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Gender Inequality and Economic Growth in Nepal: An ECM Approach

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Abstract

This study explores the impact of gender inequality on economic growth in Nepal by examining the long-run relationship between Gross Domestic Product per capita (GDP per capita) and three key gender-related indicators: female secondary school enrollment, women's representation in national parliaments, and the female-to-male labor force participation ratio. Using co-integration and error correction modeling on data from 1991 to 2023, the analysis confirms that all variables are integrated of order one, justifying the use of co-integration techniques. The results reveal a statistically significant and positive long-term association between gender inclusion and economic growth, with female labor participation exerting the strongest influence, followed by educational attainment and political representation. The stationarity of residuals and the significant error correction term affirm the existence of a stable equilibrium, while Granger causality tests suggest that economic growth drives female labor participation and highlight short-run inter-linkages between education and political empowerment. With a high explanatory power ($R^2 = 0.9873$), the findings reinforce the theoretical view that gender inequality constrains economic development. This study offers critical empirical evidence and recommends gender-inclusive and socially equitable policies that promote educational access, labor market inclusion, and political representation for women, ultimately contributing to the achievement of the sustainable development goals targets.

Key Words: Gender Inequality, Economic Growth, Gross Domestic Product Per Capita,

JLE Classification Codes: J16, O40

1. Introduction

¹ Basanti Acharya is currently working as a Lecturer of Economics at Bhaktapur Multiple Campus. Her academic interests focus on topics such as economics, economic analysis, and the role of women in the economy. In particular, she is involved in the study, teaching, and research of the contemporary Nepali economy as well as the role of women in economic activities.

Gender inequality is a severe and persistent issue, particularly in developing countries. It can occur in different areas like education, employment, health, family and society. In recent years, there has been growing recognition that development goals cannot be achieved without addressing gender inequality and empowering women. In Nepal, the concept of gender equality began to gain recognition in the 1990s. The 1990 Constitution of Nepal guarantees fundamental rights to all citizens prohibiting discrimination on the basis of race, caste, religion, sex or ideological conviction (Constitution of Nepal, 1990). The Constitution (1990) of Nepal also ensures equal property inheritance rights for women and guarantees equal pay for men and women workers performing similar jobs. Gender inequality is the condition in which access to rights, resources, and opportunities is unequally distributed between individuals due to gender. Mason and King (2001) defined gender equality as encompassing equality under the law, equality of opportunity including equal rewards for work and equal access to human capital and other productive resources that enable opportunity, and equality of voice which refers to the ability to influence and contribute to the development process.

Sen (2001) defines gender inequality as not one homogeneous phenomenon, but a collection of disparate and interlinked problems. According to him, varieties of disparity between genders existed such as mortality inequality; basic facility inequality for instance, excluding girls from schooling; special opportunity inequality such as, disparity in higher education, professional trainings etc.; professional inequality in certain occupations; inequality in ownership of assets; and inequality within household in the division of labour. Gender inequality is a significant barrier to development and is widely acknowledged as such. World Bank (2012) has revealed that gender equality can have large impacts on productivity. The gender gap in education, political participation and employment opportunities should be reduced not only it is fair and just, but also because narrowing these disparities, will have positive consequences on various societal outcomes (Duflo, 2012). Globally, numerous studies using time series data have explored the link between economic growth and gender equality. These studies consistently demonstrated that reducing gender disparities positively impacts societal and economic outcomes. For instance, Klasen (2000) showed that gender inequality in education has a direct negative impact on economic growth, which is equally strong in both developing and developed countries. This occurs by lowering the average quality of human capital and indirectly influencing investment and population growth. The study also finds that increases in female labor force participation and employment are associated with higher economic growth. Moreover, gender inequality in education leads to higher birth rates and increased child mortality, which harms overall well-being, particularly in developing countries.

Similarly, Kabeer and Natali (2013) highlight that promoting gender equality particularly in education and employment contributes to economic growth. Reflecting this, UNDP (2015) declared achieving gender equality and empowering women as one of the core goals of the Sustainable Development Goals (SDGs). Despite progress being made in achieving gender parity in primary education in many countries, including Nepal, discrimination still exists in areas such as secondary and higher education, national decision-making, wage equality, and labor market participation. Women constitute nearly half of the global population and more than half of the population in Nepal. Without promoting genuine gender equality, it will be difficult to ensure healthier children and better education for future generations. As former World Bank Group President Jim Yong Kim, emphasized that closing persistent gender gaps is essential to boosting sustainable growth and ending poverty by 2030 (Hoel, 2015). Further, some researchers have reported a significant positive relationship between female participation in parliament and economic growth (Altuzarra, Gálvez-Gálvez, and González-Flores, 2021; Mirziyoyeva and Salahodjaev, 2023). Promoting sustained, inclusive, and sustainable economic growth remains a key aim of the SDGs. To achieve these goals, the Government of Nepal, along with the private sector, must prioritize expanding women's access to education, ensuring equal opportunities in the labor market, and support women's political empowerment.

In the context of Nepal, however, the relationship between gender inequality and economic growth has received relatively little attention, particularly in empirical analysis. This study seeks to address this gap by investigating the long-term relationship between gender inequality and economic growth using a multidimensional approach. Specifically, it analyzes socio-economic and political aspects of gender inequality to provide a comprehensive understanding of how reducing these inequalities can contribute to sustainable economic growth. Gender, as an independent variable in explaining economic performance, is particularly important in Nepal not only due to the scarcity of existing research but also because gender dynamics fundamentally shape the country's economic and social structures. Addressing gender inequality is not only a matter of social justice but also a key driver of sustainable economic development.

This study aims to analyze the impact of gender inequality in the areas of education, political participation, and labor force participation on economic growth in Nepal. To achieve this objective, it employs time series data spanning from 1991-2023 obtained from the World bank (2024) and applies the Error Correction Model (ECM) for analysis. The study uses Gross Domestic Product per capita (GDPPC) as a proxy for economic growth, with female secondary **school enrollment (FSSE)**, **seats held by women in National Parliaments (FPP)**, and **the female to**

male labor force participation rate (FLFP) as independent variables representing different dimensions of gender inequality. The empirical results reveal that all three independent variables have a very strong and significant relationship with economic growth.

