. These research findings are at par with the views of Klasen (2019) who posited that the bulk of the economies on the African continent are lagging behind in terms of ensuring equal educational opportunities to both males and females compared to other continents, such as America, Europe and Asia. When females lack opportunities for quality education, their chances of entering the labour market become adversely affected and they may not meaningfully contribute to economic growth.

Brice, Ngoa and Simon (2021) researched the effects of information and communication technologies (ICT) on FLP in 48 African countries. The three main findings were that ICT use, particularly the use of mobile phones and the internet, significantly increases labour force participation of African women; this effect is strengthened by economic

growth and female education. The strongest impact of ICT on female employment in Africa is in the industrial sector (Brice et al. 2021). These findings imply that a lack of ICT tools limits the capacity of women to participate in the labour market. Moreover, investment in human capital is a key ingredient that can help women to actively participate in the labour market.

In addition, it became clear that the government needed to implement gender-sensitive policies and remove all institutional obstacles to women's access to the labour market to close the gender gap in employment (Idowu 2019). This shows that institutional barriers can limit the full participation of women in the different sectors of the economy. Thus, initiatives should be taken to increase FLP with education, literacy and household food security (Idowu 2019).

Idowu (2019) researched on demand drivers for female participation in the labour market with a focus on selected African economies. The results of the research showed that while female marginal productivity was found to be unfavourable in the near term, it had a considerable positive impact on the long-term demand for female labour and gender inequality in employment (Idowu 2019). The study focused on demand drivers but supply drivers were ignored. There is an existing research gap that this study seeks to close by examining both demand and supply side drivers for low female participation in the labour market.

Furthermore, Chaka, Oladunjoye and Tshidzumbe (2022) used autoregressive distributed lag to examine the relationship between globalisation and FLP in South Africa. The study found that while economic affluence, opportunities, and real economic growth have a positive and significant influence on FLP in South Africa, globalisation does not (Chauke et al. 2022). Based on the research findings, the determinants of FLP vary depending on the economy and the diverse macro-economic factors. As a result, improving FLP in any economy should be tailor-made to meet the needs of the affected country.

In addition, Disci (2018) researched FLP in Turkey and found that the low rates of FLP were attributed to low wage rates. This means that the rate of wages and salaries offered in the labour market is a determinant of FLP.

Research has shown that between 1968 and 2016 Japan was able to raise groups that were severely underrepresented in the labour force, to the level of women by increasing their participation (Shambaugh, Nunn & Portman 2017). Japan had a prime-age FLP rate of just 66.5% in 2000, which was 10% points lower than the US level and below the OECD average (Shambaugh et al. 2017). Since then, while the Japanese rate has increased to 76.3%, the US rate has trended downward to 74.3% in 2016 (Shambaugh et al. 2017). The increase in FLP in Japan was achieved because of different policy reforms, such as paid maternity leave, increased government day-care, as well as repayment of two thirds of

salaries to the workers during the leave period (Shambaugh et al. 2017). The Japanese policy reforms impacted the economy which increased FLP. This reflects the fact that government support is necessary for enhancing FLP.

Methodology

This section presents the research methodology used in the study. The methodology section is based on arguments taken from the U-shape theory and the HCT. An econometric model and a brief description of the variables will be presented. The dependent variable was FLP. The research used six crucial independent variables, which were wage rate (WR), poverty (PR), life expectancy (LE), educational levels (EDU), fertility rate (FR) and economic growth (EG). Data from 1991 to 2021 were collected from the World Bank portal.

Education was added as a variable in the study because there is a positive relationship between the level of education and one's potential to participate in the labour market (Ango et al. 2022; Khan et al. 2020; Maika & Mbatkam 2023). Without the necessary educational qualifications, one may not fit the labour market to offer certain types of services. Furthermore, this variable was added because, based on the discussion of the HCT, it was established that education is an essential variable that impacts FLP. The variable, wages, was added because it is a form of remuneration when one renders one's labour. Research points out that in some instances when the wages offered are low, it can be challenging to attract labour (Doerrenberg, Duncan & Löffler 2023).

