MAKERERE UNIVERSITY

MAKERERE UNIVERSITY BUSINESS SCHOOL

FEMALE LABOUR FORCE PARTICIPATION RATE AND UGANDA'S ECONOMIC GROWTH

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A DISSERTATION SUBMITTED TO MAKERERE UNIVERSITY BUSINESS SCHOOL (FACULTY OF GRADUATE STUDIES AND RESEARCH) IN PARTIAL FULFILLMALET OF THE REQUIREMALETS FOR THE AWARD OF THE DEGREE OF MASTER OF ARTS IN ECONOMIC POLICY AND MANAGEMALET OF MAKERERE UNIVERSITY

"PLAN A"

DECEMBER, 2023

DECLARATION

I declare that this dissertation titled; "***FEMALE LABOUR FORCE PARTICIPATION RATE AND UGANDA'S ECONOMIC GROWTH***" is my original work and it has never been presented to any academic institution of higher learning for the award of any academic qualification.

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APPROVAL

This dissertation by APIRE JOHN PAUL has been written under our supervision and it is now ready to be submitted for examination with our approval as supervisors.

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DEDICATION

This work is dedicated to the family of Mr. Joseph Apire and Late Mrs. Apire immaculate. To Madam Margaret Kakande Head Budget Monitoring and Accountability at Ministry of Finance, Planning and Economic Development, for their moral support, encouragement and understanding.

ACKNOWLEGEMENT

I am grateful to the almighty God that has given the gift of life, the gift of my parents and friends, given me the opportunity to be in school and guided me throughout this study and writing of this report.

My heartfelt thanks go to my parents Mr. Joseph Apire and Mrs. Immaculate Apire who generously provided me with financial, emotional and social support while carrying out this study and throughout my entire course. Great thanks go to my supervisors Dr. Anthony Olyanga Moni and Ms. Vincent Katutsi Patsy whose efforts guided me in the right direction from the beginning till the end of this report and he has greatly contributed in making a difference in my performance.

Profound thanks to all the people who have been resourceful throughout this study. It is due to your support and ideas that I have been able to produce this work. Special thanks to the Management of Ministry of Finance, Planning and Economic Development and specifically, staff of the department of Finance and Administration. Utmost thanks to Dr. Dickson Turyareeba for his guidance and inspiration to help me complete this report.

My sincere thanks go to my course mates led by Mr. Johnathan Omollo, Ms. Sharon Mande, Mr. Wilber Drazi Vundru, Mr. Job Ayebale, Mr. Ibrahim Wako Kisu and Mr. Richard Mugoya for their dedicated support throughout this study and the entire course.

Thank you all and may God bless you all abundantly.

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey Fuller
ARDL	Autoregressive Distributed Lag
BOU	Bank of Uganda
ECM	Error Correction Model
FLF	Female Labor Force
FLFP	Female Labor Force Participation
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
IMF	International Monetary Fund
IV	Instrumental Variables
OLS	Ordinary Least Squares
SDGs	Sustainable Development Goals
SSA	Sub-Saharan Africa
UBOS	Uganda Bureau of Statistics
UGX	Uganda Shillings
UNHS	Uganda National Household Survey
USD	United States Dollar
VAR	Vector Autoregressive Model
WB	World Bank
WDI	World Development Indicators
WLFPR	Female labour force Participation Rate

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ABSTRACT

The purpose of this study was to investigate the effect of selected female labour force participation indicators on Uganda's economic growth. The study focused on the effect of female labour force participation rate, the level of education of females in labour force and fertility rate on Uganda's economic growth. The study adopted a causal relationship research design and utilized time series quarterly data for the period 1990 -2021 obtained from World Bank development indicators and the Uganda Bureau of Statistics in the analysis. Estimation of the empirical model was achieved by employing the ARDL (3, 3, 1, 1, 1, 2) model.

Estimates indicated that, over the period of analysis, female labour force participation rate had a significant negative causal effect on Uganda's economic growth in the short run but did not show any causal influence in the long run, which supported the postulates of the U-shape hypothesis. Estimates further showed that female labour force with basic education had no short run and long run causal effect on Uganda's economic growth while the female fertility rate had negative short run causal influence on Uganda's economic growth but showed no long run causal effect.

Results from this study give a precursor that policy focusing on skills acquisition of female in labour force, scaling up of birth control measures as well as enacting policies that increase physical capital stocks may be lucrative policy options to boost Uganda's economic growth. The study contributes to existing body of literature by adopting and modifying the Solow-style neoclassical model in combination of the U-shape development hypothesis by disaggregating the labour input by gender and analyzing its contribution to growth in Uganda's economic growth.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This study critically analyzes female's labor force participation and its effect on Uganda's economic growth using quarterly data for the period from 1990 to 2021. This chapter covers the background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, scope of the study, significance of the study and the conceptual framework.

1.1 Background of the Study

Economic theories have argued over the necessary conditions for economic growth of a nation. There has always been a debate over whether endogenous or exogenous factors are responsible for economic growth of nations (Doré & Teixeira, 2023; Fankhauser & Jotzo, 2017). None of the theories however, has denied the role of the human resource, commonly represented as labour, as a critical source of growth in output. Connected to the widespread economic disparities across nations, the increasing inequality of income and extensive poverty are major issues in the process of development (Boukhatem, 2016). Growth variations continue to be reported at a global level, regional level and at national levels. What has come to be generally accepted is that the Covid-19 pandemic came in recently as a shock factor that impeded productivity of the key production factors and severally affected the growth rate of many nations. The global economy for instance was projected to grow at a rate of 6.0 percent in 2021 while economic growth in Sub-Saharan Africa (SSA) was reported at only 4.1percent in 2021, following a slowdown in global growth (IMF, 2022). These economic challenges come at a time when countries' ability to support growth and protect poor households is severely constrained. The fiscal deficit in SSA expanded during the pandemic to 5.6 percent of GDP in 2020 (from 3.0 percent of GDP in 2019). In 2022, the deficit

amounted to 4.8 percent of GDP due to consolidation efforts (World Bank, 2023). Overtime, Uganda's economic growth has seen some high and low growth projections, for example in 1990 the GDP of Uganda was $4.30 billion with a Per Capita of $245 and a growth rate of 6.47%, in 2000 there was a significant growth in GDP of up to $6.19 billion with a Per Capita of $258 although the rate was slow at 3.14%, in 2010 the GDP of Uganda was at $26.67 billion, with Per Capita of $825 and the growth tare was 5.64%, and then in 2020 as the COVID-19 pandemic set in, the GDP was at $ 37.60 billion, with Per Capita of $847 and slow growth rate of 2.95%. (World Bank, 2023).

Though growth literature lays down the growth theories which can provide framework for modelling sources of growth in GDP of countries and that none of them deny the contribution of the labour variable as a factor of production, the existing growth theories are not explicit on analysis of gender in the labour variable and its influence on growth in output. The growth accounting for example as discussed by Romer (1986), only attempts to break down total real-output growth into components attributable to growth in capital input, growth in labor input, and growth in total factor productivity, the so-called Solow residual that measures the increase in output that can't be explained by input growth. The growth accounting is thus limited in its ability to disaggregate the labour input by gender and its contribution to the growth rate in output, yet gender equality and female's empowerment issues have been regarded as "fundamental" dimensions of human development (UNDP, 2016).

Despite the insensitivity to gender contribution in growth in output by the known growth theories, more recent growth literature has incorporated the gender element in the labour variable to be a driving factor to growth in output. Verick (2018) for instance asserts that female's participation in the labor market varies greatly across countries, reflecting differences in economic development,

social norms, education levels, fertility rates, and access to childcare and other supportive services. The concern among researchers however is that the outcomes of female's participation in the labour force in relation economic growth is complicated, and reflect changes in the pattern of economic growth (Thaddeus *et al.,* 2022). Thus, there is need to further investigate the role of gender, particularly female labour force, on the rates and patterns of countries' economic growth. In this respect, they study focuses on the role of female labour force participation on Uganda's economic growth. There is limited empirical evidence on Uganda in the empirical growth literature with authors who have studied the link between female labour force participation to economic growth. Furthermore, the limited empirical evidence suggests mixed findings on the causal relationship between female labor force (FLF) participation and economic growth. On strand of authors on the subject find a U-shaped relationship between female labor force participation and economic growth (for instance: Tam, 2011; Lechman & Okonowicz, 2013; Olivetti, 2013; Tsani *et al.*, 2013; Lechman & Kaur, 2015, among others). The U-shaped hypothesis claims that economic development (approximated by GDP per capita) and FLF are mutually conditioned (Boserup *et al.*, 2013) and such regularity is probably attributed to countries` structural transformations. In general, the U-shape hypothesis suggest an inverse relationship between female labor force participation and economic growth. The other strand of authors in empirical literature have reported a positive relationship between female labor force participation and economic growth (e.g. Na-Chiengmai, 2018; Dogan and Aky€uz, 2017; Lahoti & Swaminathan, 2013; Seguino, 2009, among others).

