ORIGINAL RESEARCH ARTICLE

Gender disparity in access to education, under-5 mortality, and economic growth in sub-Saharan Africa

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Abstract

This paper empirically analyses the impact of gender disparity in access to education and under 5 mortality on economic growth in selected sub-Saharan African (SSA) countries from the period 2005 – 2020. The study engaged a panel data of 17 selected SSA countries sourced from the World Development Indicators (WDI) and the United Nations Institute for Statistics (UNIS) and applied the instrumental variable generalised method of moments analytical approach. The result shows that the interaction between gender parity in access to education and primary school enrolment has a significant impact on economic growth. The study concludes that policies to promote gender parity in access to education would be of paramount importance to increase economic growth towards the actualisation of sustainable development goal related to inclusive and equitable quality education and the promotion of lifelong learning opportunities (SDG4) in SSA countries. *(Afr J Reprod Health 2023; 27 [12]: 27-35).*

Résumé

Cet article analyse empiriquement l'impact de la disparité entre les sexes dans l'accès à l'éducation et la mortalité des moins de 5 ans sur la croissance économique dans certains pays d'Afrique subsaharienne (ASS) de la période 2005 à 2020. L'étude a porté sur des données de panel de 17 pays sélectionnés d'ASS provenant de les indicateurs de développement dans le monde (WDI) et l'Institut de statistique des Nations Unies (UNIS) et ont appliqué l'approche analytique des moments à variables instrumentales généralisées. Le résultat montre que l'interaction entre la parité entre les sexes dans l'accès à l'éducation et la scolarisation primaire a un impact significatif sur la croissance économique. L'étude conclut que les politiques visant à promouvoir la parité entre les sexes dans l'accès à l'éducation seraient d'une importance primordiale pour accroître la croissance économique vers la réalisation des objectifs de développement durable liés à une éducation de qualité inclusive et équitable et à la promotion des opportunités d'apprentissage tout au long de la vie (ODD4) dans les pays d'ASS. *(Afr J Reprod Health 2023; 27 [12]: 27-35).*

Introduction

Gender disparities in access to education, under-5 mortality and economic growth are longstanding challenges that persist in sub-Saharan Africa (SSA). The region encompasses 48 countries and is home to diverse cultures, languages, and socio-economic conditions. While progress has been made in various areas, significant gender gaps continue to impede the overall development and well-being of girls and women.

Enrolment in educational institutions, among other things, is one of the important factors that lead to the economic progress of a country[1-3]. Through education, knowledge is diffused and transmitted in a way that makes the understanding of information and processes a lot easier, thereby leading to successful implementation of new technologies devised by others, which in turn brings about growth[4-6]. Countries in SSA that are particular about economic growth in the long run, are likely to be those that focus on improved levels of primary and secondary school enrolments and improved quality of education[7].

According to Kapur[8] gender inequality is a global problem which is prevalent in institutions of

education and stated that, compared to their male counterparts, girls are not given the same opportunities, especially with respect to participatory opportunities. Gender is a pertinent issue in education in SSA countries as boys are given priority with respect to emerging educational opportunities[9]. Gender inequality in the educational sphere is considered a drawback towards progress in systems of education and poses a threat to the actualisation of the SDG4 (equitable access to education).

The Dakar Framework of Education is one of the most relevant frameworks for education till date. It is an international commitment focused on promoting education for all individuals. As stated by Ozturk[10] educating women and girls is one of the greatest investments that can effectively impact a developing country. It is noted that it brings several positive spill-over effects for families, some of which include: better nutrition and health of family members, reduced mortality rates of infants, advanced attainment of education of women and increased use of birth spacing. There are several factors which contribute to the limited educational access in SSA. Some of these include: early marriage or/and pregnancy, poor quality of teaching, practice of child labour, high private costs of education, and parental attitudes[11].

There is existing literature on gender related issues which provide information on ways in which educational gender inequality may act as a hindrance to growth of national economy[13,14,15]. When it comes to educational gender inequality and growth/development, most studies imply that educational gender imbalances, diminishes the average amount of human capital, which contributes to downward trends in terms of economic performance[16].