The Human Development Index (HDI) was added as a proxy of poverty measurement. Idowu (2019) posited that exposure to poverty, together with the limited opportunities for women's empowerment, cripples their prospects to participate in the labour market. This indicates that there is a relationship between poverty and labour market participation. The index is useful for poverty measurement as it incorporates income, education and health. The research shows that it produces reliable estimates in as far as poverty measurement is concerned (Bejar 2021; Korankye et al. 2020). In addition, the HDI uses health and education; these factors also form part of the multi-dimensional index, which is one of the most robust proxies for poverty measurement (United Nations Development Programme 2022; Vollmer & Alkire 2022).

Life expectancy was added as a variable because when an economy has a low life expectancy it implies that there will be fewer people who will be active in the labour force (Cosic, Williams & Stone 2021). Fertility rate is a variable because research shows that high fertility is positively associated with low FLP (Bloom et al. 2013; Skadsen 2017). Lastly, economic growth was added as a variable because research shows high levels of economic growth are normally accompanied by the expansion of industries and the creation of job opportunities, which should be availed to both females and males (Hussein et al. 2023). This variable was also added because based on

the discussion under the U-shape theory, it was observed that economic growth facilitates economic development.

Model

This section presents the estimation technique used in the study. The research adopted the Panel Auto Regressive Distributed Lag (PARDL) model, developed by Pesaran and Shin (1999) because it helped to determine the factors affecting FLP in North Africa. The PARDL is applicable when the variables are integrated in the order of 1 and 0 (Giles 2013; Mamvura & Sibanda 2020). The model was selected because it enables the estimation of short-run and long-run parameters and is regarded as a useful model in panel analysis (Mamvura & Sibanda 2020; Shin, Yu & Greenwood 2014). Panel Auto Regressive Distributed Lag was used because it helps reduce the chances of spurious regression (Gholami, Sang-Vong Tom & Heshmati 2005). The model is stated as (Equation 1):

$$\Delta Y_{it-1} = m + \delta_{1\Delta} X_{it-1} + \delta_{2\Delta} X_{it-2} + \delta_{3\Delta} X_{it-1} + \delta_p \Delta X_{it-p} + \omega_2 Y_{it-2} + \varepsilon_{it} \qquad \text{[Eqn 1]}$$

where ΔY_{it} represents a vector of (kx1) representing FLP, i represents economies in North Africa, Δ captures differences in operator, X_1, Y_1 are the lagged independent variables for every i = 1 p, δ_1-δ_3 represents the short-run coefficients of the model explaining the short-run relationships between the variables, ω_1, ω_2 represents the long-run relationship, and ε_{it} is the error term.

Summary of dataset

This section presents the summary of the dataset (Table 1). The panel data used in this research was from 1991 to 2021. The first column shows the variable name, and the second and third columns are the indicators used, as well as the variable description, respectively. The unit of measurement is in the fourth column. The last column is the data source.

Interpolation was used to fill the missing data values. The variables selected have a bearing on FLP and both are supply-side and demand-side factors linked to FLP.

Results

This section presents the discussion of the results that relate to the key variables used in the study.

Descriptive statistics

This section presents the descriptive statistics, as well as FLP rates in North Africa.

Female labour force participation rates in North Africa

Figure 1 provides the FLP rates in North Africa.

Period 1 is from 1991 to 1998, Period 2: 1999–2006, Period 3: 2007–2014, and Period 4: 2015–2021. In Period 1, Sudan, Morocco, and Libya recorded a sharp increase in FLP though it remained below 30%. Tunisia and Algeria recorded a steady increase in FLP; at the end of Period 1 they were at 13% and 25%, respectively. Egypt experienced FLP fluctuations in Period 1. In Period 2, Libya recorded an acute increase in FLP reaching 35% while Sudan recorded very few changes. Egypt continued to experience major fluctuations in FLP and at the end of Period 2 it recorded a 24% FLP rate. Algeria and Morocco recorded a steady increase in FLP rates in Period 2. For Sudan, the FLP rate was constant. In Period 2, Tunisia showed a gradual increase in FLP rates and at the end of the period it was at 15%.