In addition to the concern of the mixed findings, empirical evidence also reports reverse causality between female participation in economic activity and growth in output. Akyeampong and Fofack (2013), Na-Chiengma (2018) and Verick (2018) for instance report that as size of economy expands, female have easier access to labor market, leading to an increase in female participation

in the productive activities. To be more specific, the subject of study has not been given much attention to Uganda. This study attempts to contribute on the subject by further investigating the effect of female's labor force participation on economic growth of Uganda using time series quarterly data for the period 2010-2021.

1.2 Problem statement

There are substantial variations in rates and patterns of economic growth across the globe. Uganda, in particular has registered various episodes of the rates of economic growth over the years. There is dominant use of theoretical growth models in empirical growth literature by authors attempting to explain the source of cross-country growth differences. Among the theoretical growth models used by a myriad of researchers is the neoclassical growth model of Solow-style which emphasizes endowments of three main inputs: Capital, labour and technology as key predictors of growth in output. The model, however aggregates the labour input without regard to gender, yet in recent growth literature, the issue of gender in labour force has emerged as a key determinant of economic growth. Given the insensitivity of growth theories about gender contributions to growth in output and the mixed findings on both the nature of the causal effect as well as the direction of causal connection between female labour force participation and economic growth, this study contributes to the debate by adopting and modifying the Solow-style neoclassical model and its extensions to further investigate the effect of woman labour force participation on Uganda's economic growth using quarterly data for the period 1990-2021.

1.3 Purpose of the study

This study sought to investigate the effect of selected female labour force participation indicators on Uganda's economic growth.

1.4 Objectives of the Study

The study sought to address the following specific objectives:

i. To investigate the effect of female labour force participation rate on Uganda's economic growth.
ii. To investigate the effect of education level of females in employment and Uganda's economic growth.
iii. To investigate effect of fertility rate and Uganda's economic growth.

1.5 Research Hypotheses

The study seeks to give an empirical test the following null hypotheses:

$\boldsymbol{H_{01}}$**:** Female labour force participation rate in employment has an effect on Uganda's economic growth.

$\boldsymbol{H_{02}}$**:** The level of education of females in employment has no effect on Uganda's economic growth

$\boldsymbol{H_{03}}$**:** Fertility rate has no effect on Uganda's economic growth.

1.6 Scope of the study

The study focuses on the key indicators of female's labor force participation which include; the female participation rate in employment, level of education of females in employment and fertility rate and how these indicators contribute Uganda's economic growth.

1.6.1 Geographical Scope

The study is be limited to Ugandan economy.

1.6.2 Time Scope

The study period spans from the year 1990Q1 to 2021Q4. This study period has been considered for analysis because it has full observations for all the model variables, notably data on labour force participation rate being disaggregated by gender was only available beginning with the year 1990. Moreover, Uganda began registering impressive rates of economic growth in early 1990S

shortly after the introduction of the Economic Reform Program (ERP) which was launched in 1987.

1.7 Significance of the Study

i. The study findings will guide policy makers in the design and implementation of evidence policies to increase the labor force participation rate of female in key productive sectors for enhanced growth in GDP.

ii. The study will contribute to knowledge gap by providing empirical evidence on the contribution of female's labor force participation to the economic growth of Uganda.

iii. The study findings will also provide an empirical test to the theories the study is anchored on such as a test of the efficacy of the neoclassical growth model and the U-shaped growth hypothesis.

1.8 Theoretical Framework

This study is anchored on two growth theories namely; the Solow-style neoclassical growth theory developed by Solow (1956) and its extension by Mankiw et al. (1992) and the U-shaped economic development theory formerly demonstrated by Durand (1975) and popularized by Psacharopoulos & Tzannatos (1989). These theories, together with empirical literature, guided in identifying the critical growth factors to include in the empirical model in this study. The Solow-style neoclassical growth model emphasized the role of capital accumulation in influencing long-run rate of economic growth while the U-shaped relationship theory posits that there is a U-shape relationship between economic growth and female labour force participation (Verick, 2018).

The Solow (1956) model explains that, output is produced by capital stock, labor stock and exogenously determined technology factor. The Solow-style neoclassical growth model assumes

that capital accumulation is subject to diminishing returns, and as such, in per capita terms, the long-run growth of income per person requires exogenous improvements in technology which generate productivity growth (Crafts, 1995). In non-per capita form, the neoclassical growth argues that, economic growth is compatible with labor augmenting technical progress, which acts as if it were increasing the available amount of labor. In the long-term, output per capita and labor productivity grow at an exogenously given rate of technical progress. The main idea is that technical progress is entirely exogenous to these models so that in reality economic growth is left unexplained (Solow and Swan, 1956), but can be accounted in the Solow residual.

My contribution in this study is a modification of the Solow-style neoclassical model to encompass the U-Shaped development theory in our analysis, by a simple decomposition of the labour stock variable appearing in the neoclassical growth model so as to reflect the gender dimalesions. Particularly, I use the total labour force participation rate as a proxy for labour stock, and then decompose the total labour force participation rate into female labour force participation and male labour force participation, but focus on the influence of the labour participation. I consider the total labour force participation rate as a good proxy for "effective labour" because it only considers the working population that are actively engaged in economic activity. The total labour force participation rate indicator shows the relative size of the supply of labour available for production of market goods and services in the country (UNHS Report, 2019/2020). The U-shaped development theory argues that as countries develop economically, they experience a reduction in female labour force participation, eventually followed by a recovery.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter presents a review related literature to the subject under study. The chapter begins with an abridged review of the theories upon which the study is anchored. The chapter goes ahead to present the empirical review of the related studies.

2.1 Theoretical Literature Review

2.1.1 Concept of economic growth

According to Chollisni *et al*. (2022), a country's economic growth is defined as an increase in its output of goods and services from one accounting period to the next. It illustrates how well a nation or area can meet the requirements of its people in terms of economics (Ozturk & Ullah, 2022). According to Lin & Zhou (2022), economic growth is defined as a rise in real GDP or GDP per capita, which is the national product measured in constant prices. Economic growth is typically gauged by the rate of increase in the nation's Gross Domestic Product (GDP) in economics and other disciplines.

2.1.2 The Solow-Style neoclassical growth theory

The Solow-style neoclassical growth theory developed by Solow (1956). The Solow-style neoclassical growth model emphasized the role of capital accumulation in influencing long-run rate of economic growth. The model explains that, output is produced by capital stock, labor stock and exogenously determined technology factor. The Solow-style neoclassical growth model assumes that capital accumulation is subject to diminishing returns, and as such, in per capita terms, the long-run growth of income per person requires exogenous improvements in technology which generate productivity growth (Crafts, 1995). In non-per capita form, the neoclassical growth argues that, economic growth is compatible with labor augmenting technical progress, which acts

as if it were increasing the available amount of labor. In the long-term, output per capita and labor productivity grow at an exogenously given rate of technical progress. The main idea is that technical progress is entirely exogenous to these models so that in reality economic growth is left unexplained (Solow and Swan, 1956), but can be accounted in the Solow residual.

The neoclassical growth model takes the following form:

$$Y(t) = A(t)K(t)^{\alpha}L(t)^{1-\alpha} \quad (1)$$

Where: Y is Income or the economy's Gross Domestic Product (GDP), A is a scaling factor or productivity parameter which reflects the state of technology, K is physical capital stock and L is the amount of labour stock in the economy.

Because of the dynamic relationship between labour and technology, the neoclassical production function is often re-stated as:

$$Y(t) = K(t)^{\alpha}[A(t)L(t)]^{1-\alpha} \quad (2)$$

In equation (2), the model now states that technology is labour augmenting and that workers' productivity depends on the level of technology.

This study's unique contribution rests in the benchmark of the neoclassical growth model in (2) and its modification to encompass the postulates of the U-shape development theory with a simple decomposition of the labour stock variable so as to reflect the gender dimensions (Female labour force and Male labour force). Particularly, I use the total labour force participation as a proxy for labour stock in the output function. I consider the total labour force participation as a good proxy for "effective labour" because it only considers the working population that are actively engaged in economic activity. The total labour force participation indicator shows the relative size of the supply of labour available for production of market goods and services in the country (UNHS Report, 2019/2020).