Santos and Klasen[17] emphasised that in the process of assessing the importance of gender inequality in relation to economic growth, the difference between intrinsic and instrumental concerns has to be considered. The study suggests that emphasis should be placed on the capability theory enunciated by Amartya Sen[18] which states that if concerns are with total wellbeing, we need to view the incremental capabilities of education and longevity as crucial elements which contribute to overall wellbeing. Hill and King[19] stressed the fact that educating women does not only enhance the growth and productivity of the labour market, but educating women has so many positive impacts on social wellbeing, which are not always assessed by the market.

In SSA, progress has been made towards closing gender gaps with respect to school enrolment over the last three decades. However, several SSA countries still have significant gender gaps in the enrolment of females[20,15,6]. It is in the light of the above, that this study was conducted to focus on gender disparities that are faced with respect to educational access and its effects on economic growth in the selected SSA countries. Therefore, the specific objective of this study is to examine impact of gender disparities in access to education on economic growth, and infant mortality rate on economic growth in 17 SSA.

Empirical literature

A study on educational gender inequality in SSA was undertaken by Baten, Kempter, De Haas and Zu Selhausen[9] who found that it was evident that when compared to most developing countries in the 20th Century, SSA countries had made limited improvements with respect to closing the gender gaps prevalent in educations. In a similar study, Thevenon and De Pero[21] reported that increased educational attainment of women shifts the steady state of economic growth upwards. The study finds that for each additional schooling year, output increases by 10% per annum. In total, the estimated results indicate that an increase in years of education increased the GDP per capita by slightly more than 60%.

A cross-country study was conducted by Knowles, Lorgelly and Owen[13] to determine how gender disparity in education affects economic growth. Male and female education were evaluated as separate factors in the study which used a neoclassical growth model. The results of the study showed a positive and significant effect of female education on labour productivity. In contrast, the role of male education on economic productivity was less unclear. The findings from this study suggest that gender gap in education hinders economic development. Dollar and Gatti[22] examined the differences between the wellbeing of women in developing and developed world and showed that gender inequality in education is detrimental to economic growth.

Assoumou[14] investigated how gender inequality in education influences per capita gross

domestic product in Economic and Monetary Community of Central Africa (CEMAC) countries. The study was undertaken was to understand how gender inequality in education could have direct or indirect impact on per capita GDP of the countries. The Generalised Method of Moments estimator from Blundell and Bond was used in the study, which concluded that improving the gender equality index at all levels of education will increase per capita GDP. The study therefore recommended that CEMAC countries should engage in the implementation of policies that diminish educational gender inequalities in order to promote sustainable economic growth.

Ezeh[16] investigated the impact of gender inequality on economic growth in SSA. The study used the gender difference between male and female elementary education, as well as the gap between male and female secondary education as indicators of gender inequality and found that a statistically significant relationship exists between the two core variables, at both the primary and secondary level, with both impacting economic growth. Akinbi and Akinbi[23] carried out a similar study on gender disparities in the process of attaining formal education, and concluded that they have implications for economic development. The study established through the use of substantive data that basic enrolment into formal education is still in the favour of males.

Dube[20] conducted an in-depth literature review on gender disparities in with respect to educational enrolment and attainment using an in-depth literature review on gender gaps in educational attainment and enrolment in SSA and reported that there are several social factors which contribute to the disparities, some of which include cultural and economic factors. The study found that the main driver of poor educational attainment and enrolment amongst girls is rooted in economic issues.

Moheyuddin[24] looked at how gender disparities in education affect income, economic growth, and development. Using a descriptive approach, the study found that gender inequality in education is an endogenous variable that can be partly understood by geographic factors, civil liberties, and religious preferences. Somani[25] examined the importance of educating the girl child and how this is important for the overall development of the society. The study established that educating the girl-child is important for development, and provided some strategies on ways to reduce gender gaps in education. The proposed strategies included mentorship programs, community service initiatives, and community engagement.