In Period 3, Algeria, Morocco and Egypt progressively increased as far as FLP rates are concerned, but there were minor fluctuations. Libya's FLP rates in Period 3 remained constant at 35%. Tunisia's FLP rates continued to increase steadily in Period 3 while Sudan's rates remained constant. In Period 4, Algeria recorded an increase of FLP and it was finally

TABLE 1: Summary of data set.

Variable	Indicator	Variable description	Unit of measurement	Source of data
Female labour force (FLP)	Total labour force (%)	Female labour force as a percentage of the total, shows the extent to which women are active in the labour force. Labour force comprises people aged 15 and older, who supply labour to produce goods and services during a specified period	Percentage	World Bank (2023a)
Life expectancy (LE)	Years	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life	Years	World Bank (2023b)
Poverty (PR)	Human Development Index (HDI)	The absence of opportunities, coupled with high levels of undernourishment, hunger, illiteracy levels, lack of access to education, physical and mental diseases, socio-economic instability	Human development index	United Nations (2022)
Educational levels (EDU)	School enrolment, tertiary, female (% gross)	Ratio of total enrolment in tertiary education as a percentage of total population	Percentage	World Bank (2023c)
Waged & salaried workers (WR)	Female employment (%)	This refers to workers who hold the type of jobs defined as 'paid employment jobs,' where the incumbents hold explicit (written or oral) or implicit employment contracts that give them a basic remuneration that is not directly dependent upon the revenue of the unit for which they work	Percentage of female employment	World Bank (2023d)
Fertility rate (FR)	Rate	The number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with age-specific fertility rates of the specified year	Total births per woman	World Bank (2023e)
Economic growth (EG)	Percentage	Refers to an increase in an economy's gross domestic product value on a yearly basis	Annual percentage	World Bank (2023f)

Note: For more information, please see the full reference list of the article, Mateko, F.M., 2024, 'What are the drivers of female labour market participation in North Africa?', *South African Journal of Economic and Management Sciences* 27(1), a5179. https://doi.org/10.4102/sajems.v27i1.5179

29%. Egypt recorded a sharp decline in the FLP rate and at the end of 2021 it was 17%. Libya's FLP rate remained constant, and an insignificant increase was recorded towards the end of Period 4. On the other hand, Morocco suffered from fluctuations and a drop in FLP rate to 23%. Tunisia's FLP rates rose in Period 4 as it recorded 18% at the end of 2021. Overall, from Period 1 to Period 4, all North African economies had low FLP rates, and the economy exceeded 40%.

Table 2 shows the descriptive statistics.

In terms of FLP, the mean was 25.15%, median was 25.23%, minimum was 12.27%, and the maximum was 35.77%. The standard deviation (SD) was 5.66, skewness was –0.32, kurtosis was 2.88, and the Jarque–Bera (JB) was 3.46. In terms of FR, the mean was 3.27%, the median 2.97%, maximum 6.11%, and the minimum 1.96%. The SD was 1.02, skewness 1.03, the Kurtosis 3.12, and the JB was 33.56.

In terms of LE, the mean was 71.03 years, the median 71.93 years, the maximum 79.37 years. The minimum was 51.39 years, the SD 5.63, kurtosis 4.15, skewness –0.97, and the JB was 39.99. In terms of WR, the mean was 66.40, median 67.39, maximum 98.81, and the minimum 26.50. The SD was 20.15, skewness –0.12, kurtosis 2.42, and the JB was 3.03. In terms of EG the mean was 3.35%, the median 3.55%, and the maximum 86.82%. The minimum was –50.33%, SD 9.83%, and skewness

was 2.73%. The kurtosis was 41.84% and the JB was 11 926.85. Lastly, for EDU the mean was 1.05, median 0.10, maximum 80.17. The minimum was –0.09 and the SD 8.38, skewness 7.99, kurtosis 66.61, and the JB was 33 344.21.

Correlation analysis

This section presents the correlation analysis. The discussion is based on the most salient coefficients.