The rest of this study is organized as follows: Chapter 2 reviews the relevant literature; Chapter 3 discusses the data and methodology used in the study; Chapter 4 presents the results; and Chapter 5 concludes the study with policy implications.

2. Review of Literature

There are mixed findings on the relationship between gender inequality and economic growth. A few relevant studies are reviewed below.

Volart (2000) examined sex discrimination and economic growth using data from over 100 countries for the period 1965-1989. Education was measured through indicators such as average years of schooling, gross enrollment ratios and completion rates at the primary secondary and higher levels for both female and male aged 25 and above. The study found that higher overall education and reduced gender discrimination positively impact real per capita GDP growth. Specifically, a 1% decrease in gender inequality in primary schooling controlling for factors such as overall secondary education and regional dummy variables increased the growth rate by 0.0123 percentage points.

Balioune-Lutz and McGillivray (2007) assessed the impact of gender inequality measured by the ratio of girls to boys in primary and secondary enrollment, and the ratio of literate females to males aged 15–24 on economic growth, in Sub-Saharan Africa and Arab countries. Using the Arellano-Bond GMM technique, the study found that gender inequality in literacy has a statistically significant negative effect on growth, and this result remains consistent across various model specifications. The study further revealed that higher gender inequality has an even stronger adverse impact on income growth in Arab countries. Interestingly, in more open economies, gender inequality in literacy showed a positive effect on growth, suggesting that trade-induced growth may come with increased inequalities. However, the effects related to school enrollment gaps were less consistent.

Pokharel (2012) examined the relationship between gender equality and economic growth in Nepal using time series data from 1990 to 2005. Measures of gender equality included life expectancy, government expenditure on health, secondary enrollment rate, government expenditure on education, labour force participation and gender inequality index. The study employed Ordinary Least Squares (OLS) method for analysis. The findings indicated that although gender equality in Nepal has improved over the years across all indicators, the empirical results did not show a statistically significant relationship between gender equality and GDP per capita growth rate.

Ali (2015) examined the effect of gender inequality in education and labor force participation between males and females on economic growth in Pakistan, using data from the period 1980 to 2009 through multiple linear regression. The study found that reducing gender inequality in education and employment has a positive long run impact on GDP growth, highlighting the importance of gender equality in promoting economic development.

Xu (2015) examined the impact of female political participation on economic growth in 30 Asian countries, including Nepal, from 1991 to 2013. Using fixed-effects and random-effects panel regression models, the study found that higher representation of women in parliament is associated with increased real GDP per capita, indicating a positive link between female political participation and economic growth.

Theveon and Pero (2015) assessed the relationship between gender gap in education and economic growth in OECD Countries. Education indicators included male and female average years of schooling and the proportion of males and females with completed secondary education and above. Using longitudinal cross-country data from 30 countries covering the period 1960 to 2008, the study found a positive and significant impact of increased women's educational attainment relative to men on per capita GDP growth. The results remained robust to the distinction between sub-periods, indicating that the effect of the equalization of years of completed education on economic growth has been higher in the more recent periods.

Karoui and Feki (2017) analyzed the impact of gender inequality in education on economic growth in Tunisia using a co-integration approach for the period 1970-2009. Education was assessed based on the proportion of girls among all primary school graduates per year, secondary school graduates per year, and university graduates per year. The study revealed a long-term relationship between gender inequality in education across all levels and the GDP growth rate. Among these, the ratio of female university graduates had the most significant influence on economic growth.

Al-Shammari and Al Rakhis (2017) investigated the impact of gender inequality in labor force participation and education on economic growth in the Arab region for the period 1990–2014. The study employed Pooled OLS and Fixed Effects techniques. Gross Fixed Capital Formation as a percentage of GDP was used as a proxy for capital accumulation, while male labor force participation rates, trade openness, population growth, and oil prices were included as control variables. Interestingly, the findings revealed no evidence that gender inequality in education or labor force participation hinders economic growth in the Arab region. Instead, the study found that the main drivers of economic growth in the region are capital accumulation and population growth.

Altuzarra, Gálvez-Gálvez, and González-Flores (2021) examined the impact of gender inequalities in education, labor market participation, and political representation on economic growth in 105 developing countries, including Nepal and those in Sub-Saharan Africa (SSA), using data from 1990–2017. Using cross-country and panel regressions, along with a two-step GMM approach to address endogeneity, heterogeneity, and autocorrelation, the study found that gender equality in education positively influences GDP per capita growth - more strongly in SSA countries than in the overall sample of developing countries. However, the female–male labor force participation ratio was not statistically significant. Political representation of women was positively associated with growth in the full sample but had a negative relationship in SSA countries, possibly due to limited influence of women on policy priorities despite increased political participation.

Khanal (2023) examined gender equality in the context of sustainable development goals: some reflections from Nepal. The study aimed to explore the essential role of gender equality in

achieving sustainable development and to address the specific challenges and progress made in Nepal toward the SDGs. The study employed an explorative method to examine the intersection of gender equality and sustainable development. The research analyzed the social, economic, environmental, and partnership aspects of SDGs in relation to gender equality. It highlighted how these dimensions contributed to human well-being and justice. The study emphasized the need for comprehensive and coordinated efforts to address gender disparities, promote women's empowerment, and ensure the active participation of women and girls in decision-making processes. Furthermore, the study concluded that achieving sustainable development in Nepal requires integrating gender equality into policies, programs, and strategies.