The decomposition of the total labour force participation to reflect gender dimensions enable us to incorporate the U-shaped economic development hypothesis into our analysis. The U-shaped economic development theory argues that as countries develop economically, they experience a reduction in female labour force participation (FLFP), eventually followed by a recovery. At early stages of development (commonly represented by lower levels of GDP per capita), female participate extensively in economic activity by doing unpaid work in family farms and businesses. At this initial stage, low GDP per capita is positively correlated with higher female labour force participation rate. As economies develop, female tend to withdraw from the labor force as jobs migrate to industries and cities. There are two plausible explanations for a decrease in female participation as the economy grows: One is that rising female incomes and rising levels of female education tend to reduce supply of female labour (Mehrotra & Parida, 2017), and the second one is that changes in labour markets push female out of agricultural jobs and the other opportunities fail to materialize, reducing demands for female's labour (Klasen & Pieters, 2015).

Borrowing from the developments in the extended neoclassical growth model by Mankiw, Romer and Weil (1992) which recognized the factor of human capital as a key indicator of growth in output, I introduce the education level of female in labour force as an additional female labour force characteristic which captures the role of education of female in labor force on growth in output. The modified version of equation (2) then becomes:

$$Y(t) = K(t)^{\alpha}\left[A(t)L_f(t)L_m(t)\right]^{\beta}H^{1-\alpha-\beta} \qquad (3);$$

Where in equation (3), L_f represents female labour stock, L_m represents male labour stock, and H represents human capital, commonly measured by education level.

2.1.3 The U-Shaped Development theory

A widely debated theory that has been the subject of numerous studies contends that there is a U-shaped relationship between economic growth and female's labor force participation (Verick, 2018). The stylized argument is that when a country is poor, female work out of necessity, mainly in subsistence agriculture or home-based production. As a country develops, economic activity shifts from agriculture to industry, which benefits male more than woman (Verick, 2014). Better levels of economic growth result in higher education levels, lower fertility rates, and lessened social stigmas, allowing femaleto benefit from new career opportunities in the service sector that are more readily available and family-friendly (Fox & Gandhi, 2021). The declining portion of the U-shaped curve explains transitions from a labor-intensive, subsistence-agriculture economy to an industrialized one where more male input is required than female input. It implies that there is an early-stage trade-off between economic progress and female's equal access to the job market Female labor force participation (FLFP) is one of the key factors for explaining increases in total participation rates and changes in total participation rates between countries, According to Jaumotte (2003) and Burniaux *et al.* (2004).

At a household level, these structural shifts can be described in the context of the neoclassical labor supply model: as a spouse’s wage rises, there is a negative income effect on the supply of female’s labor (Giné, Martinez-Bravo & Vidal-Fernández, 2017). Once wages for female start to increase, however, the substitution effect will induce them to increase their labor supply thus increased growth of the economy (Kurekova, 2011).

2.2 Empirical Literature Review

2.2.1 Effect of Female labour Force Participation Rate on Economic Growth

Using annual data from the World Bank development indicators, Thaddeus *et al.* (2022) studied a sample of 42 sub-Sahara African countries with an aim of examining the contribution of female labour force participation rate on economic growth during the period of 1991–2019. The study employed the cointegration analytical methods to examine the underlying relationship. The authors implemented the Autoregressive Distributed Lag model and Granger causality in the analysis. Results indicated that there was a long-run causal relationship between female labour force and economic growth in sub-Sahara Africa and that the direction of causality was unidirectional running from economic growth to female labour force.

Khaliq *et al.* (2017) employed Johansen cointegration tests and used the Error Correction Modelling to examining the relationship between female labour force participation rate and economic growth in Pakistan. The study utilized time series data for the period 1990 to 2014. The results from the study indicated existence of an inverse long-run relationship between the variables which confirmed the U-shaped link hypothesis.

Using the classical Solow's growth model and a version of Mankiw, Romer, Weil (1992), Na-Chiengmai (2018) examined the hypothesis that level of female participation in workforce, as measured by female labor force participation rate, has a positive effect on economic growth. The study employed the OLS method on a cross CHAPTER of 122 countries around the works and the Autoregressive Distributed Lag (ARDL) approach to a set of pooled time series data for 5 groups of countries for the period 1998 to 2016. Results showed that the coefficients of female labor force had a positive sign and was statistically significant in almost every case, confirming the hypothesis of positive contribution of female labor force on growth.

Lechman & Kaur (2015) did a study to examine the relationship between female labor force and economic growth in 162 world countries over the period 1990-2012. Data was obtained in WDI 2013. The study employed panel estimation techniques to estimate the empirical models. The study analyzed two separate sub-samples: first, the sample encompassing 162 countries; and in the second, the second consisted of four income-groups (low-income, lower-middle-income, upper-middle-income and high-in- come). The findings from the study supported the hypothesis of the U-shaped relation-ship between female labor force participation and economic growth in all sub-samples but with high cross-country variability effects.

A study by Tandrayen-Ragoobur (2011) showed a positive relationship between Female labour participation and the level of economic growth in Mauritius. The study indicated that married female had lower labor market participation rates and this affects the growth of the economy negatively, and indication of the positive relationship.

2.2.2 Level of education of female in employment and economic growth

A study by Verena *et al.* (2011) on Mauritius showed a positive correlation between female education and economic growth. The study looked into the things that motivate and dissuade female to work. Utilizing data from the 2006–2008 household census and employing the logistic regression modeling for Mauritius, Verena *et al.* (2011) found that their findings were consistent with earlier research for developing nations, which showed that female with higher levels of education are better able to contribute their skills for useful services. The study further showed that older female participates more actively, though this effect grows at a slower rate as female get older.

Syomwene and Kindiki (2015) employed a systematic literature review approach to study and discuss the relationship between female education and sustainable economic development in Kenya in an attempt to find practical solutions to Kenya's development problems. Their study came with two main conclusive remarks: (i) Female education was one of the initiatives that can propel Kenya in the achievement of Millennium Development Goals, and (ii), female education can facilitate the achievement of Kenya Vision 2030 which aims at making Kenya a newly industrializing, middle income country providing high quality life for all its citizens by the year 2030.

By employing panel regression analysis, Oztunc *et al.* (2015) examined the extent to which female's education affects long-term economic growth in the Asia Pacific region. The study used secondary data from Bangladesh, Cambodia, China, India, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Thailand, and Vietnam for the period 1990 to 2010. Female education was measured by female primary school enrolment while economic growth was measured by GDP. The study found that female primary school enrollment was a significant factor for annual per capita income growth.

A panel study on Morocco, Algeria, Tunisia and Egypt was launched by Alaoui (2016) to investigate effect of female's education on economic growth. Female's education was measured in terms of primary, secondary and tertiary enrolments. The study results indicated mixed results with respect to direction of effect on economic growth. Particularly the study indicated that female's tertiary education significantly affected economic growth positively, while primary and secondary school enrolment were negatively linked to the economic growth. The study's conclusion was that female's tertiary education was a master key to economic growth and

development accompanied by a healthy and good quality of institutional capital and by eliminating all forms of gender discrimination.

Tansel and Güngör (2012) in their study examined the gender effects of education on economic development in Turkey. The study utilized province level data collected over four time periods (i.e. 1975-1980, 1980-1985, 1985-1990 and 1990-2000) for the 67 provinces of Turkey. Estimation was done by Pooled Robust Regression and sensitivity analysis was accomplished by running OLS and 2SLS estimators. The main finding of the study was that female education positively and significantly affected the steady-state level of labor productivity and hence growth in output, while the effect of male education was in general either positive or insignificant.

2.2.3 Fertility rate of female and economic growth

Fertility is one of the widely recognized predictors of both female labour force participation in the labour market and on overall economic growth. Authors in literature have reported differing opinions on the impact of fertility on economic growth. Even in theory, scholars have proposed various theories to explain this demographic transition and its relation to economic growth.

A somewhat earlier study by Brander and Dowrick (1994) examined the effects of population growth and fertility on economic growth using a 107 country panel data set covering 1960-1985. The study found that high birth rates appeared to reduce economic growth through investment effects and possibly through "capital dilution", although classic resource dilution was not evident in the data. Most significantly, however, the study reports that birth rate decline had a strong medium-term positive impact on per capita income growth through labour supply or "dependency" effects.

A study by Er (2012) which employed panel data estimation with fixed effects on 187 countries around the world of different income levels for the study period 1998-2008 aimed finding out

which of the female indicators of education, employment, health and political factors, measured in many sub-indicators were significantly affecting economic growth. The results of the study revealed that different measurements, such as less fertility, more employment of female, and more participation of female in the parliament were significant in influencing the economic growth of a country.