Table 3 illustrates the correlation between WR and FLP was positive at 23%. Economic growth was negatively associated with FLP at 1% while EDU was positively associated with FLP at 4%. The relationship between FR and HDI was negative at 78% while the relationship between LE and HDI was positive at 82%. Wage rate, EG, and EDU were negatively associated with HDI at 19%, 2% and 7%, respectively. Life expectancy was negatively correlated with FR at 86%. The relationship between WR and FR was positive at 49%.

Unit root tests

To test for unit root in the research, augmented Dickey–Fuller test and Phillips–Perron test were used. The results are presented in Table 4.

The results in Table 4 indicate that FLP, HDI, WR and EDU were stationary after the first difference. EG, LE and FR were
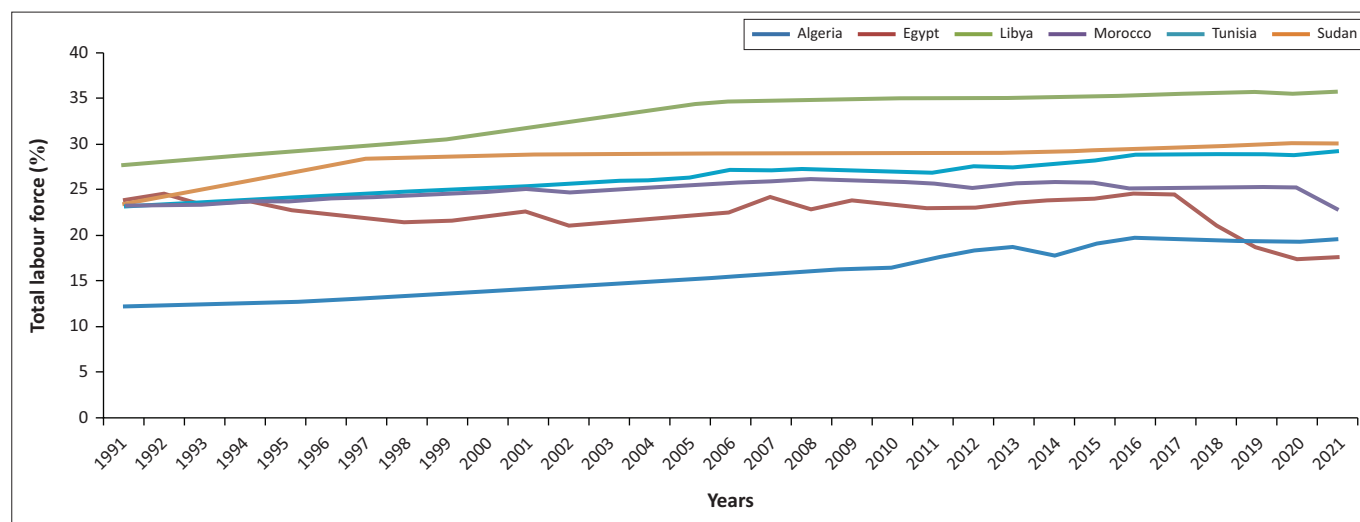
FIGURE 1: Female labour force participation rates in North Africa. Period 1 is from 1991 to 1998, Period 2: 1999–2006, Period 3: 2007–2014, and Period 4: 2015–2021.

TABLE 2: Descriptive statistics.

Variables	FLP	HDI	FR	LE	WR	EG	EDU
Mean	25.15	0.62	3.27	71.03	66.40	3.35	1.05
Median	25.23	0.65	2.97	71.93	67.39	3.55	0.10
Maximum	35.77	0.74	6.11	79.37	98.81	86.82	80.17
Minimum	12.27	0.33	1.96	51.39	26.50	-50.33	-0.09
Std. Dev.	5.66	0.10	1.02	5.63	20.15	9.38	8.38
Skewness	-0.32	-0.92	1.03	-0.97	-0.12	2.73	7.99
Kurtosis	2.88	2.90	3.12	4.15	2.42	41.84	66.61
Jarque–Bera (JB)	3.46	26.80	33.56	39.99	3.03	11926.85	33344.21

FLP, female labour force participation; HDI, human development index; FR, fertility rate; LE, life expectancy; WR, wage rate; EG, economic growth; EDU, educational levels.

stationary at level. All in all, the panel was stationary at both level and the first difference using the ADF and PP unit root tests.

