

Gender Gaps In Education And Economic Growth: African Countries

الفجوة بين الجنسين في التعليم والنمو الاقتصادي في الدول الإفريقية

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This research paper examines the impact of gender gap in education on economic growth in African countries. To analyze this impact, the study utilizes panel data for African countries from 2006 to 2023, were use, employing six indicators.

The study concludes that gender gaps in education hinder the growth and development of African countries, with detrimental consequences for both men and women if left unaddressed. Strong institutions are crucial for implementing effective strategies to eliminate gender inequality in education across African countries.

Keys words: Education Inequality; Gender gap; economic growth, African countries, Panel Data Regression.

JEL classification codes: J16, O49.

ملخص:

نحاول من خلال هذه الورقة البحثية تحليل أثر الفجوة بين الجنسين في التعليم على النمو الاقتصادي في الدول الأفريقية، ولتحليل هذا التأثير، تستخدم الدراسة بيانات تحليلية لعدد من الدول الأفريقية للفترة الممتدة ما بين 2006 إلى 2023، حيث تم استخدام ستة مؤشرات. لتقدير هذا الأثر.

تخلص الدراسة إلى أن الفجوة بين الجنسين في التعليم تعيق النمو والتنمية في الدول الأفريقية، مع ما يترتب على ذلك من عواقب ضارة على كل من الرجال والنساء إذا لم يتم معالجتها. وتعتبر المؤسسات القوية ضرورية لتنفيذ استراتيجيات فعالة للقضاء على التفاوتات بين الجنسين في التعليم في جميع أنحاء الدول الأفريقية.

الكلمات المفتاحية: عدم المساواة في التعليم؛ الفجوة بين الجنسين؛ النمو الاقتصادي؛ الدول الأفريقية؛ المخاطر بيانات التباين

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1-Introduction

The right of women to education is the most important and essential right, as it empowers women to fully exercise and enjoy all their other rights and values. Education is important for women to exercise their civil and political rights, expression, voting, and holding public office. Similarly, economic, social and cultural rights, including choosing a profession, earning equal pay, benefiting from technological advancements, and pursuing higher education, are significantly enhanced through quality education.

Education or human capital is an outstanding positive effect on economic growth and development. In particular, girls' education increases human capital and growth (Schultz, 1994; Dollar and Gatti, 1999). The education of girls is doubly beneficial. As for males, an increase in female human capital directly leads to an increase in income and growth. However, there is another benefit of educating girls due to the positive effect of mothers on health and the education of their children (Schultz, 2002).

The education of women is among the most important challenges facing educational systems and institutions. Gender disparities are still large as a result of discrimination between males and females according to inherited social and cultural traditions, and therefore the lack of equal opportunities to obtain education in the first place and to continue with the advanced stages of Education.

Education is a basic tool for women's empowerment. It enhances women's contributions to both family and society, thereby fostering human development. Education empowers women to understand their rights as outlined in the Convention on Human Rights and the Convention on the Elimination of All Forms of Discrimination against Women. This includes the right to challenge gender stereotypes at all educational levels, as affirmed by other international conventions and charters.

The era following World War II witnessed a notable rise in the value placed on education. The realization of its crucial role in socioeconomic growth led to compelling reasons for increased investment in and attention to African education. (Nwomonoh, 1998; World Bank, 1995). Education was seen as a powerful tool for improving human behavior, boosting self-esteem, and encouraging independence. It also equips people to make informed choices about their health, diet, family size, hygiene, and food production and management. (Gartner, 2010; Watkins, 1999). Educating women, especially, leads to a chain of positive outcomes. These include reducing poverty,

preventing diseases, and eliminating violence and political unrest. It also helps ensure that knowledge is passed down through generations, promotes gender equality, and drives societal progress. Through this analysis, the research problematic is highlighted :

Do gender gaps in education affect economic growth in African countries ?

To address this problematic, we relied on a single hypothesis :

Gender inequality in education negatively impacts economic growth in African countries.

To validate this hypothesis, the research paper was divided into three sections. The first section explored the theoretical and empirical links between gender inequality in education and economic growth. The second section examined the factors underlying gender inequality in education, while the third presented the study model.