By fitting a non-linear dynamic model using cross-country data and treating fertility decline and economic growth endogenous by considering a simultaneous system of equations in the change variables, Ranganathan *et al.* (2015) utilized panel data from WDI for over 200 countries for a period of more than 50 years to examine the effect of demographic transitions on economic growth. Results from the study indicated that the fertility rate affected child mortality but only indirectly by increasing or decreasing the economic growth. In particular, results shed that fertility rate decreased when child mortality was low, and was weakly dependent on GDP. As fertility rates fell, GDP increased, and as GDP increased, child mortality fell. In a simultaneous system setting, results also indicated that economic growth did not directly impact the fertility rate, but influences it through the intermediate variable child mortality.

2.2.4 Gaps identified in the reviewed literature

Accordingly, what appears as inconclusive in the reviewed literature, is the direction of the causal effect of female labour force participation rate on economic growth. There is substantial evidence that the involvement of female in the labor force is associated with mixed effects on levels and patterns of economic growth. Some authors find a negative relationship between female labour force participation rate and economic growth, thus, supporting the U-Shaped hypothesis while other authors report a positive relationship between the two variables. There is also a concern of limited evidence of the relationship between the variables under investigation done on Uganda.

This is the entre-point of this study, to join the debate by investigating the relationship between the indicators of female labour force participation and Uganda's economic growth.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter highlights the methods and procedures the study intends to follow. The chapter presents the research design, research approach, data types and data sources, model specification, diagnostic tests, and model estimation methods.

3.1 Research Design

This study adopts a causal relationship research design. A time series multivariable regression model has been used as a tool to test the research hypothesis. This research design strategy was chosen because it allows for analysis of both short-run and the long-term analysis of the causal links between the study variables (Li *et al.,* 2022).

3.2 Data types and sources

This study utilized secondary time series quarterly data for the period 1990Q1-2021Q4 which has been collected from World Bank Development indicators data bank. Additional data has been collected from the Uganda Bureau of Statistics (UBOS). Secondary data has been preferred to be appropriate because the study variables, namely women labour force participation and GDP, are macro variables. The period 1990Q1 – 2021Q4 was chosen because it has completed data on all the study variables and readily available.

3.2.1 Method of conversion of low frequency data to high frequency data

To meet the recommended minimum number of time series observations of at least 50 observations (Warner, 1998) for time series regressions in order to estimate the regression coefficients and related statistics efficiently that are optimal for inference, this study employed the quadratic mean

average method of converting low- frequency time series to high frequency time series. The low-frequency variables are the 'annual' measured variables and to the high-frequency variables are the 'quarterly' measured variables (Casals *et al.,* 2005). This enabled the increase of time series observations from n = 32 with annual data to n = 128 with quarterly data.

3.3 Model Specification

The empirical model for analysis is developed on the basis of two main theories this research study benchmarks: The neoclassical growth theory earlier developed by Solow (1956) and its extension by Mankiw, Romer and Weil (1992) and the U-Shaped development theory initially demonstrated by Durand (1975) and popularized by Psacharopoulos & Tzannatos (1989).

Re-writing equation (3) in a general non-linear form, I have:

$$Y(t) = K(t)^{\alpha}\left[A(t)L_f(t)L_m(t)\right]^{\beta}H^{1-\alpha-\beta}\mu e^{u} \qquad (4);$$

In equation (4), μ represents observable factors that influence Y that are not explicitly indicated in the extended neoclassical growth model and e is the Euler's constant. The rest of the variables are defined as in equation (3).

In the empirical analysis, Y is measured by GDP (*gdp*); K is measured by gross capital formation (*gkf*); L_f is measured by total female labour force participation designated by (*tflfp*), L_m is measured by total male labour force participation designated by (*tmlfp*) and H is measured by total female labour force with basic education (*feduc*).

Introducing the variable notations in the empirical model, equation (4) becomes:

$$gdp(t) = gkf(t)^{\alpha}[tflfp(t)tmlf]^{\beta}feduc^{1-\alpha-\beta}\mu e^{u} \qquad (5);$$

Letting $(1-\alpha-\beta) = \beta_3$ and taking natural logarithms in equation (5) while indicating a time indicator in a conventional way, I get a multivariate linear regression as follows:

$$lngdp_t = \alpha\, lngkf_t + \beta_1\, lntflfp_t + \beta_2\, lntmlfp_t + \beta_3\, lnfeduc_t + ln\mu + u_t lne \qquad (6)$$

To avoid possible omitted variable bias, the study based on empirical literature to further introduce additional variables in the empirical model such as total fertility rate (*fert)* and inflation, which are not explicitly indicated in the neoclassical growth model and its extensions and are not explicitly represented in the U-shaped development theory, but which have been linked as important factors that influence economic growth as provided by empirical evidence. These additional factors, together with a constant, are captured by μ in equations (5) and (6).

Incorporating the additional growth factors in our analysis, the empirical multiple linear regression for analysis is then expressed as:

$$lngdp_t = \delta + \alpha\, lngkf_t + \beta_1\, lntflfp_t + \beta_2\, lntmlfp_t + \beta_3\, lntflfeduc_t + \beta_4\, fert_t + \beta_5\, \inf_t + u_t \qquad (7);$$

Where:

$lngdp_t$ is the natural logarithm of GDP at time t; $lngkf_t$ is the natural logarithm of gross capital formation at time t,$lntflfp_t$ is the natural logarithm of total female labour force participation at time t; $lntmlfp_t$ is the natural logarithm of total male labour force participation at time t; $lntflfeduc_t$ is the natural logarithm of total female labour force with basic education at time t; $fert_t$ is the average total fertility at time t; inf_t is the rate of inflation at time t; u_t is the error component in the time series empirical model; and δ is a constant.

Due to concerns of high multicollinearity of the male labour force participation with female labour force participation and gross capital formation, the variable male labour force was excluded from the model and the final empirical model became:

$$lngdp_t = \delta + \alpha\, lngkf_t + \beta_1\, lntflfp_t + \beta_2\, lntflfeduc_t + \beta_3\, fert_t + \beta_4\, \inf_t + u_t \qquad (8)$$

3.3.1 Variable definitions, unit measurement, variable data source and expected signs

The model variables, their definitions, unit of measurement, data sources and expected signs of the relationship with the dependent variable are summarized in Table3.1.

Table3.1: Model Variables in original units, definitions, data sources and expected signs

Model Variable	Definition	Units of measurement	Data Source	Expected sign
Dependent Variable				
Gross Domestic Product (*GDP*)	The monetary value of goods and services produced by a country for a period given one year	Current US$ (Billion)	UBOS	
Independent variables				
Total female labour force participation ($tflfp$)	Proportion of total labour force participation that are female , ages 15-64	Count	WDI	-/+
Total male labour force participation ($tmlfp$)	Proportion of total labour force participation that are male , ages 15-64	Count	WDI	+
Total female labour force with basic education ($feduc$)	Proportion of female working age population with basis education.	Count	WDI	-/+
Total Fertility rate ($fert$)	Births per woman, total	Count	UBOS	-/+
Gross capital formation (gkf)	Gross fixed capital formation (formerly gross domestic fixed investment)	Current US $ (Billion)	WDI	+
Inflation (inf)	Annual percentage change in CPI	percentage	WDI	-

Source: Author's compilation

3.4 Data Analysis

The study employs varied data analytical techniques, some of which explore the key descriptive statistic on model variables, others explore the time series data behavior, and the other techniques investigate the nature of causal relationships among the variables in the empirical model.

3.4.1 Descriptive statistics

The study variables are described in general terms using descriptive statistics, when the variables are expressed in their original units. The descriptive statistics of interest in this study are the number of observations, the mean, the minimum values, the maximum values and the standard deviations. The summary descriptive statistics are displayed in tabular form.

3.4.2 Diagnostic tests

The study conducts both the pre-model estimation diagnostic tests and the post-model estimation tests as indicated below. In the context of time series modeling, diagnostic tests are performed in a study to ensure that the data is adequate for analysis.

3.4.2.1 Pre-model estimation diagnostic tests

These diagnostics are conducted before the actual model estimation to check on the time series data behavior. These tests include the following:

(1) Multicollinearity test

This test is conducted to check the level of linear relationships between the independent variables included in the empirical model. The multicollinearity check has been conducted by running a correlation matrix between the independent variables. Evidence of multicollinearity is determined by observing any pairwise correlation between the explanatory variables of more than 80 percent (0.8) in absolute terms (Gujarati and Porter, 2009). In order to further assess the level of multicollinearity in the model, the study estimated the variance inflation factors (VIFs) of the independent variables prior to estimation of the final model by the ARDL estimation technique. The VIFs estimates before the preferred ARDL model estimation has been achieved after running an OLS model.