Mirziyoyeva and Salahodjaev (2023) investigated whether the representation of women in parliament promotes economic growth, using evidence from Europe and Central Asia. The main aim of the study was to assess the effect of female parliamentary participation on economic growth in 48 countries within the Europe and Central Asia (ECA) region. The study covered the period from 2000 to 2018. The dependent variable was annual GDP growth. The core empirical technique used was the two-step system Generalized Method of Moments (GMM) estimator, along with random and fixed effects models. The empirical results found that female participation in parliament has a positive and significant impact on economic growth. In particular, a 10 percentage point increase in women's representation in parliament leads to a 0.74 percentage point increase in GDP growth.

2.1 Research Gap and Value -added

Globally, numerous studies using time series data have examined the relationship between gender equality (or inequality) and economic growth . However, in the Nepalese context, such studies are scarce. This study seeks to address this gap by examining multiple dimensions of gender inequality such as social, economic, and political to assess its impact on economic growth. By incorporating these broader dimensions, the research offers a more comprehensive perspective on how gender disparity influences economic performance. This study aims to contribute to the existing literature by providing insights specific to the Nepalese context.

3. Data and Methods

3.1 Theoretical Framework of the Study

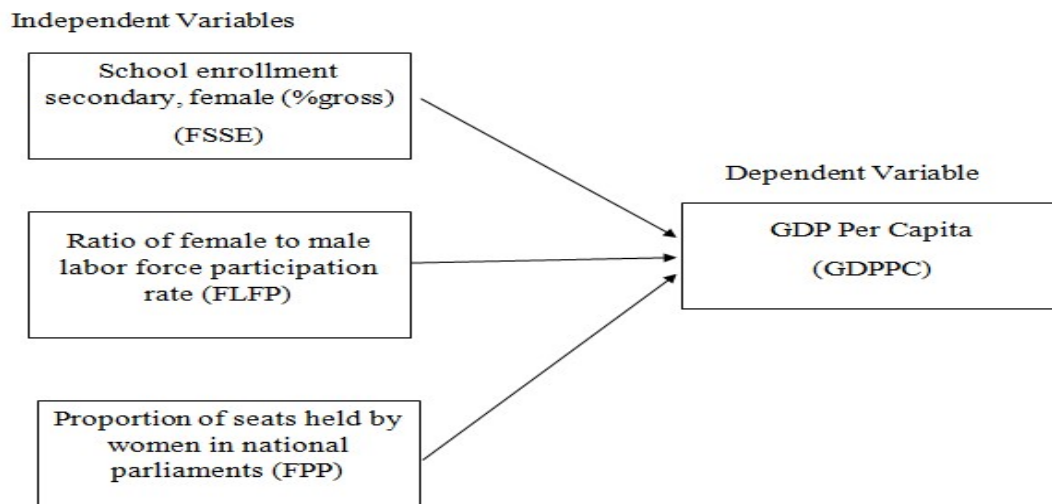
Various theoretical perspectives have been used to explain the negative relationship between gender inequality and economic growth.

Sen's (1999) Capability Approach emphasized that development is the expansion of real freedoms, not just economic growth. Sen (1999) argued that true development requires gender equality, as excluding women from education, healthcare, employment, and political participation limits overall progress. Reducing gender gaps is thus both a goal of development and a means to achieve higher economic growth. Mason and King (2001) emphasized that gender inequalities hinder economic development by imposing indirect costs on productivity, efficiency, and overall economic advancement. These inequalities, which arise from discriminatory practices within households and labor markets, also hinder the growth of human capital. Lagerlöf (2003) suggested that reducing the gender gap promotes economic development. Using a growth model, the study found that as human capital between spouses becomes more equal, couples prioritize child quality over quantity, leading to lower fertility rates and boosting human capital accumulation and per-capita income growth. Similarly, Duflo (2012) highlighted that the relationship between women's empowerment and economic development is bidirectional. Economic development can help reduce gender disparities by providing women with greater access to education, employment, and health services. However, empowering women for example, through greater educational attainment, labor force participation, and political involvement is itself a critical driver of sustained economic growth. Moreover, Duflo (2012) emphasised that continued policy commitment is needed to promote gender equality. The theoretical framework of this study is supported by numerous theories on gender equality and economic growth and economic development (Sen, 1999; Mason & King, 2001; Lagerlöf, 2003; Duflo, 2012). Therefore, based on the theoretical underpinnings this study aims to examine the relationship between gender differences in education, labor force participation, and female parliamentary representation, and economic growth.

3.2 Conceptual Framework of the Study

To analyze the impact of three predictors of gender inequality on economic growth, this study uses time series data covering the period from 1991-2023. All the data required for this study were obtained from World Bank (2024).

Figure No. 1 Conceptual Framework of the Study



Source: Conceptual Framework by Researcher

Economic growth is commonly defined as an increase in the value of goods and services produced by an economy, while economic development includes both economic growth and improvements in people's quality of life (Khan and Khan, 2012). The secondary school enrollment ratio reflects gender disparities in access to education. Gross enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown (World Bank, 2024a). Female parliamentary participation measures the percentage of parliamentary seats in either upper or lower house held by women (World Bank, 2024b). It is a key indicator that reflects the extent to which women occupy positions of political power in a country and provides an approximation of gender equality in the political sphere. Labor force participation indicates the proportion of women aged 15 and older in a country that is economically active (World Bank, 2024c). GDP per capita is gross domestic product divided by total population. GDP is the sum of gross value added by all resident producers in the economy plus any taxes on products, minus any subsidies that are not included in the value of the products (World Bank, 2024d). Khan and Khan (2012) and Haller (2012) stated that GDP per capita or GNP per capita is a better indicator of economic growth.