2-Gender Inequality in Education and Economic Growth: Theoretical Framework

The education of women is one of the most important challenges facing educational systems and institutions. Gender disparities are still large as a result of discrimination between males and females according to inherited social and cultural traditions, and therefore the lack of equal opportunities to obtain education in the first place and to continue with the advanced stages of Education.

Gender equality aims for equal economic opportunities, educational attainment, health, survival, and political empowerment. (Gender gap report ; 2017) highlighting gender disparities as a widespread issue, especially in developing countries, gender has not been widely recognized as a crucial macroeconomic variable by economists. Research on the determinants of economic growth has largely overlooked gender perspectives (Barro & Sala-i-Martin, 1991; Grossman & Helpman, 1991; Kim & Lau, 1996).

An increase in GDP per capita is associated with improvements in various measures of gender equality. As (Dollar and Gatti ;1999) argue, gender inequality in education negatively impacts economic growth. Societies that are reluctant to invest in females suffer from slower economic growth and lower incomes as a result .

Gender equality significantly impacts economic growth. Research by (Aniruddha Mitraa et al ; 2015) indicates that gender inequality in education negatively affects economic growth. Furthermore, (Mehrunisa, M. et al ;2016) found that gender inequality in higher education has a more severe negative

impact on economic growth compared to inequality at the secondary and primary levels. (Aniruddha Mitraa et al ; 2015) also emphasize that achieving gender equality can accelerate a country's economic growth rate.

According to (Ward et al ; 2010), achieving greater gender equality in developing countries can boost economic growth and performance by increasing the stock of human capital. Consequently, human capital is a primary asset driving economic, social, and overall national prosperity, (Dollar and Gatti ;1999). These authors also emphasize that educational disparities between sexes negatively impact economic growth.

Women's labor force participation significantly impacts economic growth. Research by (Oztunc, H and al ;2015), building on (Hakuna and al ; 2016), indicates that women's education is a crucial factor in increasing their labor force participation. A higher level of women's education is correlated with a higher rate of women's labor force participation. (Hakuna and al ; 2016) further argue that gender inequality often stems from disparities in opportunities, including unequal access to education and legal systems.

To achieve economic growth, a country must prioritize gender equality in education. Governments should therefore focus on educational policies that increase female enrollment, participation, and literacy rates. This will enhance women's contributions to economic growth and transformation, as research by (Dauda ;2012) and (Seguino ; 2002) indicates that factors such as women's life chances and education spending positively influence growth.

Educational inequality within a region signifies underlying problems in the existing education system. It represents an unfair denial of equal educational opportunities to all individuals, irrespective of socioeconomic status, social politics, or other factors. The high levels of educational inequality prevalent in a region hinder societal progress and educational reform, as argued by (Zalukhu and Collyn ; 2021). Conversely, providing equitable education across all regions, regardless of socioeconomic background, gender, or race, can positively impact overall well-being.

Modernization theory posited education as a catalyst for social change. In Africa, it was believed that education could facilitate a development trajectory mirroring that of Western European nations. Generally, development economists have supported the positive correlation between investment in education and economic returns for both individuals and countries. While the value of education in building a human resource base to promote modernization and industry is widely acknowledged, educational economists have also recognized

that during periods of fiscal austerity, public education investment should prioritize strata and sectors offering the highest potential economic returns (EdithMukudi ;2002).

(Ombati, V., and Ombati, M ;2012) They contend that gender inequality in education within sub-Saharan Africa results in disparate access to education for boys and girls. Factors like gender, location, socioeconomic status, and regional variations contribute to this inequality, leading to disproportionately high illiteracy rates among girls and women

The study finds that gender inequality in education is largely driven by factors like political turmoil, conflict, poverty, economic hardships, harmful cultural beliefs, female genital mutilation, child marriage, and sexual harassment. These issues are further compounded by ineffective teaching, a shortage of gender-sensitive educators and learning resources, inadequate learning environments, and the effects of HIV/AIDS.

As affirmed by (Ombati, V., and Ombati, M. ; 2012), gender inequality in education impedes the growth of individuals, the development of countries and societies, and harms both men and women if not addressed from the outset.