(2) Unit root tests

This test is conducted to investigate the stationarity status of the variables in the empirical time series regression model. Time series variables that are non-stationary are considered as having unit roots. According to Granger and Newbold (1974), an OLS regression model with unit root variables may yield spurious regression problem. To avoid this possible occurrence, the study implements the Augmented Dicker Fuller (ADF) test, which unlike the DF test, considers serial correlation in the series. In addition, unit root tests help to reveal whether the time series variables in the model are stationary in levels or they become stationary after differencing.

(3) Cointegration test

The study conducts a cointegration test to investigate whether there is existence of long run equilibrium relationship in the empirical model. The study implements the Johansen and Juselius cointegration test (Johansen, 1991), which is appropriate when one is having a multivariate model and can capture more than one co-integrating vector. Presence of cointegration indicates the existence of a long-term equilibrium relationship between the variables (Granger and Newbold, 1974).

3.4.2.2 Post-model estimation diagnostic tests

These tests are conducted after the actual model estimation to test model adequacy. These include the following tests:

(4) Serial correlation test in the residuals

Serial correlation in the residuals is the relationship between consecutive values of the residuals between time periods. According to Zovko (2008), serial correlation is commonly detected in time series data. Presence of serial correlation in the residuals can affect the efficiency of the regression estimates. This study implements the Breusch-Godfrey serial correlation test under the null

hypothesis of no serial correlation of first order in the residuals. The null hypothesis is rejected when the reported probability value is less that the significance level of $\alpha = 0.05$.

(5) Normality of the residuals test

To ensure validity of the test-statistics generated after model estimation, the study conducts the normality test on the residuals, which is a test under the null hypothesis that the estimated residuals are normally distributed. In this respect, the study implemaleted the Jarque-Bera. The null hypothesis is rejected if the reported probability value is less that the significance level of $\alpha = 0.05$.

3.5 Model estimation techniques

Basing on the unit root test results and the cointegration test results, this study employed the autoregressive distributed lags (ARDL) model to estimate the regression coefficients of the empirical model. The ARDL has been deemed appropriate because it accommodates series with mixed orders of integration, I (1) and I (0) variables under the conditions of presence of cointegration. In addition, the ARDL model allows estimation with presence of both the endogenous and exogenous variables in the model, thus the model controls for endogeneity concerns as the assumption of no autocorrelation in the error component is maintained (Pesaran et al., 2021). In this study, I fit the ARDL in which I treat "logarithm of GDP" and logarithm of gross fixed capital formation as endogenous variables while the rest of the variables, namely: "logarithm of female labour force participation", "logarithm of female labour force with basic education", fertility" and "inflation" are treated as exogenous variables.

3.6 Ethical considerations

Research ethics are rules and norms which are expected to be followed while conducting social research, including professional standards and ethical principles. Observing ethical norms in research is vital as it enhances the goal of the research study. The study is guided by the ethical

rules and standards set by Makerere University, Makerere University Business School and the economic profession.

CHAPTER FOUR
PRESENTATION OF STUDY FINDINGS

4.0 Introduction

This chapter presents the study findings. Interpretation of the estimates are also presented in this chapter. Summary tables and graphs are used in the presentation of the study findings. The key descriptive statistics on all model variable are first presented and interpreted, followed by the pre-estimation diagnostic tests on model variables. This is proceeded by presentation and interpretation the regression estimates together with the post-estimation diagnostic tests.

4.1 The descriptive statistics on all model variables

The study generates the key descriptive statistics on all the model variables in their original unit's measurement. Given that the model variables in this study are quantitative variables and continues, the key descriptive statistics of interest are the mean, minimum, maximum values as well the standard deviation and number of observations for each of the model variables. The estimates of the descriptive statistics are displayed in Table 4.1 as indicated below.

Table 4.1: Descriptive statistics on all model variables (1990q1-2021q4)

Variable name	Obs	Mean	Minimum	Maximum	Std. Dev.
Gross Domestic Product (current US$, billion)	128	16.68	2.83	41.74	12.69
Gross capital formation (current US$, billion)	128	4.05	0.45	10.13	3.46
Female labour force participation (count)	128	4,938,541	2,804,985	8,640,011	1,633,561
Male labour force participation (count)	128	5,303,764	3,154,765	8,780,223	1,583,231
Female labour force with basic education	128	3,288,992	1,039,669	4,496,817	1,205,264
Fertility, total(births per woman)	128	6.19919	4.54625	7.06403	0.79271
Inflation, GDP deflator (annual %)	128	11.51991	-5.99676	90.35822	17.8866

Source: Author's compilation

The descriptive statistic in Table 4.1 indicates over the study period, the mean gross domestic product was approximately $.16.7 billion with standard deviation of approximately $12.7 billion. The maximum gross domestic product recorded over the study period was approximately $ 41.7 billion while minimum Gross Domestic Product recorded over the study period was approximately $ 2.83 billion. It is observed that Uganda's Gross Domestic Product recorded standard deviation which was not far from the mean value, giving a coefficient of variation of approximately 76 percent which is higher the desired level of 25 percent to achieve a high level of parameter accuracy (Kelly, 2007). This result suggests high variability in the gross domestic product over the study period. The high variability in Uganda's GDP could be explained by various growth episodes Uganda has registered over the study period.

The descriptive statistics indicate that the mean gross capital formation over the study period was approximately $ 4.05 billion with standard deviation of approximately $ 3.46 billion, the maximum gross capital formation was approximately $ 10.1 billion and its minimum was approximately $ 0.45 billion.

The mean female labour force participation stock was approximately 4.93 million people (which was less than the mean male labour force participation stock of 5.30 million people), the maximum female labour force participation stock was approximately 8.64 million people (less than the maximum male labour force participation stock of 8.78 million people) while the minimum female labour participation stock was approximately 2.80 million people.

The descriptive statistics in Table 4.1 further indicate that the mean female labour force with basic education was approximately 3.29 million people, the maximum female labour force with basic

education was approximately 4.50 million people while the minimum female labour force with basic education was approximately 1.04 million people.

The average fertility per woman was 6 live births, the maximum fertility was 7 live births while the minimum fertility was 4 live births. Inflation (annual change in GDP deflator) averaged 11.52 percent, maximum inflation rate was 90.36 percent while the minimum inflation rate was -5.99 percent.

4. 2 Pre-estimation diagnostic tests

4.2.1 Unit root test results on all model variables

The study implemented the Augmented Dicker Fuller (ADF) test in order examine stationarity status of the time series variables and to assess the order of integration of the variables in the empirical model. In the ADF unit root test, lag selection order has been based on the Schwarz's Bayesian Information criteria (SBIC). Table 4.2 shows the summary of the unit test results.

Table 4.2: Unit root test results

	Variable in Levels			Variable in first Difference			Order of Integration
Variable	**Lags**	**ADF Z(t) statistic**	**Prob. for Z(t)**	**Lags**	**ADF Z(t) statistic**	**Prob. for Z(t)**	
Logarithm of GDP	2	-0.84	0.8066	4	-3.46***	0.009	I(1)
Logarithm of gross capital formation	2	-0.89	0.7922	4	-3.55***	0.0067	I(1)
Logarithm of female LF participation	2	2.67	0.9991	1	-2.26**	0.0129	I(1)
Logarithm of male LF participation	2	-0.80	0.9661	1	-3.62**	0.0285	I(1)
Log. of female LF with basic education	2	-1.85	0.3563	4	-3.94***	0.0018	I(1)
Fertility	3	1.07	0.9950	3	-3.75**	0.0194	I(1)
Inflation	2	-5.13***	0.0000	-	-	-	I(0)

Source: Author's compilation. **p<0.05; *** p<0.01

The ADF unit root results in Table 4.2 indicate that, for all the variables except inflation, the estimated Z(t) statistics do not reject the null hypothesis of having a unit root in levels at 5 percent level of significance (which implies that these variables are non-stationary in levels) but when these variables are first difference and the ADF unit root test are performed on them, the estimated Z(t) statistics reject the null hypothesis of having a unit root at 5 percent level of significance

(which implies that these variables become stationary in first differences). For the variable "inflation", the estimated Z (t) statistic rejects the null hypothesis of having a unit root in levels at 5 percent level of significance. These unit root test results suggest that the variable inflation is integrated of order zero, I (0) while the rest of the variables are integrated of order one, I (1). The mixed orders of integration of the time series variables have implication for choice of model estimation procedure. For instance, under conditions of cointegrating relationship, mixed orders of integration of the time series variables suggest that the ARDL could be the most appropriate estimation procedure to adopt.