3.3 Methodology

This study explores the relationship between gender inequality and economic growth in Nepal. It employs a descriptive and explanatory approach to analyze the effect of gender inequality on economic growth. This study adopts an empirical and analytical approach to examine the relationship between women empowerment and economic growth in Nepal using time-series econometric techniques.” This study uses time series data covering the period from 1991-2023. All the data required for this study were obtained from World Bank (2024). Although, the concept of gender equality began to gain importance in Nepal following the establishment of democracy in 1990, this study focuses on the period from 1991 to 2023 due to the availability of data for this

timeframe. GDP per capita serves as a proxy for economic growth, while the study examines school enrollment secondary, female (FSSE), ratio of female to male labor force participation rate (FLFP) and proportion of seats held by women in national parliaments (FPP) as predictors. To examine the connection, the Engle-Granger Cointegration Test and Error Correction Model are applied.

3.3.1 Empirical Method

The empirical model aligns with the theoretical framework and is represented by the following equation. To leverage the desirable time series properties of the variables and facilitate direct elasticity calculation, logarithmic transformations are applied to the variables. Therefore, the econometric estimation model is as follows:

$$GDPPC = \beta_0 + \beta_1 (FSSE) + \beta_2 (FPP) + \beta_3 (FLFP) + et$$

Where,

GDP= GDP Per Capita

FSSE = Female Secondary School Enrollment

FPP= Female Political Participation

FLFP = Female Labour Force Participation.

β_0 = constant.

β_1 , β_2 , and β_3 are regression parameter of the variables.

et = error term.

4. Results and Discussion

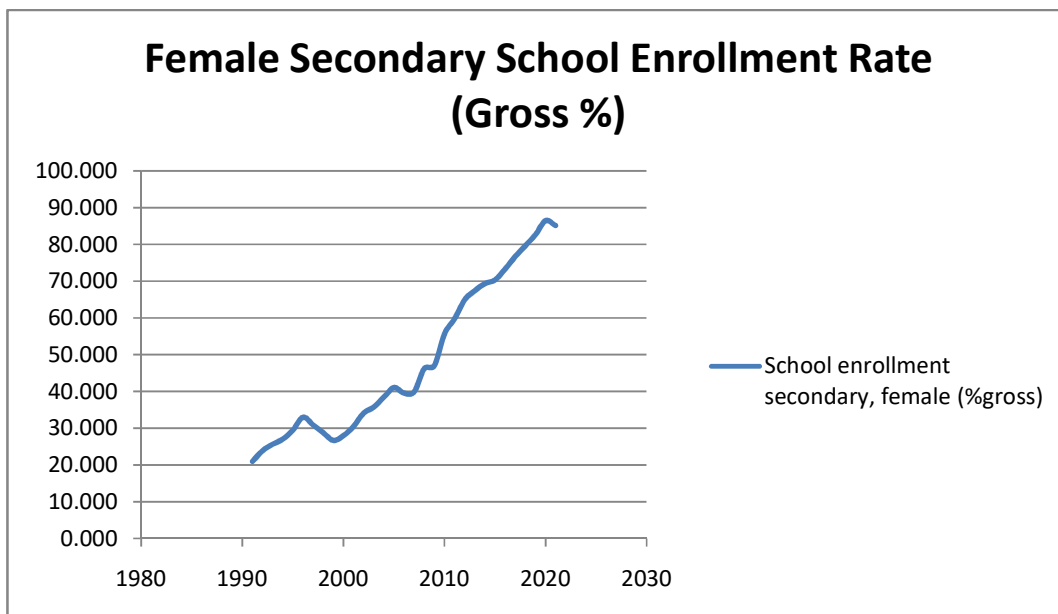
Presentation and discussion are divided into two parts; (a) Trend analysis and (b) Empirically econometric analysis.

4.1 Measures of Gender Inequality of trend Analysis

4.1.1 Female Secondary School Enrollment

Education is widely regarded as one of the key drivers of economic growth and social development. Blumberg (2005) highlighted that female education positively impacts society by rising the age of marriage, boosting women's employment and earnings, and enhancing children's education, creating a virtuous cycle. Furthermore, Chung et al. (2013) revealed that the indicators of education are among the most important measures of gender equity and women empowerment. Nepal has achieved gender parity at primary and secondary education levels. Although Nepal's progresses in school enrolment and gender parity have been remarkable, the drop out ratio of girls remains higher than boys mainly due to socioeconomic reasons. The ratio of women to men in tertiary education has increased over the past decade; however, a significant gap between males and females in higher education still exists. According to National Planning Commission [NPC] (2020), the Gender Parity Index (GPI) in enrollment for primary schools was 1.06 indicating more girls enrolled in primary schools than boys. In contrast GPI for secondary level was only 0.95 in 2019 implying fewer girls than boys. The report highlights significant improvement in female secondary school enrollment but greater focus should also be placed on increasing the completion rate in secondary education.

Figure 2



Source: World Bank, 2024a

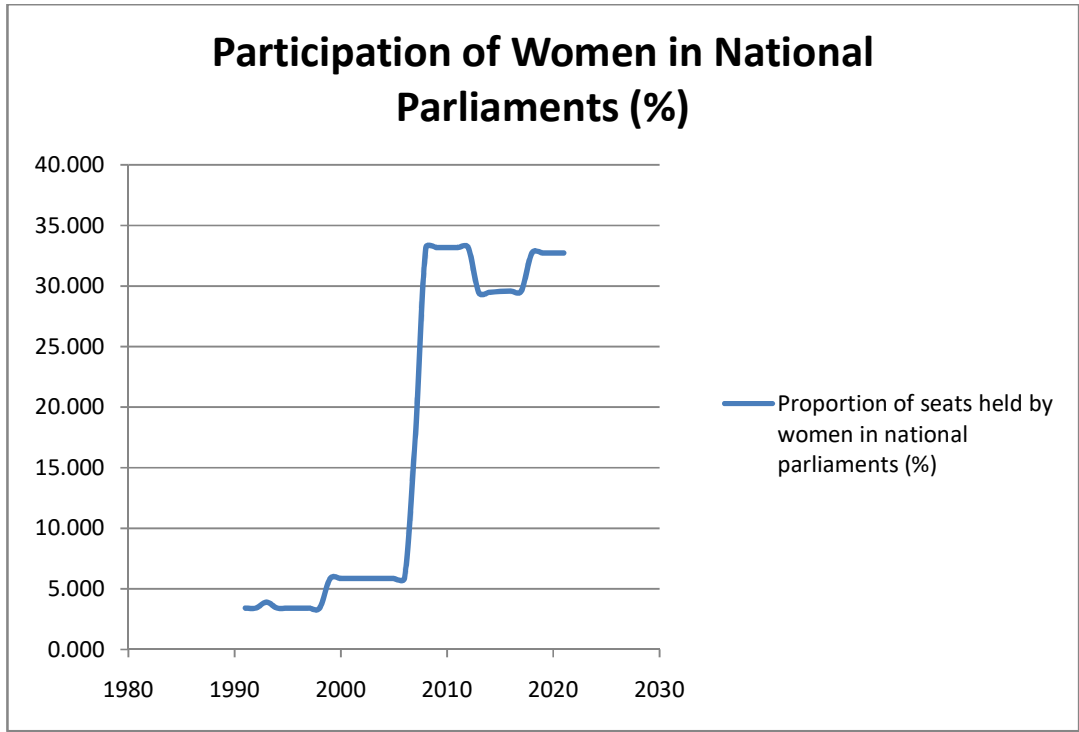
4.1.2 Female Parliamentary Participation