3- Methodology and Model

The study aims to measure the impact of gender differences in education on the economic growth of a group of African countries for the period between 2006-2023, where the study relied on the use of time series models (Data Panel) because of the increase in the accuracy of prediction, as it takes into account the impact of time change and the impact of the change of difference between countries.

Table(1): StudyVariables

SERIES SYMBOL	SERIES NAME	SERIES SOURCES
GDP	GDP per capita	Database of the World Bank
ETE	Enrolment in tertiary education (Female-to-male ratio)	World economic forum
ESE	Enrolment in secondary education (Female-to-male ratio)	World economic forum
EPE	Enrolment in primary education (Female-to-male ratio)	World economic forum

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LR	Literacy rate	World economic forum
SRB	Sex ratio at birth (female/male)	World economic forum

Source: prepared by researchers based on the database of the World Bank and the World Economic Forum

This study employs a pooled cross-sectional time series (panel data) dataset for its quantitative analysis. The dataset comprises $n = 21$ cross-sectional units, representing 21 African countries. Each cross-sectional unit contains a time series of $t = 18$ periods, covering the annual period from 2006 to 2023. Consequently, the total number of observations used in the analysis is $(n \times t) = 378$. Based on the sample used in the analysis, the growth function is formulated as follows :

$$(1) GDP_{it} = \alpha_i + ETE_{it} + ESE_{it} + EPE_{it} + LR_{it} + SRB_{it} + \varepsilon_{it}$$

3.1 Descriptive Statistics Of Study Variables:

Table(2): Descriptive Statistics

	GDP	EPE	ESE	ETE	LR	SRB
Mean	1983.618	0.946146	3.472598	0.667479	5.079669	3.436571
Median	1429.895	0.990000	0.920000	0.685000	0.781500	0.940000
Maximum	8737.041	1.000000	983.0000	1.000000	818.0000	944.0000
Minimum	191.7513	0.664000	0.081000	0.140000	0.310000	0.920000
Std. Dev.	1635.421	0.079213	50.51534	0.233506	59.36706	48.50568

Source: prepared by researchers based on the Eviews13

From the descriptive statistics of the dependent variables, we observe The average growth rate of GDP index is positive at 1983.618, with a maximum value of 8737.041 and a minimum of 191.7513. The standard deviation is 1635.421, The average primary school enrollment rate is also positive at 0.946146, with a maximum of 1.000000 and a minimum of 0.664000. The standard deviation is 0.079213 , The average secondary school enrollment rate is positive at 3.472598, with a maximum of 983.0000 and a minimum of 0.081000. The standard deviation is 50.51534, The average tertiary education enrollment rate is positive at 0.667479, with a maximum of 1.000000 and a minimum of 0.140000. The standard deviation is 0.233506, The average literacy rate is positive at 5.079669, with a maximum of 818.0000 and a minimum of 0.310000. The standard deviation is 59.36706 , The average sex ratio at birth (female-

male) is positive at 3.436571, with a maximum of 944.0000 and a minimum of 0.920000. The standard deviation is 48.50568 .

3.2 Stationarity Testing of Study Variables

To estimate panel data models, the adopted methodology necessitates an initial examination of the stationarity of both the time series and cross-sectional dimensions of the model's variables. If these series are non-stationary, their inclusion in the estimation process can lead to misleading and potentially spurious results. To address this, we conducted stationarity tests on the time series using four primary tests : Levin, Lin, and Chu (LLC), Pesaran and Shin (LPS), Augmented Dickey Fuller (ADF), and Phillips-Perron (PP). The stationarity of the time series was tested at both the level and level with trend. The results of these tests are presented in Table 3.