4.2.2 Cointegration test results

The study implements the Johansen and Juselius cointegration test (Johansen, 1991) test. The procedure adopted in this study enables the estimation and reporting of statistics which are used to determine the number of cointegrating equations in a vector error correction model (VECM) of the specified relationship in the cointegration test. Lag selection in the cointegration test has been based on the Schwarz's Bayesian information criteria (SBIC). The study bases on the "trace" statistic to determine the number of cointegrating equations, *r*, in a VECM of the underlying relationship. The null hypothesis of the trace statistic is that there are no more than *r* cointegrating relations. The Johansen cointegration test results are summarized in Table 4.3 as indicated below:

Table 4.3: The cointegration test results

Maximum rank	Eigen Value	Trace statistic	Critical value (5%)
0	-	128.5752	94.15
1	0.29440	84.6389	68.52
2	0.21995	53.3411	47.21
3	0.18456	27.6338*	29.68
4	0.12452	10.8774	15.41
5	0.05616	3.5954	3.76
6	0.02813	-	-

Source: Author's compilation.

According to the cointegration test results displayed in Table 4.3, the trace statistic rejects the null hypothesis that there are no more than r =3 cointegrating relations in the empirical model. The implication of this result is that the cointegration test detects four cointegrating relations in the model. The conclusion from the cointegration test conducted is that the Johansen test detects presence of cointegration in the model being estimated.

Presence of cointegrating relations in the empirical has implications for estimation. In particular, the study proceeds to employ a cointegration-based estimation procedure, namely the autoregressive distributed lag (ARDL) model, which accommodated model variables that exhibit mixed orders of integration.

4.2.3 Multicollinearity checks among the independent variables in the model

The study checks for multicollinearity among the explanatory variables in the empirical model which is to be estimated using regression analysis. Thus, the multicollinearity check is conducted on the log-transformed variables (except inflation). This test is conducted to assess the degree of linear relationships among the independent variables. Table 4.4 shows the correlation matrix which indicates the estimated simple correlation coefficients, alongside their respective probability values, between the explanatory variables in the empirical model.

Table 4.4: Correlation matrix among the independent variables in the empirical model (P-values in parentheses)

Variable	1	2	3	4	5	6
Logarithm of gross capital formation	1.000000 -----					
Logarithm of female labour force participation	0.7536*** (0.0000)	1.000000 -----				
Logarithm of male labour force participation	0.8560*** (0.0000)	0.8999*** (0.0000)	1.000000 -----			
Logarithm of female with basic education	0.7428*** (0.0000)	0.7334*** (0.0000)	0.8351*** (0.0000)	1.000000 -----		
Fertility	-0.9022*** (0.0000)	-0.9684*** (0.0000)	-0.7669*** (0.0000)	-0.681541 (0.0000)	1.000000 -----	
Inflation	-0.2215** (0.0120)	-0.304101 (0.0005)	-0.302455 (0.0005)	-0.368648 (0.0000)	0.249413 (0.0045)	1.000000 -----

Source: Author's compilation. ***p<0.01; **p<0.05; * p<0.1
1=Logarithm of gross capital formation; 2= Logarithm of female labour force participation; 3 = Logarithm of male labour force participation; 4= Logarithm of female labour force with basic education; 5= Fertility; 6 = Inflation.

The estimated pairwise correlation coefficients between the independent variables, as summarized in Table4.4, indicate that the variable "logarithm of male labour force participation" is highly linearly correlated with variables; logarithm of gross fixed capital formation (r = 0.8560, p = 0.0000), logarithm of female labour force participation (r = 0.8999, p = 0.0000) and logarithm of female with basic education (r = 0.8351, p = 0.000). The implication of this high correlation is that the inclusion of the variable "logarithm of male labour force participation" together with logarithm of gross fixed capital formation, logarithm of female labour force and logarithm of female with basic education in the same linear regression model would cause high multicollinearity in the model and this may jeopardize the efficiency of model estimates.

The study did further analysis about the level of linear relationships among the independent variables by estimating VIFs of the independent variables. The estimation of the VIFs has been dome after the OLS estimation. Table 4.5 shows a summary of VIFs when all the model

independent variables are included and Table 4.6 shows a summary of VIFs when one of the model independent variables (i.e. Logarithm of male labour force) is excluded.

Table 4.5: Variance Inflation Factors of the model independent variables (all the independent variables included)

Variable Name	VIF	1/VIF
Logarithm of male labour force participation	140.30	0.007128
Logarithm of female labour force participation	123.76	0.008080
Logarithm of gross capital formation	14.08	0.071023
Logarithm of female with basic education	12.46	0.080257
Fertility	2.28	0.438596
Inflation	1.29	0.775194
Mean VIF	**40.03**	

Source: Compiled by the author

It can be observed that the VIFs in Table 4.5 are exceedingly high for variables: Logarithm of male labour force participation, Logarithm of female labour force participation, Logarithm of gross capital formation and logarithm of female with basic education. For each of these independent variables, the estimated VIF well exceed the maximum acceptable level of the VIF of 10. Additionally, the mean VIF (Mean VIF = 40.03) in excess of 10. The VIF summary estimated in Table4.5 indicate that the "Logarithm of male labour force participation" has the highest VIF (VIF = 140.30), which is exceedingly above unacceptable level of VIF. When the "logarithm of male labour force participation" is excluded among the independent variables and VIF are re-estimated, the following results show up:

Table4.6: Variance Inflation Factors of the model independent variables (Logarithm of male labour force participation excluded)

Variable Name	VIF	1/VIF
Logarithm of female labour force participation	9.74	0.102669
Logarithm of gross capital formation	8.57	0.116686
Logarithm of female with basic education	4.62	0.21645
Fertility	1.25	0.8
Inflation	1.05	0.952381
Mean VIF	**5.05**	

Source: Compiled by the author

In Table4.6, the estimates of the VIFs of the individual independent variables are less than 10. The mean VIF (Mean VIF=5.05) is now in acceptable range. In consideration of high linear correlation

caused by “logarithm of male labor force participation” with other independent variables in the model and its very high VIF, this study excluded it (i.e. the study excluded, the variable “logarithm of male labour force participation”) from the final model (equation 8) for estimation on concerns of causing multicollinearity problem in the empirical model.

4.3 Regression estimates

After having found that the variables in the empirical model are characterized with mixed orders of integration and that there as cointegration in the relationship being modeled, I estimate the model by the autoregressive distributed lag (ARDL) model. I allow SBIC to choose lags in the ARDL model, both for autoregressive terms of the dependent variable and the lagged terms of the independent variables. The ARDL model has ability to display both the short run and long run regression coefficients as well as the adjustment parameter/equilibrium error. Table 4.7 displayed the summary of ARDL estimates, which includes estimates of equilibrium error, short rum and long run coefficients as well as relevant post-estimation diagnostic test results.

Table 4.7: ARDL (3, 3, 1, 1, 1, 2) regression estimates

	Coef.	Std. Err.	probability
Adj. parameter (ECT_{t-1})	-0.16407***	0.037424	0.000
Long-run Coefficients			
(Logarithm of gross capital formation)$_t$	0.76281**	0.438594	0.028
(Logarithm of female LF participation)$_t$	0.55721	0.707672	0.433
(Logarithm of female LF with basic education) $_t$	0.17997	0.151356	0.237
(Fertility) $_t$	0.01879	0.228436	0.935
(Inflation) $_t$	-0.00004	0.001022	0.966
Short-run Coefficients			
Δ(Logarithm of GDP) $_{t-1}$	0.59104***	0.083464	0.000
Δ(Logarithm of GDP) $_{t-2}$	0.23611***	0.085301	0.007
Δ(Logarithm of gross capital formation)$_t$	0.10474**	0.047994	0.031
Δ(Logarithm of gross capital formation)$_{t-1}$	-0.0993*	0.053725	0.068
Δ(Logarithm of gross capital formation)$_{t-2}$	-0.10826**	0.053493	0.046
Δ(Logarithm of female LF participation) $_t$	-5.98783**	2.390460	0.014
Δ(Logarithm of female LF with basic education) $_t$	0.09918	0.094218	0.295
Δ(Fertility)$_t$	-1.09043**	0.444616	0.016
Δ(Inflation)$_t$	0.00176***	0.000289	0.000
Δ(Inflation)$_{t-1}$	-0.00124***	0.000333	0.000
Constant	-0.28616	2.215683	0.897
Diagnostics			
Adj. R-squared = 0.7617			
Ramsey RESET test for omitted variables			
Ho: Model has no omitted variables			
Prob > F = 0.3344			
Pesaran, Shin, and Smith (2001) bounds test			
Ho: No level relationship			
prob > t for I(0) variables = 0.006			
prob > t for I(1) variables = 0.030			
Breusch–Godfrey LM test for autocorrelation			
Ho: No autocorrelation in the fitted residuals			
Prob > chi2 = 0.112			
Jarque-Bera normality test			
Ho: The fitted residuals are normally distributed			
Prob > chi2 = 0.227			

Source: Compiled by the author after ARDL estimation. **p<0.05; *** p<0.01

4.3.1 Robustness of the regression estimates

***Explanatory Power of the estimated model*:** The ARDL (3, 3, 1, 1, 1, 2) in Table 4.7 regression estimates indicate an explanatory power of the fitted regression, as measured by the adjusted R-Square, of approximately 0.76, implying that the fitted ARDL (3, 3, 1, 1, 1, 2) provided approximately 76 percent explanatory ability. This study considers this as a commendable

explanatory power of the estimated egression where the included explanatory variables jointly explain up to 76 percent of what accounts for variations in the logarithm of gross domestic product for Uganda.