Female Parliamentary participation is a key indicator of monitoring progress on gender equality (Kabeer, 2005; Eastin & Prakash, 2012). As the participation of women in parliament increases, it positively influences on policy decisions that can impact on economic growth and social development. Duflo (2012) argued that women as a policy makers or decision makers will

prefer policies that address their own concerns, particularly those related to child health, education and nutrition. They tend to advocate for policies that support their legal rights, enhance their bargaining power within the household, and increase their productivity in daily work or improve their access to the labor market.

In Nepal, the female parliamentary representation was **3.9 percent** in 1991, **5.85 percent** in 2000, **29.45 percent** in 2013, and it increased to **33.09 percent** in 2022 (Bhusal, 2077; Tuladhar, 2023). This significant progress in women's representation is largely attributed to constitutional provisions of proportional representation system. However, despite this advancement their role at decision-making level remains questionable.

Figure 3



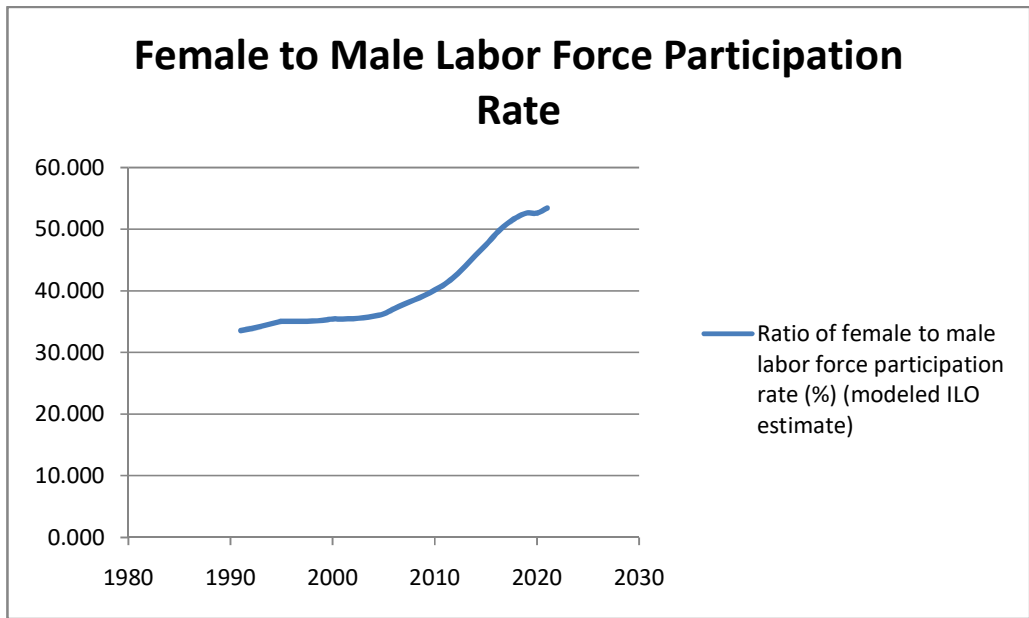
Source: World Bank, 2024b

4.1.3 Female Labor Force Participation

Female labour force participation directly reflects economic participation and access to the labor market. Blumberg (2005) argued that enhancing women’s economic empowerment comes close to being a “magic potion” that boosts both gender equality and the “wealth and well-being of nation, thereby contributing to national income growth.

Female labor force participation is a key driver of growth and therefore, participation rates reflect a country's potential for more rapid development (Veric, 2014). Therefore, female labor-force participation is critical issues in both the global and national economies and considered as vital indicator of gender equality. However, labor force participation among Nepalese women remains alarmingly low. According to Central Bureau of Statistics [CBS] (2019), the female labor force participation rate aged 15- 64 was only 26.3 percent, compared to 53.8 percent for males. In Nepal, a significant proportion of women outside the labor force are engaged in subsistence farming for household consumption and unpaid domestic work. Alaref et al. (2024), highlighted that average female participation levels in the South Asian region remain among the lowest in the world with Nepal ranking poorly in this regard.

Figure 4



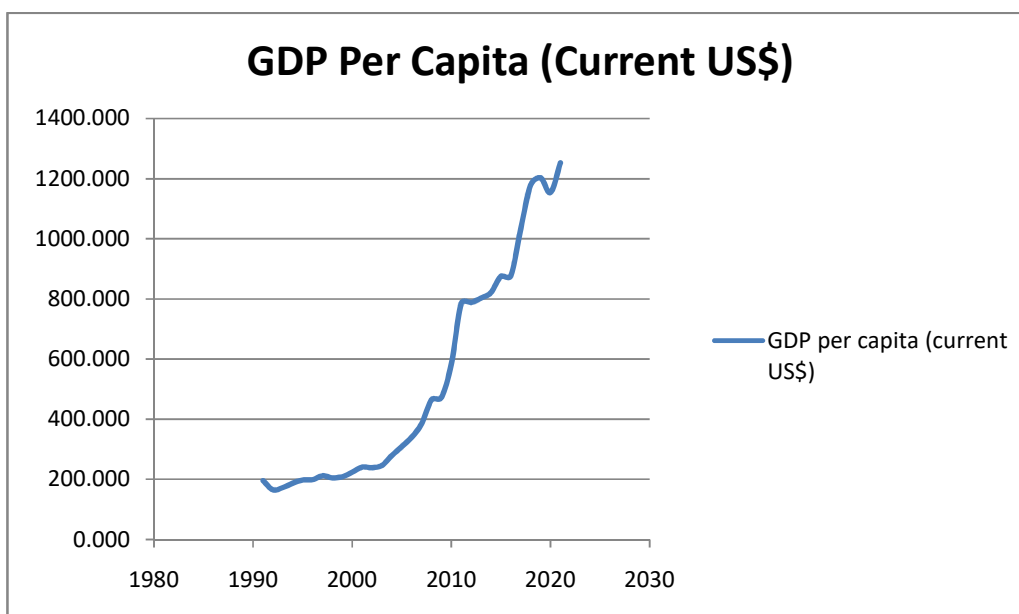
Source: World Bank, 2024c

4.1.4 Gross Domestic Product Per Capita

In this study, GDP per capita is used as a proxy for economic growth. Analyzing the trend of GDP per capita in Nepal reveals less than satisfactory performance. Nepal's economic growth has varied significantly over the year. In three years, 2002, 2016 and 2020, Nepal experienced negative growth rate indicating economic contraction due to the internal conflict and Covid-19 pandemic. The economic growth rate peaked in 2017. Over the past 31years, Nepal's GDP per capita has grown by an average 3.04 percent annually.

Figure 5

GDP Per Capita of Nepal



Source: World Bank, 2024d

4.1.5 Empirical Econometric Analysis

The econometric analysis involves the application of various statistical tests, including the Unit Root Test, Co-integration Test, Residual Test, and Error Correction Model (ECM). Specifically, we focus on the Augmented Dickey-Fuller (ADF) tests conducted for GDPPC, FSSE, FPP and FLFP over the period from 1991 to 2023. These tests aim to assess whether the data series exhibit unit roots, and the results are summarized in Table 1, which provides statistics for the Unit Root Test

Unit Root Test

The unit root test is essential for identifying whether a time series is stationary or non stationary, which directly affects the validity of econometric models. In analyzing GDPPC, this test evaluates whether variables such as GDPPC, FLFP, FPP, and FSSE exhibit long-term persistence or mean-reverting behavior, thereby ensuring accurate and dependable forecasting results.

Unit Root Test with Intercept

Table 1 summarizes the ADF test results for key economic indicators using the trend and intercept model, based on data from 1991 to 2023. This analysis assesses the stationarity of variables critical to understanding the behavior and dynamics of GDPPC.

Table 1: Summary of Unit Root Test (Intercept only)

Variables	Level Form Specification	t-stat	First Difference Specification	t-stat	Results
Log of GDPPC (Ln GDPPC)	Intercept	0.58 (0.98)	Intercept	-5.31 (0.000)	I (1)
Log of FLFP (Ln FLFP)	Intercept	1.44 (0.99)	Intercept	-7.81 (0.000)	I (1)
Log of FPP (Ln FPP)	Intercept	-0.89 (0.77)	Intercept	-3.97 (0.000)	I (1)

Log of FSSE (Ln FSSE)	Intercept	-0.20 (0.92)	Intercept	-7.21 (0.000)	I (1)
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Source: Researcher's Estimation using EViews 12

The Augmented Dickey-Fuller (ADF) test results show that all variables: Ln GDPPC, Ln FLFP, Ln FPP, and Ln FSSE are non-stationary at level but become stationary after first differencing, as indicated by their significant t-statistics at the first difference. Hence, all variables are integrated of order one, I (1), justifying the use of co-integration techniques for further analysis.

Unit Root Test with Trend and Intercept

Table 2 provides the summary statistics of the ADF tests for key economic indicators, using the trend and intercept model, with data spanning from 1991 to 2023. This analysis is crucial for assessing the stationarity of variables that are key to understanding GDP per capita (GDPPC).

Table 2: Unit Root Test with Trend and Intercept

Variables	Level Form Specification	t-stat	First Difference Specification	t-stat	Results
Log of GDPPC (Ln GDPPC)	Intercept	-2.85 (0.19)	Intercept	-5.31 (0.000)	I (1)
Log of FLFP(Ln FLFP)	Intercept	-1.47 (0.81)	Intercept	-7.81 (0.000)	I (1)
Log of FPP (Ln FPP)	Intercept	-1.46 (0.82)	Intercept	-3.97 (0.000)	I (1)
Log of FSSE (Ln FSSE)	Intercept	-3.62 (0.04)	Intercept	-7.21 (0.000)	I (1)

Source: Researcher's Estimation using EViews 12

The ADF test results show that in the level form, all variables (Log of GDPPC, Log of FLFP, Log of FPP, and Log of FSSE) have t-statistics above the critical values, indicating non stationarity. However, in the first difference form, all variables become stationary with t-statistics significant at the 1% level, suggesting they are integrated of order I (1).

4.2 Co-integration Relation

The co-integrating relationship defined as $\text{LnGDPPC} = f(\text{Ln FLFP}, \text{Ln FPP}, \text{Ln FSSE})$ explores the long-run equilibrium association between economic growth measured by the logarithm of GDP per capita and three gender-related socio-economic variables.