Table(3): Stationarity Testing of Study Variables

	LLC	LPS	ADF	PP	LLC	LPS	ADF	PP
	Constant only				Constant and trend			
At the level								
GDP	-3.48141	-2.59164	65.1763	78.8048	-3.99298	-2.54109	63.3750	87.9238
	(0.0002)	(0.0048)	(0.0125)	(0.0005)	(0.0000)	(0.0055)	(0.0181)	(0.0000)
EPE	-4.45631	-3.41198	66.9124	98.4200	-3.69579	-2.77641	62.2972	82.1208
	(0.0000)	(0.0003)	(0.0003)	(0.0000)	(0.0001)	(0.0027)	(0.0077)	(0.0000)
ESE	-1.24381	-0.20943	38.4797	65.4702	-1.08202	-0.21013	40.1708	79.2978
	(0.1068)	(0.4171)	(0.4478)	(0.0037)	(0.1396)	(0.4168)	(0.4627)	(0.0002)
ETÉ	-5.21253	-2.34273	89.5066	70.1344	-7.23421	-3.45718	73.2712	82.1342
	(0.0000)	(0.0096)	(0.0000)	(0.0012)	(0.0000)	(0.0003)	(0.0005)	(0.0000)
LR	-4.22539	-2.72463	66.2012	68.9012	-6.90981	-4.23150	90.1765	103.493
	(0.0000)	(0.0032)	(0.0100)	(0.0055)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
SRB	-0.13282	1.22552	30.6390	44.2474	-0.28719	-0.78912	42.7963	69.3429
	(0.4472)	(0.8898)	(0.9030)	(0.3770)	(0.3870)	(0.2150)	(0.4368)	(0.0050)

At the first difference								
ESE	-8.05863 (0.0000)	-8.13739 (0.0000)	136.562 (0.0000)	1174.61 (0.0000)	-6.22851 (0.0000)	-5.36211 (0.0000)	94.9339 (0.0000)	233.831 (0.0000)
SRB	-3.32210 (0.0004)	-6.18250 (0.0000)	62.0646 (0.0000)	374.353 (0.0000)	-6.13398 (0.0000)	-4.89043 (0.0000)	95.5381 (0.0000)	219.115 (0.0000)

Source: prepared by researchers based on the Eviews13

Table (4): Order Of Integration Of Time Series

Variables	GDP	EPE	ETE	LR	ESE	SRB
Degree of integration	I(0)	I(0)	I(0)	I(0)	I(1)	I(1)

Source: prepared by researchers based on the Eviews13

All variables are stable at the level, represented by the growth rate of GDP, primary school enrollment rate, higher education enrollment rate, and literacy rate, except for the secondary school enrollment rate and the sex ratio at birth (female-male) which are stable at the first difference.

3.3 Cointegration

After ensuring the stationarity of the time series variables and that they are integrated of the same order, a test will be conducted to determine whether or not there is a long-run equilibrium relationship between these variables. This will be done using cointegration tests. In panel data models, these tests differ from their counterparts in ordinary time series. Several tests exist, including the Pedroni test and the Kao test, which was used in our study.

Table (5): co-integration test for Kao

	t-Statistic	Prob.
ADF	-3.928240	0.0000
Residual variance	106518.3	
HAC variance	86571.41	

Source: prepared by researchers based on the Eviews13

From the table, we observe that the p-value is less than 0.05, therefore, we reject the null hypothesis and accept the alternative hypothesis. This implies that there is a significant joint integration among the study variables, confirming the

existence of a long-term equilibrium relationship between the independent and dependent variables.

3.4 Stimulation Of Cross-Sectional Time Series Models

Table(6): Regression Equation Test Results (Pooled Model)

Variable	Coefficien			
	t	Std. Error	t-Statistic	Prob.
C	5942.533	883.3516	6.727257	0.0000
ETE	3659.818	339.6747	10.77448	0.0000
ESE	-1.858486	1.447928	-1.283549	0.2001
EPE	-6759.388	991.9265	-6.814404	0.0000
LR	1.371908	1.235432	1.110468	0.2675
SRB_	-2.012548	1.507683	-1.334862	0.1827
R-squared	0.260354	Mean dependent var	1983.618	
Adjusted R-squared	0.250413	S.D. dependent var	1635.421	
S.E. of regression	1415.926	Akaike info criterion	17.36470	
Sum squared resid	7.46E+08	Schwarz criterion	17.42716	
Log likelihood	-3275.929	Hannan-Quinn criter.	17.38949	
F-statistic	26.18869	Durbin-Watson stat	0.189851	
Prob(F-statistic)	0.000000			

Source: preparedby researchersbasedon the Eviews13

From the table above, it can be observed that the overall model is statistically significant based on the Fisher (F) test. The calculated F-statistic is greater than the critical F-value ($F_{calc} > F_{tab}$), and the p-value is less than the 5% significance level, with a value of 26.18869 and a p-value of 0.000000.