Methods

Data and model specification

This study used a panel data for selected 17 SSA countries, which include Burkina Faso, Burundi, Cape Verde, Chad, Eritrea, Eswatini, Ghana, Madagascar, Mali, Mauritian, Mauritius, Mozambique, Niger, Nigeria, Rwanda, South Africa, and Tanzania, selected based on data availability. The data was sourced from the World Bank World Development Indicators (WDI) and the United Nations Institute for Statistics (UNIS) for the period 2005 to 2020. The WDI is a database compiled by the World Bank that provides a comprehensive overview of global development trends. WDI is a database compiled by the World Bank that provides a comprehensive overview of global development trends. The database includes hundreds of indicators related to economic growth, poverty reduction, and environmental sustainability, among others. Variables such as gross domestic product per capita, labour force participation, primary school enrolment, gross fixed capital formation and inflation were sourced from the WDI, while gender disparity indicator was obtained from UNIS. The Solow Model was used as the foundation for the study, but it was upgraded to account for human capital and health spending per capita. The baseline model in a double-log form is given in equation (1)

$$lnGDP_{it} = \alpha_0 + \alpha_1 lnGD_{it} + \alpha_2 lnPRI_{it} + \alpha_3 lnUFM_{it} + \alpha_4 lnLAB_{it} + \alpha_5 lnGFCF_{it} + e \quad (1)$$

Where GDP means gross domestic product, LAB means labour force participation rate, GD is gender disparity measures by gender parity index, PRI is primary school enrolment (measure of education), $GFCF$ is gross fixed capital formation, UFM is under-5 mortality. The interaction model is presented in equation (2)

$$lnGDP_{it} = \alpha_0 + \alpha_1 lnGD_{it} + \alpha_2 lnUFM_{it} + \alpha_3 (lnGD_{it} * lnPRI_{it}) + \alpha_4 lnPRI_{it} + \alpha_5 lnLAB_{it} + \alpha_6 lnGFCF_{it} + (2)$$

Table 1: Variables, sources and measurements

Identifier	Variable	Description	Source	Measurement
GDPC	Gross domestic product	Sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.	WDI	Constant Local currency
GD	Gender disparity	Gender parity index for gross enrolment ratio in primary and secondary education is the ratio of girls to boys enrolled at primary and secondary levels in public and private schools.	UNIS	Gender Parity Index
LAB	Labour force participation	Labour force participation rate is the proportion of the population ages 15 and older that is economically: all people who supply labour for the production of goods and services during a specified period.	WDI	Percentage (%) of labour force
PRI	Primary school enrolment	The ratio of total enrolment into primary school regardless of age	WDI	Percentage (%)
GFCF	Gross Fixed Capital Formation	Gross fixed capital formation includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchase; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings.	WDI	Current US dollars (billions)
UFM	Under 5 mortality	Mortality rate, under-5 (per 1000 live births).	WDI	per 1000 live births

Note: UNIS means United Nations Institute for Statistics, and WDI means world development indicators. Variables are in their logarithm form
Sources: Own compilation

In equation (2), where variables are as defined, $(lnGD_{it} * lnPRI_{it})$ captures the interaction of gender disparity and education measured as primary school enrolment. The variables used are presented in Table 1.

Estimation technique

To control for endogeneity, the study engaged the instrumental variable (IV) generalized method of moments (GMM). This method involves specifying a set of moment conditions that are based on economic theory. These moment conditions are then used to construct a set of equations that relate the parameters of interest to the observed data. The method estimates the parameters by minimising the difference between the observed moments and the predicted moments based on the model. One of the rationales for the use of GMM is that it can be used to estimate parameters in models where the assumptions of traditional methods, such as ordinary least squares (OLS), are violated. For example, if the errors in a model are not normally distributed or if there is

endogeneity or measurement error, GMM can still provide consistent estimates.

By using this estimate technique, it is feasible to reduce the endogeneity bias of some independent variables and regulate the individual and temporal impacts of a model. This method of analysis has also made it possible to identify the crucial relationships that exist among variables over time. Additionally, it has the capacity to keep track of any potential unobservable impact. Thus, the GMM model is given in equation (2)

$$lnY_{it} = \alpha_0 + \alpha_1 lnY_{it-1} + \alpha_2 Xln_{it} + \mu_{it} \ (2)$$

Where: Y_{it} represents the dependent variables in country i and time t; α_0 represents intercept; Y_{it-1} is the first lag of the dependent variable; X_{it} is the vector of the independent variables, and μ_{it} is the error term.