The regression results reveal statistically significant and positive relationships between all three independent variables and Ln GDPPC, indicating that gender inclusion and educational advancement play a critical role in fostering long-term economic development. Specifically, the log of the ratio of female to male labor force participation rate (Ln FLFP) has the highest positive coefficient, implying that increased gender parity in labor market participation significantly boosts per capita income, likely through enhanced productivity and better utilization of human capital. Likewise, the log of the proportion of seats held by women in national parliaments (Ln FPP) is also positively associated with Ln GDPPC, suggesting that higher political representation of women leads to more inclusive governance and economic policies that promote growth. Additionally, the log of female secondary school enrollment (Ln FSSE) positively affects Ln GDPPC, indicating that investment in female education not only empowers individuals but also enhances a country's economic capacity over the long run. The strength and significance of these relationships, confirmed through high R-squared values and

robust t-statistics, justify the existence of a stable long-run equilibrium, supporting the notion that gender equality in labor, politics, and education contributes meaningfully to sustained economic progress.

Table 3: Co-integrating Relation

Dependent Variable: LnGDPPC

Method: Least Squares

Sample: 1991 2023

Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LnFLFP	1.707067	0.359649	4.746483	0.0001
LnFPP	0.200650	0.043068	4.658873	0.0001
LnFSSE	0.612878	0.170794	3.588415	0.0014
C	-3.071428	0.837317	-3.668178	0.0012
R-squared	0.987325	Mean dependent var	6.128452	
Adjusted R-squared	0.985804	S.D. dependent var	0.746141	
S.E. of regression	0.088900	Akaike info criterion	-1.875172	
Sum squared resid	0.197579	Schwarz criterion	-1.686579	
Log likelihood	31.18999	Hannan-Quinn criter.	-1.816107	
F-statistic	649.1383	Durbin-Watson stat	1.272700	
Prob(F-statistic)	0.000000			

Source: Researcher's Estimation using EViews 12

Standard errors are in parenthesis. One Percent ***, Five Percent **, Ten Percent *

The regression analysis of the log-transformed GDP per capita (Ln GDPPC) against Ln FLFP, Ln FPP, and Ln FSSE over the period 1991–2023 demonstrates a statistically strong and significant co-integrating relationship, with an R-squared of 0.9873, indicating that 98.7% of the variation in GDP per capita is explained by the three gender-related variables. All explanatory variables are statistically significant at the 1% level ($p < 0.01$), suggesting a strong and positive long-run impact: a 1% increase in female labor force participation (Ln FLFP) leads to an approximate 1.71% increase in GDPPC, signifying the crucial role of gender-balanced labor inclusion in boosting productivity. Likewise, women's political representation (Ln FPP) and female secondary education enrollment (Ln FSSE) positively influence GDPPC, with coefficients of 0.20 and 0.61 respectively, implying that political empowerment and educational attainment among women contribute meaningfully to sustained economic growth. Despite the robust model fit (F-statistic = 649.13, $p = 0.000$), the Durbin-Watson statistic of 1.27 suggests mild positive autocorrelation, which may slightly bias the standard errors and calls for further diagnostic testing or model refinement.

To assess the model's suitability for further investigation, the researcher analyzed the residuals.

Unit Root Test of Residual

The unit root test of residuals is crucial in co-integration analysis because it determines whether a long-run equilibrium relationship exists among non-stationary variables. If the residuals from the regression $\text{Ln}gdp_{it} = \alpha + \beta_1 \text{Ln}flp_{it} + \beta_2 \text{Ln}fpp_{it} + \beta_3 \text{Ln}fse_{it} + \epsilon_{it}$ are stationary, it confirms that despite individual non-stationarity, the variables move together in the long run. This justifies the use of co-integration techniques, ensuring the regression is not spurious and the model is statistically reliable.

Table 4: Unit Root Test Result of Residual

Null Hypothesis: RESID01 has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=0)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.274357	0.0028
Test critical values: 1% level	-3.724070	
5% level	-2.986225	
10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Source: Researcher's Estimation using EViews 12

The estimated co-integrated relationship is shown in the table 4. It is a long run equilibrium relationship. All the variables are in natural logarithm. All the explanatory variables have expected sign. To examine the co-integrating relation residual from the above equation is obtained and is examined for unit root test. The report of the unit root test of the residual is shown in table 4. The critical values for the granger co-integration test at the 10 percent level for models with four variables are -3.97 . Since the computed t-statistic (-4.274357) is more than critical values, the equation in table 4 confirms a statistically significant co-integrating relationship. Granger's specific critical values are used to ensure accurate interpretation.

Pairwise Ganger Causality Test

Pairwise granger causality tests analyze time series data to assess whether past values of one variable improve forecast of another variable's future values, suggesting potential causal links between them.

Table 5: Pairwise Ganger Causality Test

Pairwise Granger Causality Tests

Sample: 1991 2023

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LnFLFP does not Granger Cause LnGDPPC	31	0.96513	0.3942

Source: Researcher's Estimation using EViews 12 Standard errors are in parenthesis. One Percent ***, Five Percent **, Ten Percent *	LnGDPPC does not Granger Cause LnFLFP		7.59991	0.0025**
	LnFPP does not Granger Cause LnGDPPC	31	2.46379	0.1048
	LnGDPPC does not Granger Cause LnFPP		1.08203	0.3537
	LnFSSE does not Granger Cause LnGDPPC	21	0.37958	0.6902
	LnGDPPC does not Granger Cause LnFSSE		1.19779	0.3275
	LnFPP does not Granger Cause LnFLFP	31	3.40220	0.0487**
	LnFLFP does not Granger Cause LnFPP		1.05156	0.3638
	LnFSSE does not Granger Cause LnFLFP	21	2.59041	0.1060
	LnFLFP does not Granger Cause LnFSSE		0.83686	0.4512
	LnFSSE does not Granger Cause LnFPP	21	3.64801	0.0495**
	LnFPP does not Granger Cause LnFSSE		4.20748	0.0340**

The Pairwise Granger Causality test reveals a unidirectional causality from Ln GDPPC to Ln FLFP ($F = 7.60, p = 0.0025$), indicating that changes in economic growth significantly influence female labor force participation, but not vice versa. No causal relationships were found between GDP per capita and either Ln FPP or Ln FSSE, suggesting that political representation and female secondary education do not Granger-cause short-run changes in GDPPC. However, Ln FPP Granger-causes LnFLFP ($p = 0.0487$), and there is bidirectional causality between Ln FSSE and Ln FPP ($p = 0.0495$ and 0.0340), highlighting important short-run interlinkages between women's education and political participation. These results emphasize that while GDP growth drives female labor participation, female political participation and education are closely interdependent in shaping gender-inclusive development.