In terms of the model's explanatory power, the R-squared value was 26.03% for the full model and the adjusted R-squared was 25.04%.

Examining the coefficients, which determine the impact of independent variables on the dependent variable, and the associated probabilities, it is evident that several variables have a statistically significant effect on economic growth. Specifically, variables with a probability less than 0.05 were considered significant. These include:

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Higher education enrollment rate had a positive coefficient, indicating a positive impact on economic growth, Primary education enrollment rate had a negative coefficient, suggesting a negative impact on economic growth , Sex ratio at birth (female-male) This variable also had a significant effect on economic growth at the 10% significance level (probability less than 0.10), with a negative coefficient, indicating an inverse relationship, The remaining independent variables were not statistically significant.

Table (7): Fixed Effects Regression Results

Variable	Coefficient			
	t	Std. Error	t-Statistic	Prob.
C	-1372.722	667.6631	-2.056010	0.0406
EPE	3091.276	669.7415	4.615626	0.0000
ESE	0.077572	0.431693	0.179693	0.8575
ETE	648.6543	222.1462	2.919944	0.0037
LR	-0.445990	0.377571	-1.181207	0.2384
SRB_	0.167609	0.449576	0.372816	0.7095
Effects Specification				
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
R-squared	0.946559	Mean dependent var	1983.618	
Adjusted R-squared	0.939859	S.D. dependent var	1635.421	
S.E. of regression	401.0659	Akaike info criterion	14.93288	
Sum squared resid	53886030	Schwarz criterion	15.38050	
Log likelihood	-2779.314	Hannan-Quinn criter.	15.11053	
F-statistic	141.2757	Durbin-Watson stat	0.670851	
Prob(F-statistic)	0.000000			

Source: prepared by researchers based on the Eviews 13

Overall, the model is statistically significant, as indicated by a Fisher probability of less than 5%. The F-statistic is 141.2757 with a p-value of 0.000000. The model's explanatory power is demonstrated by an R-squared of 94% and an adjusted R-squared of 93%.

Examining the coefficients, we can determine the impact of independent variables on the dependent variable. The probability (Prob) indicates whether a variable is statistically significant if it is less than the significance level of 5%. Variables found to have a significant impact on economic growth, with a probability less than 0.05, include the higher education enrollment rate and primary education enrollment rate. Both of these variables have a positive coefficient, indicating a positive impact. The remaining independent variables were not statistically significant.

Comparing Pooled, Fixed Effects, and Random Effects Models :

To compare the pooled model with the fixed effects model, we conducted a F-test as shown in the following table:

Table (8): F-test Results

Effects Test	Statistic	d.f.	Prob.
Cross-section F	209.377818	(20,335)	0.0000
Cross-section Chi-square	983.821411	20	0.0000
Period F	5.252550	(17,335)	0.0000
Period Chi-square	89.319338	17	0.0000
Cross-Section/Period F	116.257521	(37,335)	0.0000
Cross-Section/Period Chi-square	993.229255	37	0.0000

Source: prepared by researchers based on the Eviews13

Given the p-values of 0.007 for the Cross-section F and 0.00 for the Cross-section Chi-square, which are both less than 0.05, we can reject the null hypothesis that the pooled model is the best and proceed to compare the fixed and random effects models."

Table (9): Random Effects Regression Model Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2108.535	724.9709	-2.908441	0.0039
EPE	3600.397	694.4144	5.184797	0.0000
ESE	0.069336	0.462144	0.150031	0.8808
ETE	1030.141	204.3592	5.040837	0.0000
LR	-0.430006	0.404023	-1.064312	0.2879
SRB	-0.000327	0.481223	-0.000679	0.9995
Effects Specification				
			S.D.	Rho

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Cross-section random	1244.612	0.8888	
Idiosyncratic random	440.3292	0.1112	
Weighted Statistics			
R-squared	0.120706	Mean dependent var	164.8392
Adjusted R-squared	0.108887	S.D. dependent var	475.0772
S.E. of regression	448.4670	Sum squared resid	74817639
F-statistic	10.21329	Durbin-Watson stat	0.635538
Prob(F-statistic)	0.000000		
Unweighted Statistics			
R-squared	-0.004263	Mean dependent var	1983.618
Sum squared resid	1.01E+09	Durbin-Watson stat	0.046957

Source: prepared by researchers based on the Eviews13

The model is statistically significant with a Fisher probability less than the 5% significance level. The F-statistic is 10.21329 and the p-value is 0.000000. The model's explanatory power is indicated by an R-squared of 12% and an adjusted R-squared of 10%. Examining the coefficients, we observe that the variables with a probability less than 0.05 are statistically significant and have a significant impact on economic growth. These variables include the higher education enrollment rate and primary education enrollment rate, both with positive coefficients, indicating a positive impact. Other independent variables were not statistically significant.

Table (10) : presents the Hausman test results

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	18.684221	5	0.0022

Source: prepared by researchers based on the Eviews13

The fact that the probability of the Hausman test is less than 0.05 indicates that the fixed effects model is more suitable for this study. Consequently, we will rely on its results for analysis and interpretation.

Analysis of the study results :

The findings of this study show that as the gender gap in education decreases across all three levels, economic growth rates increase. The optimal model for

our study, the fixed effects model, reveals a positive relationship between higher education enrollment rates and economic growth, as well as between primary and secondary education enrollment rates and economic growth. These results align with previous studies by (Dollar and Gatti ;1999), (Aniruddha Mitraa et al ; 2015), and (Mehrunisa et al ;2016). The gender gap in education is considered a significant challenge for many African countries. This gap, manifested in the disparity of educational opportunities between females and males, has profound implications for economic growth and development

4- Conclusion:

Education is a cornerstone of sustainable development and should be universally accessible, free from geographical and socioeconomic barriers. However, educational inequality remains a pressing challenge, particularly in Africa where gender disparities have led to disproportionately high illiteracy rates among girls and women. To examine this issue, panel data from 2006 to 2023 for African countries was utilized

The study concluded that gender inequality in education impede the growth and development of nations, negatively impacting both men and women. This is attributed to African men's perceptions of women, deeply rooted in historical, cultural, and traditional norms that have perpetuated the notion of women as solely domestic figures and subservient to men. As products of this discriminatory culture, African men contribute to the persistent gender gap prevalent in African countries, as reflected in their consistently low rankings in the Global Gender Gap Report. Issued annually by the World Economic Forum since 2006, the report assesses gender disparities across economic participation, educational attainment, health, and political empowerment. Each category comprises sub-indicators such as literacy, primary enrollment, and highest educational level. A score of 1.0 represents gender parity, while 0.0 indicates maximum inequality. For example, Nigeria, Africa's largest economy, grapples with a significant gender gap in education. Despite advancements, challenges such as customs, traditions, early marriage, and domestic responsibilities persist in countries including Benin, Burkina Faso, Mali, Ethiopia, Kenya, and the Democratic Republic of the Congo.

Several countries have advanced gender equality by constitutionally enshrining the right to education without discrimination based on sex. This includes Comoros, Libya, Tunisia, Algeria, Sudan, Somalia, Egypt, and Morocco. Conversely, Djibouti and Mauritania have yet to ratify the Convention against Discrimination in Education, and their constitutions and laws do not explicitly guarantee the right to education for all girls and women

Women in the region are twice as likely as men to be illiterate, constituting two-thirds of the adult illiterate population. To bridge this gender gap and achieve gender equality in education, governments must implement sustainable policies promoting education for all, with a particular emphasis on girls. Civil society can also be instrumental in shifting societal attitudes towards women's education. Collaborations between governments, international organizations, and the private sector are crucial for successful efforts to combat the gender disparity. Moreover, it is imperative to tailor strategies to local conditions, ensuring that initiatives to narrow the gender gap are adapted to the specific circumstances of each country.

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