Ethical considerations

Not applicable, as the study made use of no human or animal subject.

Results

Summary statistics and correlation analysis

Table 2 shows the summary statistics of all the variables included in this study. The statistical analysis of both dependent and independent variables: Gross DomesticProduct (GDP), Gender Parity (GPD), Primary School Enrolment (PRI), Gross fixed capital formation (GFCF) and Labour force participationrate (LABF). Data on the mean, median, standard deviation, minimum value, maximum value, variance, skewness and kurtosis are reported.

Table 2: Summary statistics

Description	GDP	GD	PRI	UFM	GFCF	LAB
Mean	1.16e+13	0.9239585	102.5205	80.98078	22.58773	69.35322
Median	3.60e+12	0.95864	102.705	78	20.49591	71.06
Minimum	2.75e+10	0.61297	48.35649	14.5	8.984054	45.26
Maximum	1.20e+14	1.06043	149.3075	170.2	46.73224	89.05
Std.	2.33e+13	0.1093	22.00954	39.04593	8.146363	12.5791
Variance	5.44e+26	0.0119465	484.4199	1524.585	66.36322	158.2347
Kurtosis	9.328519	2.978758	2.799873	2.229383	3.023293	1.8673
Skewness	2.64325	-0.9588044	.2017048	0.170577	0.814902	-0.2.5584

Source: Authors compilation

Table 3: Correlation matrix

Variables	GD	PRI	UFM	GFCF	LAB
GD	1.000				
PRI	0.5688	1.000			
UFM	-0.7316	-0.4530	1.000		
GFCF	0.1417	-0.1038	-0.0891	1.000	
LAB	-0.2565	0.1814	0.1063	-0.0217	1.000

Source: Authors

The result shows that the average per capita GDP for the selected 17 SSA countries is 1.16e+13 less than the median of 3.60e+12 with a minimum of 1.20e+14 and a maximum of 1.20e+14. The distribution is positively skewed evidenced by skewness at 2.64325 with kurtosis at 9.328519. It can be concluded that the distribution is peaked and heavy-tailed and has the presence of outliers (Leptokurtic). The standard deviation and variance are at 2.33e+13 and 5.44e+26, respectively. For Gender Parity Index, the observed mean is 0.9239585which is more than the median of 0.95864. The minimum value reported is 0.61297, while the maximum value is 1.06043. The distribution is negatively skewed evidenced by skewness -0.9588044. With the kurtosis at 2.978758, thus, it is concluded on the presence of outliers and that most of the numbers are located in the tails rather than around the mean. The distribution is therefore peaked and heavy-tailed (Leptokurtic). The standard deviation and variance are at 0.1093 and 0.0119465 respectively.

The mean value for primary school enrolment is 102.5205 from 245 observations while the median is 102.705. The minimum and maximum values are 48.3565 and 149.3075 respectively. The distribution for this variable is positively skewed with skewness of 0.2017, the kurtosis is 2.7998, and the standard deviation and variance are 22.00954 and 484.4199 respectively.

The mean value for under 5 mortality is 80.98078, while the median is 78. The minimum and maximum values are 14.5 and 170.2 respectively. The distribution for this variable is positively skewed with skewness of 0.1705, the kurtosis is 2.2293. The standard deviation and variance are 39.04593and 1524.585. The mean value for Gross fixed capital formation is 22.5877, while the median is 20.49591. The minimum and maximum values are 8.9840 and 46.73224

Table 4: Results of the IV GMM estimation technique

Dependent Variable	GDPL	IV-GMM
lnY_{it-1}		0.5120***
		(0.000)
Gender disparity	6.106***	3.59632
	(0.000)	(0.012)
Primary school enrolment	-2.282***	-4.1921
	(0.003)	(0.081)
Under-5 mortality	-1.554***	1.61735
	(0.000)	(0.000)
Prim sch. enrolment and gender disparity interaction		0.0393
		(0.59)
Gross fixed capital formation	0.840**	0.2221
	(0.026)	(0.646)
Labour force	5.075***	2.3319
	(0.000)	(0.006)
Constant	8.518***	
	(0.0052)	
Observations/groups	210	160/15
R-Squared	0.36	
Sargan Test		0.4229
F-Stat	21.08	63.33
	(0.000)	0.0000
Hausman (prob)	0.0044	

Source: Authors
Note: ***, ** and * implies that the p value is significant at 1%, 5% and 10% respectively

respectively. The distribution for this variable is positively skewed with skewness of 0.81490, the kurtosis is 3.023293. The standard deviation and variance are 8.146363 and 66.36322 respectively. The mean value for labour force participation rate is 69.35322 from 255 observations while the median is 71.06. The minimum and maximum values are 45.26and 89.05 respectively. The distribution for this variable is negatively skewed with skewness of -0.2558426, the kurtosis is 1.867382. The standard deviation and variance are 12.57914 and 158.2347 respectively. To test for the tendency of multicollinearity amongst the variables, the study engaged the correlation analysis presented in Table 3. From the result presented in Table 3, since the correlation coefficients of all the variables in the model are below 0.75, this suggests the absence of multicollinearity among the variables.

Fixed effects and GMM results

Based on the Hausman test, the p-value is 0.0044 indicates that the fixed effects model should be adopted. With the variables being in the logarithmic form, the interpretations are given in percentage form. The result has a goodness of fit represented by R^2 of 36%. The R^2 indicates how much of the dependent variable is explained by the independent variables implying that gender parity in access to education, human capital, under 5 infant mortality, labour and capital explain up to 36% of the variations in economic growth. The probability of the F-test is 0.000 which shows that all independent variables in the model are jointly significant in explaining the dependent variable which is economic growth.

The coefficient of Gender Parity Index (GPI) is statistically significant and also economically significant and showed a positive relationship between gender parityand economic growth. A 1% increase in GPI, holding other variables constant, will result in a 6% increase in economic growth at 5% significance level. Primary school enrolment (PRI) is statistically significant but not economically significant by showing a negative relationship between human capital and growth. Increased human capital should translate to increased economic output and thereby growth. The co-efficient shows that a percentage increase in PRI would translate to a 2.3% reduction in economic growth, holding all other variables constant, significant at 5% level.

The coefficient of labour (LABR) is statistically significant and also economically significant by showing a positive relationship between economic growth and labour force participation. A percentage increase in LABR, holding other variables constant will result in a 5.08% increase economic growth, significant at 5% level. However, the result shows that the interaction of primary school enrolment and gender disparity has no significant influence on economic growth.

From the GMM, it shows that the first lag of economic growth has a significant positive impact on the current level of economic growth in SSA. Primary school enrolment had a negative coefficient which indicates that there is a negative

relationship between primary school enrolment and economic growth. Gender parity index shows a positive relationship with economic growth and this means that as the gender gap is closed, economic growth increases. This variable is statistically significant with a coefficient of 3.596. This shows that for every 1% increase in gender parity, economic growth increases by 3.596 percent.

Gross fixed capital formation shows a positive relationship with economic growth but it is not significant. The coefficient of this variable is 0.22% which indicates that a 1% increase in GFCF would result in a 0.22% increase in economic growth. Labor shows a positive relationship with economic growth, this variable is statistically significant with a coefficient of 2.33. This implies that for every 1% increase in labour force participation, economic growth increases by 2.33%.

Discussion

The study engaged the GMM to control for endogeneity. Using the GMM Sargan test which was conducted to test for over identifying restrictions to check whether the instruments, as a group, appear exogenous. This test of instrument validity has to do with a comparison of the number of instruments used in each case and the related number of parameters. Results shows the probability value of the Sargan test as 0.4229 and this means that the null hypothesis should be rejected. The null hypothesis specifies that there are over-identifying restrictions. The result of this test indicates the validity of the choice of the instruments and concludes that the independent variables are exogenous and the endogeneity problem has been accounted for.

In order to constantly promote the growth of the economy gender disparity in access to education should be addressed. Hence ways to reduce disparities in access to education should be addressed by the relevant stakeholders with effective policy interventions. Some of the ways in which this can be addressed is through policies to address access to education, policies to reduce poverty and for government to take initiative prioritize to disadvantaged groups in society.

Another pertinent issue addressed in this study is the fact that policies for gender parity in access to education should be integrated with

policies to promote primary school enrollment as evidenced by the results of the IV GMM estimation technique. This should be done in order to close the gender gap whilst also investing in human capital, so as to promote the growth of the economy. The findings of this study have also reemphasized the importance of capital formation and labor force participation in the growth of the economy, as this has been evidenced in the results of the IV-GMM analysis. Policymakers could use the information to develop targeted interventions and policies aimed at reducing gender disparities in education, improving maternal and child health outcomes, and promoting economic growth in the region. This could include investments in education and healthcare infrastructure, as well as measures to address systemic barriers to gender equality and economic development.

Strengths and weaknesses

One of the strengths of the study is that, after examining the individual impact of gender disparity in access to education on economic growth, it incorporated the interaction impact of these two components on economic growth. Also, by focusing specifically on SSA, the study narrows its scope and allows for a more in-depth analysis of the region's unique circumstances. This can lead to more targeted policy recommendations. Furthermore, the study utilises quantitative data to analyse the relationship between gender disparity in education, under-5 mortality, and economic growth. This provides a rigorous and evidence-based approach to understanding these issues.

The study is however, not without limitations. Some of the weaknesses is associated with data limitations. The study's findings are dependent on the availability and quality of data on gender disparity in education, under-5 mortality, and economic growth in SSA. If the data is unreliable, it may limit the accuracy and generalizability of the study's conclusions. Also, due to data availability, the study only made use of only 17 SSA countries, which may limit the generalizability of its findings to other regions or countries.

Recommendations and conclusions

This research project empirically analysed the impact of gender disparities in accessto education

on economic growth in 17 selected Sub-Saharan African countries from the period of 2005 to 2019. This study adopted the fixed effects model after conducting the Hausman test and this test was able to satisfy the first objective ofthis study. The second objective of this study on the other hand was carried out using the Instrumented Generalized Method of Moments.

The study found that Gender parity in access to education measured by the gender parity index was found to have a positive and significant effect on economic growth in the selected countries. This has proven that indeed gender disparity in access to education is detrimental to the growth of the economy.

Thus, policymakers, the government and all relevant stakeholders must take the appropriate steps to ensure that gender parity is made of paramount importance. The recommendations also place responsibility on government as well as international bodies and agencies to ensure that gender parity in access to education is enhanced across the countries employed in this analysis and less developed societies as a whole.

Based on the findings of this study, following the testing of formulated hypothesis, some of the following recommendations will be put forward to the government and relevant stake holders in Sub-Saharan Africa and less developed economies in Africa in order to promote gender parity in access to education which will contribute to the growth of the economy. As low levels of educational attainment persist in most underdeveloped societies, the government could intentionally implement a policy mix which caters both for gender parity in access to education alongside policies to promote primary school enrolment. As gross enrolment policies are implemented, it is essential that gender parity policies are implemented side by side, in order to ensure that as much as the government is fostering policies to reduce illiteracy as a whole, gender inclusivity is made of paramount importance in order to foster the growth of the economy and remedy the girl child from forms of social and economic exclusion.

In less developed countries and societies, many girls are discouraged from pursuing an education due to constraints on financial resources. The government could intentionally invoke policies and programs to address and significantly reduce poverty whilst also supporting less privileged individuals through any means possible, some of which could include making primary education free for all.

Countries, institutions and primary agents of socialization should intentionally desist from patterns of thinking that assign traditional gender roles which encouragesuperiority of the male child over the female child. Countries, Institutions and primary agents of socialization should intentionally desist from patterns of thinking that assign traditional gender roles which encourage superiority of the male child over the female child.

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