***Omitted variables test*:** Under the null hypothesis that the estimated model has no omitted variables bias, the F-statistic from the RAMSET Reset omitted variables test does not reject the null hypothesis because its corresponding probability value is greater than the 0.05 significance level (Prob > F = 0.3344). The implication is that the estimated ARDL (3, 3, 1, 1, 1, 2) model does not suffer from the omitted variable bias.

***No level relationship test*:** After model estimation, the study conducted the Pesaran, Shin, and Smith (2001) bounds test under the null hypotheses that there is no level relationship model for I (0) and I (1) variables respectively. Results in Table 4.5 indicate that the estimated t-statistics reject the null hypothesis at 5 percent level for both I (0) and I (1) variables respectively [prob > t =0.006 for I(0) variables and prob > t = 0.030 for I (1) variables] , confirming presence of cointegration between the logarithm of gross national product and I (0) and I (1) variables.

Autocorrelation test: The Chi-square statistic from the Breusch–Godfrey LM test for autocorrelation does not reject the null hypothesis of no autocorrelation in the residuals produced from the estimated ARDL (3, 3, 1, 1, 1, 2) model. This is because the Chi-square probability (p = 0.112) exceed the 0.05 significance level. This result suggests that the residuals from the estimates regression are not auto correlated which renders the estimates consistent.

Normality of the residuals test: Under the null hypothesis that the estimated residuals are normally distributed, the Chi-square statistic produced from the Jarque-Bera normality test does not reject

the null hypothesis at 5 percent level of significance (p> Ch2 = 0.227). This result suggests that the ARDL (3, 3, 1, 1, 1, 2) estimates are valid for statistical inference.

The estimated coefficient of the error correction

The ARDL (3, 3, 1, 1, 1, 2) in Table 4.7 regression estimates indicate that the estimate of the error correction term or the adjustment parameter is negative and statistically significant at 5 percent testing level (Coef. of ECT_{t-1} is -0.16407, p=0.000). The negative sign is consistent with a priori expectations. The statistical significance shows that the model converges to its long run equilibrium value, which is further evidence of presence of cointegration in the model. This result thus suggests that there is presence of long run causal relationship in the model.

4.3.2 Identification of statistically significant coefficients

In this study, the statistically significant model estimates are judged by their corresponding p-values which are less that the significance level. The significance level has been set at 5 percent (i.e. $\alpha = 0.05$).

Statistically significant long run coefficients: At 5 percent level of significance, the ARDL (3, 3, 2, 1, 4, 2) regression estimates in Table4.5 indicate that it is only the long run coefficient on variable "logarithm of gross capital formation" that is statistically significant (Coef. = 0.76281, p = 0.028). The rest of the long run coefficients on all the other independent variables are statistically insignificant at 5 percent level of significance. This is because the estimated long run coefficients on all these other independent variables have associated p-values that exceed the significance level of 0.05.

Statistically significant short run coefficients: The ARDL (3, 3, 1, 1, 1, 2) regression estimates in Table 4.5 indicate the short run coefficient on variables "Δ Logarithm of $GDP)_{t-1}$" ,

"Δ(Logarithm of GDP)$_{t-2}$", "Δ(Logarithm of GDP)$_{t-2}$" , "Δ(Logarithm of gross capital formation)$_t$" , "Δ(Logarithm of gross capital formation)$_{t-2}$" , "Δ(Logarithm of female LF participation)$_t$", "Δ(Fertility)$_t$" , "Δ(Inflation)$_t$" and "Δ(Inflation)$_{t-1}$" are all statistically significant at 5 percent level of significance." This is because the estimated short run coefficients on the listed independent variable have associated p-values that are less than the significance level of 0.05.

4.3.3 Establishing whether the study objectives have been addressed following regression estimates

Obj. 1: To investigate the effect of female labor force participation rate on Uganda's economic growth.

The regression estimates indicated that the variable of female labour force participation rate had a negative and statistically significant short run coefficient but had a statistically insignificant long run coefficient. This result suggests that of female labour force participation has a significant short run negative effect on Uganda's economic growth but does not show long run causal effect. This result further indicates that the U-shape development hypothesis is not fulfilled by this study.

Obj. 2: To investigate the effect of the level of education of females in employment and Uganda's economic growth.

Estimates of the empirical model indicated that both the short run and the long run estimated coefficient on the variable of female education in the employed female labour force had were positive but statistically insignificant at all conventional testing levels. Having used "basic education" as a proxy for female education in this study, this result suggests two implications: one is that there is a positive relationship between female in employment with basic education and Uganda's economic growth; the other one is that the females in employment with basic education do not have an effect on Uganda's economic growth both in the short run and in the long run.

Obj. 3: To investigate the effect of fertility rate and Uganda's economic growth.

The fertility rate variable emerged with a negative and statistically significant short run coefficient and with positive and statistically insignificant long run coefficient. This result shows that fertility rate has a significant short run causal effect on Uganda's economic growth but does not have a long run causal effect.

4.3.4 Conclusion from the model estimates

On the basis of the statistically significant coefficients, and in reference to the study objectives, estimates from the ARDL (3, 3, 1, 1, 1, 2) regression model indicate that female labour force participation rate in the employed female labour force has a significant negative short run causal effect but does not show any long run effect on Uganda's economic growth; the level of female education in the employed female labour force has no short run and long run causal effect on Uganda's economic growth while the female fertility rate has negative short run causal influence but shows no long run causal effect on Uganda's economic growth.

CHAPTER FIVE

DISCUSSION OF THE STUDY FINDINGS

5.0 Introduction

The discussion of the study findings presented in this chapter has been done in line with study hypotheses as well the study objectives. The discussion of the findings is based on the regression estimates obtained and presented in the previous chapter (chapter four). The discussion of the results are complimented with the findings of other authors in the related field.

5.1 Findings in relation to objective one

Objective one of this study was to investigate the effect of female labour force participation rate on Uganda's economic growth. The associated null hypothesis in respect of addressing objective one was stated as follows:

$\boldsymbol{H_{01}}$**:** Female labour force participation rate has no effect on Uganda's economic growth.

The variable "female labour force participation in employment" has been used as a proxy of Female labour force participation rate. The short run regression estimates indicated a negative and statistically significant coefficient on the logarithm of female labour force participation while the long run regression estimates indicated a positive and statistically insignificant coefficient on the logarithm of female labour force participation. This result suggested that the rate of female labour force participation in employment has a significant causal effect on Uganda's economic growth in the short run but does not have a long run causal effect in the long run. The regression estimates thus present a dual implication with respect to the stated hypothesis: on one side the null hypothesis is rejected with respect to the short run regression estimates, and on the other side the null hypothesis is not rejected with respect to the long run regression estimates.

I urge that the negative and statistically short run regression coefficient on the female labour force participation could be explained by a number of factors: firstly, the disaggregation of the labour stock input into the components of female and male labour force could have made the disaggregated variables to have a negative relationship with total output, arising from the "poorly measured" labour input variable due to disaggregation; secondly, borrowing from the rudiments of the U-shape theory of development, the negative coefficient on female labour force participation could be consistent with the stylized argument that at the initial stages when a country is struggling to grow (say in the short run), female mainly work in subsistence agriculture or home-based production whose output is not captured in national accounting. As a country develops, economic activity shifts from subsistence agriculture to industry. But in Uganda's context, possibly more male as opposed to female get employed in the industrial sector, as more female remain and more engage in home-based subsistence activities (Verick, 2014). In the medium term, as the country exhibits some structural transformation and as more female are engaged in subsistence, growth emerges from other factors other than increased female labour force participation in employment. Negative causal effect of female labour force participation on growth in GDP has been reported in other elated studies (e.g. Tandrayen-Ragoobur, 2011; Olivetti, 2013; Tsani et al., 2013; Lechman & Kaur, 2015; Khaliq et al., 2017) whose study results showed that the coefficients of female labor force had a positive sign and was statistically significant in almost every case, confirming the hypothesis of positive contribution of female labor force on growth.