Lag length selection

The Vector Autoregressive model was used to determine the optimal lag length in this study. The results are presented in Table 5.

The Akaike criterion was used for decision purposes on the appropriate lag length. Table 5 shows that Lag 2 was selected because it had the lowest AIK value of 16.42.

Panel auto regressive distributed lag short-run results

This section presents the results of the Panel Auto Regressive Distributed Lag model short-run results.

Table 6 shows that EG was significant at 1% level. In terms of coefficients, a 1% increase in economic growth leads to a 2% increase in FLP in North Africa in the short run. These findings are at par with the views of Hussein et al. (2023) and Thaddeus et al. (2022) who posited that high levels of economic growth are normally accompanied by the expansion of industries and the creation of job opportunities, which should be made available to females and males.

Panel auto regressive distributed lag long-run results

The following results show the long-run PARDL results.

The results presented in Table 7 show that HDI, FR and LE were significant at the 1% level. In terms of the coefficients, a 1% increase in FUNE leads to a 4% increase in FLP in the long run. This means that an increase in female unemployment leads to an increase in FLP, and this research finding is in line with the views of Altuzarra, Gaalvez and Gonzale (2018) and Chaudhary and Verick (2014). This is also supported by the fact that if people are unemployed, they fight to enter the labour market to earn a living. Thus, unemployment will act as a driver for women to participate in the labour market.

For HDI, a 1% increase in HDI will lead to an increase in FLP by 25% in the long run. It should be noted that reverse causality between these two variables was ignored because it

was regarded as insignificant as other researchers identified that high levels of HDI lead to high FLP and not vice versa (Bea et al. 2016; Naidoo 2015). This research finding means that when females have high living standards their participation in the labour market will increase by 25%. These research findings are supported by the fact that low poverty levels allow women to be active in the labour market as they will have a certain degree of socio-economic stability, be healthy, and have access to other basics of life (Fabrizio et al. 2020; Idowu 2019). Poverty is a multidimensional aspect that incorporates access to education, socio-economic stability, and access to health, just to mention a few; thus, when one has access to these services, a woman will have better prospects of participating in the labour market (Beegle et al. 2016; United Nations 2019).

A 1% increase in FR will lead to a 61% increase in FLP in the long-run. This means that as females give birth, their

TABLE 4: Unit root tests.

Variable	ADF test		PP test	
	Level	1st Diff	Level	1st Diff
FLP	-	0.00	-	0.00
HDI	-	0.00	-	0.00
FR	0.00	-	0.00	-
LE	0.00	-	0.00	-
WR	-	0.00	-	0.00
EG	0.00	-	0.00	-
EDU	-	0.00	-	0.00

FLP, female labour force participation; HDI, human development index; FR, fertility rate; LE, life expectancy; WR, wage rate; EG, economic growth; EDU, educational levels; Diff, difference.

TABLE 5: VAR model for optimal lag selection.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2733.507	NA	24864990	39.73199	39.90168	39.80095
1	-1077.641	3095.749	0.002381	16.66146	18.18873	17.28211
2	-997.0031	141.4086	0.001887	16.42033*	19.30516	17.59266

LR, likelihood ratio; FPE, Final Prediction Error; AIC, Akaike Information Criterion; SC, Schwarz Criterion; HQ, Hannan Quinn; VAR, Vector Autoregressive Model.
*, chosen lag according to Akaike criterion.

TABLE 6: Panel auto regressive distributed lag short-run results.

Variable	Coefficient	T-statistic	Probability
EG	0.02	2.29	0.00

TABLE 7: Panel auto regressive distributed lag long-run results.

Variable	Coefficient	T-statistic	Probability
HDI	25.10	7.74	0.00
FR	0.61	7.32	0.00
LE	0.47	21.12	0.00

HDI, human development index; FR, fertility rate; LE, life expectancy.

TABLE 3: Correlation analysis.

Variables	FLP	HDI	FR	LE	WR	EG	EDU
FLP	1.00	-	-	-	-	-	-
HDI	-0.02	1.00	-	-	-	-	-
FR	0.06	-0.78	1.00	-	-	-	-
LE	-0.07	0.82	-0.86	1.00	-	-	-
WR	0.23	-0.19	0.49	-0.21	1.00	-	-
EG	-0.01	-0.02	-0.06	-0.05	-0.05	1.00	-
EDU	0.04	-0.07	-0.08	-0.01	-0.20	0.01	1.00

FLP, female labour force participation; HDI, human development index; FR, fertility rate; LE, life expectancy; WR, wage rate; EG, economic growth; EDU, educational levels.

engagement in the labour market increases by 61%. These research findings are contrary to the stylised facts established by other researchers, where low levels of fertility were found to be positively associated with high FLP (Atlas, Tassevemn & Turgut 2016; Doepke, Kindermann & Terlit 2022). The explanation of this is that as females give birth they need to work to secure the welfare of the children (Doepka et al. 2022; Evan & Vizarova 2017; Kinoshita & Guo 2015).

To achieve this, working in different industries helps one to earn an income which will enable one to meet some of the financial goals of the children (Kinoshita & Guo 2015). Thus, more children require funds for their welfare, and participation in the labour market is one way to earn a living. As children require care and more time, the less time can be spent being active in the labour market; therefore, it should be noted that financial resources play a pivotal role in the welfare of children (LeBaron et al. 2020). In addition, research shows that high fertility is associated with high labour force participation because of the fact that some employers pay parental benefits, such as long maternity and paternity leave, as well as financial allowances (Kinoshita & Guo 2015).

Concerning LE, a 1% increase in LE will lead to an increase in FLP by 47% in the long-run. This means that a long life is associated with a high participation rate in the labour market. This research finding is on par with the views of Cosic, Williams and Stone (2021) and Tetzlaff et al. (2022). In their studies, they found a positive correlation between life expectancy and FLP. This explains that people may need to work longer to prepare for their retirement and to earn an income that is useful for family survival Geyer et al. (2022). In addition, some employers remove early retirement benefits, and such reforms cause people to work longer (Aisa, Pueyo & Sanso 2012; Heller et al. 2022; Kuitto & Helmdag 2021).

Implications of the findings

The research findings imply that North African economies need to work collaboratively to improve FLP to enjoy the accompanying benefits, such as economic growth and economic development. There will also be the attainment of selected SDGs, such as poverty reduction, reduced hunger levels, as well as reduced inequalities. This is crucial for the development of the African continent at large as high rates of FLP in North African economies have positively impacted the performance of the continent.

Post estimation tests

This section presents a brief discussion on the post-estimation tests conducted in the study.

Heteroskedasticity tests

To test for heteroskedasticity, the Breusch–Pagan Godfrey test was used. The p-value of 0.33 was greater than 0.05; hence, it was concluded that there was no heteroskedasticity.

Policy recommendations

This section presents the policy implication of the findings. Addressing low FLP rates is crucial for these economies as they are signatories to the United Nations that crafted the SDGs which should be achieved by 2030.

Women empowerment programmes

In the research, it was realised that economic growth is essential for improving FLP in North Africa. It is, therefore, crucial and desirable for North African economies to develop women empowerment programmes that will enable them to participate in economic activities. This will help to increase the number of women in the labour market.

Pro-women policies

There is a need for the North African economies to develop pro-women policies for education and health. Research findings depicted low levels of poverty encourage high levels of FLP. In the study, poverty was measured using the HDI which incorporates access to education and health. Thus, pro-women policies should be designed to ensure that women have access to quality education and quality healthcare. This will ultimately help in improving the FLP in North Africa.

Conclusion

This research sought to determine the key factors behind FLP in North Africa. The empirical results demonstrated that institutional hurdles, inadequate investment in education, and a lack of gender-sensitive policies, all restrict women's ability to engage in the labour market. The HDI, fertility rate, economic growth, and life expectancy were the major predictors of FLP in North Africa based on the primary study findings. In terms of policy recommendations, it was suggested that North African governments need to develop policies that advance the interests of women, as well as the implementation of empowerment programmes.

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Data availability

Data is publicly available on the World Bank portals, which can be sourced from the reference list.

Disclaimer

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