4.3 Error Correction Model

The ECM is used to capture both the short-run dynamics and long-run equilibrium adjustments between target variables and GDP, showing how deviations from equilibrium in GDPPC are corrected over time.

In equation form, it is expressed as:

$$D(\text{Ln gdppc}) = c + D(\text{Ln fmlp}) + D(\text{Ln pwnp}) + D(\text{Ln sef}) + \text{ECT}(-1)$$

The Error Correction Model (ECM) for $D(\text{Ln GDPPC})$ demonstrates both short-run and long-run dynamics, with an adjusted R^2 of 0.3761, indicating that around 38% of the variations in GDP per capita growth are explained by the independent variables.

Table 6: Error Correction Model

Dependent Variable: $D(\text{LnGDPPC})$

Method: Least Squares

Sample (adjusted): 1992 2023

Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.022665	0.030232	0.749695	0.4622
D(LnFLFP)	1.508032	1.079078	1.397519	0.1776
D(LnFPP)	0.146275	0.059977	2.438874	0.0242
D(LnFSSE)	0.141145	0.298616	0.472665	0.6416
ECT(-1)	-0.676271	0.177194	-3.816561	0.0011
R-squared	0.480109	Mean dependent var		0.061026
Adjusted R-squared	0.376131	S.D. dependent var		0.091668
S.E. of regression	0.072405	Akaike info criterion		-2.236237
Sum squared resid	0.104849	Schwarz criterion		-1.992462
Log likelihood	32.95296	Hannan-Quinn criter.		-2.168624
F-statistic	4.617397	Durbin-Watson stat		1.490358
Prob(F-statistic)	0.008368			

Source: Researcher's Estimation using EViews 12

Standard errors are in parenthesis. One Percent ***, Five Percent **, Ten Percent *

The error correction term ECT (-1) is negative and statistically *significant* (coefficient = -0.6763, $p = 0.0011$), confirming a strong and stable long-run equilibrium relationship approximately 68% of the previous year's deviation from equilibrium is corrected in the current year. Among the short-run coefficients, only D(Ln FPP) is statistically significant ($p = 0.0242$), suggesting that changes in women's political representation positively influence short-term economic growth. The other variables, D(LnFLFP) and D(LnFSSE), are statistically insignificant, indicating limited short-term influence. Overall, the model is statistically sound (F-statistic = 4.617, $p = 0.0084$), highlighting a meaningful mix of short-run and long-run effects on GDP per capita.

Overall, the ECM captures short-term dynamics and GDP adjustment, highlighting variable significance and suggesting further nuanced analysis of economic factors and timing effects.

5. Conclusions and Policy Inferences

5.1 Conclusions

The primary objective of this study is to analyze the impact of gender inequality specifically in education, labor force participation and political representation on economic growth in Nepal. The study utilizes the latest available data to examine whether gender inequality hinders economic growth. It provides robust empirical evidence affirming a significant long-run relationship between economic growth and gender-related factors in Nepal, as demonstrated through co-integration

analysis. All variables; GDP per capita, female labor force participation, secondary school enrollment, and political representation were found to be integrated of order one, justifying the use of co-integration techniques. The results reveal that gender inclusion, particularly through increased female labor participation, followed by education and political representation, plays a vital role in promoting economic growth. The model predicts that a 1% increase in female labor force participation leads to a 1.71 % rise in GDP per capita. Similarly, a 1% increase in the proportion of seats held by women in national parliaments is associated with 0.20% increase in GDP per capita. Additionally, a 1% increase in female secondary school enrollment results in a 0.61 % in GDP per capita. Among these factors, the impact of female labor force participation on economic growth is the strongest and most significant. The error correction model indicates that nearly 68% of any disequilibrium adjusts annually, confirming a stable long-run relationship. Furthermore, Granger causality tests underscore GDP's influence on labor participation and reveal dynamic short-run interdependencies among the gender indicators. With a high explanatory power ($R^2 = 0.9873$) and statistically significant coefficients, the study highlights that greater gender equality is not only a matter of fairness but also a key catalyst for sustained economic development.

In light of Nepal's limited macroeconomic research focusing on gender inequality, this study fills a critical gap by offering both theoretical and empirical validation of the detrimental effects of gender disparity on economic performance. It reinforces existing literature by showing that gender inequality, especially in education, employment, and leadership - acts as a structural barrier to growth. These gender-responsive strategies are crucial for fostering inclusive growth and achieving long-term economic stability in Nepal. However, given the presence of mild autocorrelation in the data, future research should consider employing more refined econometric techniques to strengthen the reliability of results and further explore sector-specific gender dynamics within Nepal's economy. Further, as macro-level studies may not fully reflect the micro - level realities, it is essential to conduct research at the micro-level to better understand of household- level economic development and gender disparities.

5.2 Policy Inferences

The findings of the study reveal a strong and significant relationship between gender inequality particularly in female parliamentary representation, secondary school enrollment, and labor force participation and per capita GDP. This underscores the critical role of reducing gender disparities in promoting economic growth. Therefore, policy efforts in Nepal should prioritize expanding educational access for girls and women, promoting equitable labor force participation, and enhancing women's representation in political and decision-making roles. Understanding this relationship is crucial for designing effective policies that promote both inclusive economic development and gender equality.

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