5.2 Findings in relation to objective two

Objective two of this study was to investigate the effect of the level of education of female in employment and Uganda's economic growth. The associated null hypothesis that was set to be tested in respect of addressing objective two was stated as follows:

$\boldsymbol{H_{02}}$**:** The level of education of female in employment has no effect on Uganda's economic growth.

Due to limited education statistics on Ugandan labour force, the study used the stock of female in labour force with basic education (female working-age population with basic education) as proxy for female education with an intention of investigating how the level of education of female in employment effects Uganda's economic growth. According to "Education and Mismatch Indicators database (EMI) (2023), basic education comprises primary education or lower secondary education according to the International Standard Classification of Education.

Estimates from this study indicated that in both short run and long run, the estimated coefficient on the variable "logarithm of female labour force with basic education" was positive and statistically insignificant at 5 percent level of significance. This result was consistent with the stated null hypothesis that was set to be tested. The results show that the stock of female in labour force with basis education does not influence Uganda's economic growth both in the short run and in the long run. On the basis of this results outcome, this study states that the stock of female in labour force with primary education or lower secondary education has no effect on Uganda's economic growth. The study applauses the positive sign on the coefficient and attributes the "statistical insignificance" to data problems: first, it was only data on female in labour force with basic education that was available for the period under study- there were quite many missing observations on other education levels in the data banks. Thus "female education in labour force with basic education" could have been a poor proxy for female level of education that made the coefficient being statistically insignificant. Additionally, Uganda is still struggling to meet sustainable development goal number four of "ensuring inclusive and equitable quality education and promote lifelong learning opportunities for all". There are still gender disparities in terms of access to education as well as to employment in Uganda. Female/Girl children are a more

vulnerable gender. Though, Uganda recognizes that education is crucial for both building human empowerment, and delivering economic progress, there are still challenges that inhibit human capital development, and particularly female which may have a detrimental effect on overall growth and development of Uganda. The Office of the Prime Minister (2020) outlines poor quality and efficiency of primary education and limited systemic capacity in the education sector as some of the challenges. Consequently, labour force attainment of basic education perhaps by both genders may still have no or limited effect on Uganda's economic growth.

The findings from this study do not tally with the findings of related studies, for instance results from this study conflict with the findings of Oztunc et al. (2015) who found that female education as measured by female primary school enrollment was a significant factor for annual per capita income growth in the Asia Pacific region. Nevertheless, a study by Alaoui (2016) on Morocco, Algeria, Tunisia and Egypt found that female education as measured by primary and secondary female school enrolments were negatively linked to the economic growth.

5.3 Findings in relation to objective three

Objective three of this study was to investigate the effect of fertility rate and Uganda's economic growth. The associated null hypothesis that was set to be tested in respect of addressing objective three was stated as follows:

$\boldsymbol{H_{03}}$**:** Fertility rate has no effect on Uganda's economic growth.

Estimates from this study indicated a negative and statistically significant coefficient on the fertility variable in the short run and a positive and statistically insignificant coefficient on the fertility in the long run. These estimates suggest that high fertility rates have a negative and significant causal influence on Uganda's economic growth in short run but do not have any effect

in the long run. Theoretical literature links the effect of fertility on economic growth through its influence on female labour force participation. Consistent with the theoretical argument, it's noticed that signs on the short run and long run coefficients on the female labour force participation and fertility variables respectively match. The negative short run causal effect of fertility on Uganda's economic growth may be explained by the fact that many of the employed young female when they have given births tend to be give short term maternity leave from employment which temporarily reduce total labour supply. The same effect is observed even in informal employment where the female that are due to give birth withdraw labour temporarily. The temporal/short run reduction in labour supply, as more of working female temporarily get out of active labour on maternity leave, could have a negative effect on output of goods and services, and this could bring about a negative effect on aggregate output. As maternity leave is over, the breast-feeding mothers return to employment, but as it was with female labour force in employment, they will have an insignificant effect on overall output. This renders the high fertility to have a negative short run effect on aggregate supply and an insignificant influence on GDP growth in the long run.

In terms of short run effects, findings from this study are consistent with the findings of Brander and Dowrick (1994) who found that high birth rates appeared to reduce economic growth, attributing it to investment effects and "capital dilution". This study's findings also concur with the findings of Er (2012) who concluded from his study findings that less fertility was significant in influencing the economic growth.

CHAPTER SIX

CONCLUSION, POLICY RECOMMALEDATIONS AND AREAS FOR FURTHER RESEARCH

6.0 Introduction

In this chapter, the summative conclusion is presented. Policy recommendation derived from the study findings are also presented in this chapter. The last sub-section of this chapter presents areas for further research.

6.1 Conclusion

This study sought to investigate the effect of selected female labour force participation indicators on Uganda's economic growth. The particular female labour force participation indicators that were analyzed in this study were: the female labour force participation rate, the level of education of female in labour force and fertility rate. Time series data for the period 1990 -2021 was obtained from World Bank development indicators and the Uganda Bureau of Statistics (UBOS) have been used in the analysis. The adopted a causal relationship research design.

Analysis showed that the series in the empirical model were integrated of mixed orders and that there were cointegrating relationship in the model. The study employed the ARDL (3, 3, 1, 1, 1, 2) model to estimate the regression coefficients. Estimates indicated that, over the period of analysis, female labour force participation rate had a negative causal effect on Uganda's economic growth in the short run but did not show any causal influence on Uganda's economic growth in the long run. This result supported the postulates of the U-shape hypothesis. Estimates further showed that female labour force with basic education (which has been used as a proxy for the level of education of female in labour force) has no short run and long run causal effect on Uganda's

economic growth while the female fertility rate had negative short run causal influence but showed no long run causal effect on Uganda's economic growth.

Furthermore, estimates indicated that gross capital formation (which has been used to represent the physical capital input in the Solow-Style neoclassical model) had positive and significant casual effect on Uganda's economic growth both in the short run and in the long run. Such a result from this study indicates the prominence of the explanatory ability of neoclassical growth theory in predicting growth in output even when more recent data is used to model growth.

The study contributes to existing body of literature by adopting and modifying the Solow-style neoclassical model in combination of the U-shape development hypothesis by disaggregating the labour input by gender and analyzing its contribution to growth in Uganda's economic growth while including additional female labour force indicators in the empirical model.

6.3 Policy recommendations

The study draws the following policy recommendation aimed at fostering Uganda's rate of economic growth:

1) Education policies should put more emphasis on the level of training of the labour force in all gender categories, focusing on female in labour force. It appears that the level of education in itself is not sufficient in fostering female in labour force to significantly contribute to total output, but the attainment of specialized skills by the female in labour force may increase productivity in economic activity and ultimately make a significant positive contribution to Uganda's economic growth.
2) Uganda should intensify birth control policy interventions to control birth rates in attempt to tame high fertility rates. This intervention would indirectly reduce on the labour hours lost in maternity leave offered to pregnant female in employment who are due to give birth

of their children. Saving of this labour hour's loss may give the labour input enough activity hours in labour which may boost the rate of growth in total output for Uganda.

3) Deliberate policy actions to be put in place support accumulation of gross domestic fixed investment such as initiatives to attract both domestic and foreign direct investment but also government's own effort to invest in fixed capital that earn plentiful profitable returns.

6.4 Suggested areas for further research

This study analyzed the effect of female labour force participation on Ugandan's economic growth using aggregated data or country-wide indicators on selected female labour force participation. There is thus a need to analyze sectoral based data to further investigation of the role of gender variations in labour force in contributing to sector output growth.

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APPENDIX I: Ramsey RESET test for omitted variables

Ramsey RESET test for omitted variables
Omitted: Powers of fitted values of D.loggdp

H0: Model has no omitted variables

F(3, 99) = 0.41
Prob > F = 0.3344

APPENDIX II: Pesaran, Shin, and Smith (2001) bounds test for "no level relationship"

Kripfganz and Schneider (2020) critical values and approximate p-values

	10%		5%		1%		p-value	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
F	2.250	3.449	2.638	3.943	3.493	5.007	0.006	0.053
t	-2.503	-3.786	-2.821	-4.147	-3.441	-4.834	0.000	0.030

APPENDIX III: Breusch–Godfrey LM test for autocorrelation

Breusch–Godfrey LM test for autocorrelation

lags(p)		chi2	df	Prob > chi2
1		1.218	1	0.1123
		H0: no serial correlation		

APPENDIX IV: Jarque-Bera normality test

Jarque-Bera normality test: 11.86 Chi(2) .2270
Jarque-Bera test for Ho: normality: