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Effect of Human Capital Investment on Income Inequality in Kenya

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ABSTRACT

Human capital investment has a crucial role in economic growth, and as such, it has been regarded as a significant aspect of government spending. The Gini index score reported an average of 41.6 percent in 2018, which is higher than the generally recognized perfect equality Gini index of 20%, suggesting that Kenya has been suffering from high income disparity. There has been a widespread belief that income inequality and human capital investment are mutually exclusive. The theoretical and empirical approaches in the literature provide mixed findings on the relationship. From 1990 to 2019, this study examined the effect of human capital investment on income inequality in Kenya while adjusting for interest rates and GDP per capita. The study adopted a causal research design to determine if a cause-and-effect association between the variables occurs. The time series data were subjected to diagnostic tests to ensure the presumptions of ordinary least squares held. Health expenditure was found to have a negative and statistically significant effect on income inequality after controlling for the interest rate and GDP per capita. After accounting for changes in interest rates and GDP per capita, the result shows that education investment has a negative and statistically insignificant effect on income inequality. The human development index was discovered to have a negative and statistically significant effect on disparity in income which was verified by the robust check. An inverted U was found using the Kuznets test, which was performed to broaden the scope of the research but yielded an insignificant result. The study recommends the formulation and implementation of policies that adhere to the Abuja Declaration on Health, which requires that 15% of government expenditure be allocated to health. The study recommends strict adherence to the 100% transition from primary to post-primary education. The study's conclusions are pertinent to the development and implementation of successful policies that encourage human capital investment, resulting in a decrease in Kenya's levels of income inequality.

Keywords: Education Investment, Health Expenditure, Human Capital Investment, Income Inequality.

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I. Introduction

The lacuna between the affluent and have-nots has been a pressing issue globally, according to many researchers and policymakers. Démurger (2001) posited that inequality in wealth and assets is a result of widening gaps in the quality and quantity of natural resources, infrastructure, raw materials, human capital, and other assets. Inequality refers to the disparity in the supply of profits and wealth in society (Arrow *et al.,* 2018). In addition income inequality refers to the degree to which a country's total income is distributed inequitably among its people (Dabla-Norris *et al.* 2015).

Though Kenya has been experiencing positive economic growth, its wealth is concentrated in a smaller group of people, with less than 10,000 persons controlling 62 percent of its total wealth (World Bank, 2020). This finding suggests that Kenya has been experiencing a high income disparity between the affluent and the have-nots. The Gini coefficient, a measure of the uneven income dispersion within a nation, was 40.8% in 2015, worsening to 41.6% in 2018 (World Bank, 2020). These Gini coefficients are higher than the general, internationally recognized perfect income equality index of 20%. As suggested by Dabla-Norris *et al.* (2015), higher income disparity leads to a high crime rate, unsustainable economic growth, and corruption, which hinders the achievement of the SDG's pillar on poverty reduction. Researchers have found that investing in human capital can be an important tool for addressing income inequality.

Investing in human capital can be done in a variety of ways, but the most common is to allocate money to education and healthcare in an effort to improve workers' worth in terms of their knowledge, wellbeing, and productivity (De La Fuente, 2011). Human capital investment considerably affects income inequality at a larger level, and hence all countries should rethink their investment energies in human capital (Shahpari & Davoudi, 2014).

Despite the Kenyan government's interventions in education and health, income inequality has been persistent and worsened over the years (Wakiaga, 2018). As explained by Republic of Kenya (2019), a full transition from primary school to secondary school helps to reduce income disparity by ensuring that the majority of the population earns more because of their education. Sessional Paper No. 1 of 2019 focuses on how to enhance significance, expertise, access, and equity to raise the country's literacy and education levels. This led to the formation of the National Council for Nomadic Education of Kenya (NACONEK) in 2013, which aims to promote accessible education among nomadic communities and other ASAL regions (Republic of Kenya, 2019). The SDGs call for universal health coverage, which means that healthcare would be available to all citizens, irrespective of their financial situation (Odoch *et al*., 2021). Consequently, the government has made health insurance coverage for expectant women and their babies mandatory via the National Health Insurance Fund (NHIF) and provided free prenatal services for those in need. As a result of the 2010 constitution's promulgation, healthcare services were devolved to county governments, making them easier to administer and manage. Existing literature has been found to have mixed findings on the effects of human capital spending on income disparity. Murango (2017) found that healthcare spending by the government has a significant effect on disparity in income, unlike international non-governmental organizations' spending.

This study contributes to the existing literature by investigating the effects of human capital investment on income inequality, controlling for GDP per capita and the interest rate in Kenya. The study has adopted an error correction methodology that is robust to modeling the relationship between the endogenous and exogenous variables.

II. Literature Review

A. Theoretical Literature

Equality, in its fairness and parity, is a right to all Kenyan citizens that is enshrined in the 2010 constitution. Income inequality refers to the replication of a persistent lack of equitable mobility in income within a population (Dabla-Norris *et al.,* 2015). Inequality in income has negative effects that include slowing down sustainable economic growth, substance abuse, crime, and unsustainable poverty reduction (Dabla-Norris *et al.,* 2015; Fosu, 2010; Republic of Kenya, 2021). Kuznet's inverted U hypothesis theory postulated that national income and income inequality followed an inverted U-shaped pattern. This indicates that rapid economic expansion leads to greater income disparity in the short run. Investment in education and good well-being reduces income inequality, albeit through economic growth. In addition, Steven Durlauf (1996), in his theory of persistent income inequality, suggested how a population of families is impacted by human capital investment and neighborhood choice. According to the hypothesis, a parent's choice of neighborhood has a direct impact on their children's earning potential. Segregation of wealthy families into economically homogeneous communities propagates income disparity, according to the idea of persistent inequality (Durlauf, 1996). This is because the allocation of resources is still unequal in these socially stratified regions. Children who live in more affluent areas have better access to educational opportunities and healthcare than their poorer neighborhood peers, which leads to greater income disparities in later life (Sarkar, 2008). As a result of economic stratification and large neighborhood-wide feedback effects, income inequality persists through generations. This study employed the concept of persistent income inequality since it provided compelling evidence of a connection between income disparity and human capital development.

Investing in human capital has been critical to the financial growth of every nation on the planet (Shahpari & Davoudi, 2014). Human capital investment has been severely hampered in recent decades by a slew of issues, many of which have reduced the workforce's efficiency (Soubjaki, 2017). Poor health, low literacy, and a lack of inventiveness have been common in developing countries, according to Soubjaki (2017). Spending on education and health can all be characterized as human capital expenditures. Improved healthcare quality through government spending results in increased health stock among workers, boosting their productivity and thus reducing income disparity (Anyanwu & Erhijakpor, 2009; Arthur & Oaikhenan, 2017; Mulcahy *et al.,* 2021). Behr *et al.* (2004), Soubjaki (2017), and Pose and Tselios (2009) posited that spending on education improves a worker's skillset, thereby increasing productivity and eventually increasing income distribution. According to Otieno and Ochieng (2020), the 100% primary to secondary school transition and the free primary education program enable each Kenyan child to acquire basic education, eliminating illiteracy and thus improving productivity, which reduces income disparity.

B. Emprical Literature Review

Human capital investment and income inequality in Kenya are areas with scant empirical support. There is, however, analogous research from different parts of the world. This study is unique in that it has comprehensively covered multivariables: the human capital index as a general variable and health expenditure and education investment as specific variables that affect income disparity in Kenya. Bhattacharjee *et al. (*2017 made a noteworthy effort using data for 76 regions in India and found a significant negative association between investment in health and disparity in income. Similar results were attained by Aghion (2010) and Silva (2018). These studies were, however, contrasted by the findings of Murango (2017), who, using data from 1985 to 2016, found that government spending on healthcare leads to economic expansion and a reduction in income disparity, while international non-governmental organizations' investment in healthcare has no significant effect on income disparity.

Empirical studies between education investment and income inequality show a strong relationship. Behr *et al.* (2004), while analyzing data from 1970 to 2000, found that investing in education reduces the disparity in income. This finding is comparable to the outcomes of Maiyo (2008) and Kafaei and Dorostkar (2007). Nevertheless, Shahabadi *et al.* (2018), using fixed effects techniques, found mixed results where kindergarten through 12th grade education had a substantial negative effect on income disparity while university education had a positive effect on it. The authors argued that university education leads to graduates having a wider skillset and more financial capacity. The empirical reviews show the presence of mixed evidence, a gap that this research intends to fill.

III. Research Methodology

A. Research Design

Research design involves the theoretical context that unites all the components in a research study and forms the guidelines for conducting research (Creswell & Creswell, 2017). A causal research design was used to carry out the study with the intention of defining whether there is a cause-and-effect link between income inequality and human capital investment (Erickson, 2017). The investigation aided in determining the causal dynamics and long-term link involving the parameters under consideration.

B. Data Collection and Analysis

The data utilized in this analysis was an annual time series. The World Bank's development data tables, the Kenya National Bureau of Statistics, and the United Nations Development Program (UNDP) provided the bulk of the data for this study for the period from 1990 to 2019. It involved downloading time series annual frequency historical information on education expenditure, health expenditure, income inequality, the human development index, GDP per capita, and the interest rate.

The residuals were examined with the help of E-Views and Pc-Give Ox-Metrics statistical software to obtain outcomes on the affiliation between the variables in the interrogation. The stationarity of the statistics was tested with an Augmented Dickey Fuller (ADF) unit root test, and if necessary, differencing was used to ensure the data remained stationary. Cointegration was also utilized to accomplish the same goal of identifying whether or not the variables are long-run symmetric. Granger causality was analyzed to check the connection between the parameters. Lastly, analytic checks that contain multicollinearity, heteroscedasticity, and autocorrelation were executed to guarantee that the expectations of the Classical Linear Regression Model (CLRM) hold.

C. Error Correction Model

This study employed error correction model since it incorporated long-term and short-term modeling strategies into a single, cohesive framework. Consistent with the findings of Gujarati and Porter (2003), the model provides a rough approximation of variables with a long-run evenness association. Equation (1) was created to describe the connection between human capital investment and income inequality.

$$\Delta\, ln\, GINI_t = \gamma_0 + \gamma_1 \Delta\, ln\mathrm{HK}_t + \gamma_2 \Delta\, ln\mathrm{GDCAP}_t + \gamma_3 \Delta\, ln\mathrm{INT\_R}_t + \gamma_4 Dum_1 + \gamma_5 ECT_{t-1} + \mu_t \qquad (1)$$

where;
*ln*GINI represents natural logarithm of Income Inequality.
*ln*HK represents natural logarithm of Human Capital, which in this case can be health expenditure, education expendditure or human development index.
*ln*GDCAP represents natural logarithm of Gross Domestic per Capita.
*ln*INT_R represents natural logarithm of Interest Rate.
Dum represents dummy variables for economic structural breaks in Kenya.

D. Diagnostic Tests

To check if the presumptions of the Ordinary Least Square hold true, diagnostic tests were performed, which includes autocorrelation, heteroscedasticity, and multicollinearity, on the models. According to McCullagh (2018), the designs should have linear variables, uncorrelated independent variables with the random variable, and zero variance for the error term.

Autocorrelation occurs when there is some degree of similarity between the regression residuals. To test for autocorrelation, a Durbin-Watson (DW) value were utilized. The correct definition of the model's functional form allowed for the elimination of autocorrelation. In addition, heteroscedasticity exists if the variance of the error term fluctuates across all independent variable values and for each period which contradicts assumption of the Classical Linear Regression Model that the change in the error period will be constant. In this study, the heteroscedasticity and constant variance of investment returns were examined using the Breusch-Pagan test. Finally, Multicollinearity is the term used to define the extensive intercorrelation between explanatory variables. The variance inflation factor (VIF) and coefficient of determination (R^2) were utilized to analyze multicollinearity. A variance inflation factor of less than 10 is acceptable (Alin, 2010).

IV. Results and Discussions

A. Descriptive Statistics and Normality Test

Table I illustrates the descriptive results and normality test for the variables used in the research in order to establish their distribution.

TABLE I: Descriptive Statistics and Test for Normality Results

	lnEDEX	*lnGDCAP*	*lnGINI*	*lnHEXP*	*lnINT_R*
Mean	1.772646	11.80175	3.798095	1.628102	2.900523
Median	1.774545	11.77855	3.763523	1.606965	2.807795
Maximum	2.023503	12.02148	4.051785	1.811031	3.590163
Minimum	1.604303	11.67581	3.688879	1.420933	2.484555
Std. Dev.	0.116800	0.107432	0.093082	0.106184	0.322812
Skewness	0.530834	0.672133	1.587170	0.124839	0.677015
Kurtosis	2.184675	2.115949	5.014719	2.222760	2.336537
Jarque-Bera	2.314529	3.343606	1.25840	0.860820	2.936709
Probability	0.314345	0.187908	0.000108	0.650242	0.230304

Notes: *lnEDEX, lnGDCAP, lnGINI, lnHEXP,* and *lnINT_R* are abbreviations that represent log-transformations of Education Expenditure, GDP Per Capita, Gini Coefficient, Health Expenditure, and Interest Rate respectively.

Generally, when the data set has extreme values whose range is too high or low, there is a likelihood that the central tendency will fail to be achieved since the mean tends to move towards such outliers. The test values for skewness extending from -3 to +3 and the test values for kurtosis stretching from -10 to +10 signified that the normality test outcomes displayed every variable as equally distributed and normally distributed. The education expenditure's skewness was 0.5308, the gross domestic product per capita had a skewness of 0.6721, and the Gini index had a coefficient of 1.5872. In addition, interest rates and health expenditure exhibited skewness of 0.6770 and 0.1248, respectively, indicating that the variables were distributed normally. The Jarque-Bera test's findings showed that every variable had a normal distribution: the natural logarithms of education spending, gross domestic product per capita, income disparity, the interest rate, and health expenditure were all values of 2.3145, 3.3436, 1.2584, 2.9368, and 0.8608, respectively.

B. Tests for Stationarity

The unit root tends to cause problems in forecasting by providing spurious outcomes. Under the ADF test, the null hypothesis states that the series has a unit root, while the alternative hypothesis declares its stationarity. The condition for rejection of the null hypothesis is if the test statistic is less than the critical value at the 5% significance level and concludes that the series is stationary. Otherwise, the series is non-stationary in level form, and further differencing is performed.

Table II shows that the Augmented Dickey-Fuller (ADF) values for statistical tests of the natural logarithms of education expenditure, gross domestic product per capita, health expenditure, interest rate, and the Gini were -1.934, 0.8979, -1.675, and -0.8395, respectively. These test statistics values are greater than the critical value at 5% significance level implying no reason to reject null hypothesis and the series has unit root. The natural logarithm of Gini's ADF test statistic value was -2.994, which was less than the -2.9178 MacKinnon critical value at the 5% level of significance, indicating that the series has no unit root and it is stationary.

TABLE II: UNIT ROOT TEST FOR LEVEL FORM VARIABLES

Variables	ADF Test statistic	Inference
lnGINI	2.994	stationary
lnINT_R	-0.8395	non-stationary
lnHEXP	-1.675	non-stationary
lnGDCAP	0.8979	non-stationary
lnEDEX	-1.934	non-stationary
Critical value (5%)	-2.9178	-
Critical value (10%)	-2.5964	-

Notes: *lnEDEX, lnGDCAP, lnGINI, lnHEXP,* and *lnINT_R* are abbreviations that represent log-transformations of Education Expenditure, GDP Per Capita, Gini Coefficient, Health Expenditure and Interest Rate respectively.

The results in Table III illustrate that the test statistics for natural logarithms of education expenditure, gross domestic product per capita, health expenditure, and interest rate were -6.740, -3.356, -5.537, and -4.874, respectively. These results fell below the 5% MacKinnon critical value of -2.9178 at the 5% level of significance, indicating that all the variables of interest has no unit root at first differencing. As a result, the investigation fails to reject the alternative hypothesis since all the variables in the model are stationary.

TABLE III: VARIABLES UNIT ROOT TEST AT FIRST DIFFERENCE

Variables	ADF Test statistic	Inference
*ln*INT_R	-4.874	stationary
lnHEXP	-5.537	stationary
lnGDCAP	-3.356	stationary
lnEDEX	-6.740	stationary
Critical value (5%)	-2.9178	-
Critical value (10%)	-2.5964	-

C. Lag Order Selection

The Akaike information criteria (AIC) and Schwartz Bayesian Information Criteria (SBIC) were used to identify the lag with the lowest value. If the two criteria yielded different lag lengths, the Akaike Information Criteria (AIC) lag length selection was chosen for estimation. The outcomes are summarized in Table IV.

TABLE IV: RESULTS FOR THE LAG ORDER SELECTION

lag	AIC	SC
0	-7.824453	-7.541564
1	-13.47649*	-11.49626*
2	-13.14942	-9.471870

* denotes the minimum values for both AIC and SBIC.

Table IV results show that lag 1 is the lag length, which minimizes the Akaike information criteria's (AIC) value. It was also discovered that a lag of 1 is the lag length that reduces the Schwartz Bayesian Information Criteria (SBIC) value. The implication is that, utilizing a lag length of one, the models describing the link between the explained variable and explanatory factors, as well as the moderating variables, were appropriately calculated.

D. Test for Cointegration

The cointegration test was used to assess if there exists a long-term connection amid income disparity and human capital investments. Ordinary least squares (OLS) was used to assess the factors, and the null hypothesis was rejected if the values of the trace statistic were higher than the critical value. The outcomes are shown in Table V.

TABLE V: TEST FOR THE COINTEGRATION OF THE MODEL

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.767424	109.6969	95.75366	0.0039
At most 1	0.662845	67.39931	69.81889	0.0768
At most 2	0.488380	35.87015	47.85613	0.4029
At most 3	0.258093	16.43514	29.79707	0.6814
At most 4	0.227398	7.777743	15.49471	0.4895
At most 5	0.010155	0.295988	3.841466	0.5864

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The Juselius Johansen Cointegration Test was used to determine whether or not a log-run relationship existed between the independent variables and income inequality. The researcher was able to determine if the model contained cointegration equations by examining the results of the cointegration rank test shown in Table V above. The 5% critical value and the values of trace statistics were compared in the study. The results show six null hypotheses, each of which holds that the model contains no cointegrating equations. When the trace statistic value exceeds the 5% critical value, the initial null hypothesis is rejected. Since the trace statistics are below the 5% critical limit, the research fails to reject the second null hypothesis, which states that there is only one cointegrating equation in the model. Additionally, the third, fourth, fifth, and sixth null hypotheses are not refuted by the study. This indicated the presence of cointegration, demonstrating the long-run connection between exogenous variables and income inequality.

E. Granger Causality Tests

Using test for Granger causality, the study examined the hypothesis that higher income inequality is associated with lower investment in human capital. Using a significant 5% level, the study compared the probability p-value to the 5% critical value in order to test the no-causality null hypothesis. Table 6 shows the findings of the analysis.

This study found neutral causality amid the natural logarithms of Gini and education spending that had p-values of 0.8971 and 0.9539, correspondingly, which were more than the critical value of 0.05. The natural logarithms of Gini and GDP per capita had no significant relationship, and the natural logarithms of Gini and health spending had no significant relationship. The natural logarithms of Gini and interest rate both showed neutral causality, with p-values of 0.1879 and 0.0779, respectively, that were above the threshold of the critical value of 0.05. This conclusion suggests that neither the natural logarithms of the Gini coefficient nor the interest rate are causally related.

TABLE VI: GRANGER CAUSALITY TEST OUTCOMES

Null Hypothesis	Obs	F-Statistic	Prob.
lnEDEX does not Granger Cause *lnGINI*	30	0.04733	0.9539
lnGINI does not Granger Cause *lnEDEX*		0.10911	0.8971
lnGDCAP does not Granger Cause *lnGINI*	30	0.32155	0.7281
lnGINI does not Granger Cause *lnGDCAP*		2.60319	0.0948
lnHEXP does not Granger Cause *lnGINI*	30	3.06903	0.0650
lnGINI does not Granger Cause *lnHEXP*		0.24625	0.7837
lnINT_R does not Granger Cause *lnGINI*	30	1.79373	0.1879
lnGINI does not Granger Cause *lnINT_R*		2.84423	0.0779

Notes: *lnEDEX, lnGDCAP, lnGINI, lnHEXP,* and *lnINT_R* are abbreviations that represent log-transformation of Creativity and Innovations, Education Expenditure, GDP Per Capita, Gini Coefficient, Health Expenditure and Interest Rate respectively.

F. Diagnostic Tests

Diagnostic tests were used to assess model residuals and consider the adequacy of a model, involving autocorrelation, multicollinearity, and heteroscedasticity.

1) Multicollinearity test

The coefficient of multiple determination (R^2), variance inflation factor (VIF), and t-ratios were employed to test for multicollinearity. The coefficient of determination (R^2) was 0.854, which implied that human capital investment variables expounded 85.4% of the differences in income inequalities. The t-ratios were significant, indicating that multicollinearity was missing. The VIF indicator displayed the extent to which multicollinearity inflates standard errors, and all VIF values were less than 10, indicating a lack of multicollinearity.

TABLE VII: RESULTS OF VARIANCE INFLATION FACTOR

Element	Variance Inflation Factor (models)
LnEDEX	3.7140
lnHEXP	3.1935
*ln*INT_R	8.4790
*ln*GDCAP	2.4071

2) Test for autocorrelation

The sequential independence of the error term values is an assumption of the conventional linear regression paradigm. The Durbin-Watson test statistic was used to determine if the models exhibited autocorrelation. Table VIII displays the results of an autocorrelation test.

TABLE VIII: AUTOCORRELATION

DW test value	Conclusion
2.184331	No autocorrelation

The findings in Table VIII show that the model's Durbin-Watson test statistic was 2.184331, demonstrating a lack of autocorrelation and pointing to the efficiency of OLS estimators.

3) Heteroscedasticity test

The Breusch-Pagan test was utilised to examine the influence of independent variable values on the variance of the error term produced by a regression. The null hypothesis assumed that the error term had an equal variance distribution, while the alternative hypothesis stated that the variances of the residuals were not evenly distributed, indicating heteroscedasticity. The results are presented in Table IX.

TABLE IX: TEST FOR BREUSCH-PAGAN

	Chi-square test	prob Chi-square
Regression	2.170342	0.9034

As seen in the results above, the model's p-value is more than 0.05. As a result, this implies that the error term's variance is equally distributed. Consequently, the study fails to reject the null hypothesis and draw the conclusion that there is no heteroscedasticity within the model.

G. Estimation of Models and Discussion

The results of the independent variables and control variables were estimated, with a summary of each variable's coefficient and its impact on the dependent variable.

1) Correlation Analysis Matrix

From the analysis above, the natural logarithms of education expenditure, health investment, gross domestic product per capita, and income inequality were all found to have a weak negative relationship. When education expenditure, health investment and GDP per capita increase, income inequality decreases, and vice versa. Inversely correlated with rising interest rates is the rise in income inequality.

TABLE X: CORRELATION ANALYSIS MATRIX

Variables	*lnGINI*	*lnEDEX*	*lnGDCAP*	*lnHEXP*	*lnINT_R*
LnGINI	1.000	-	-	-	-
LnEDEX	-0.275	1.000	-	-	-
LnGDCAP	-0.333	-0.507	1.000	-	-
LnHEXP	-0.385	0.372	-0.039	1.000	-
lnINT_R	0.203	-0.061	-0.554	-0.351	1.000

Notes: *lnEDEX, lnGDCAP, lnGINI, lnHEXP*, and *lnINT_R* are abbreviations that represent log-transformation of Education Expenditure, GDP Per Capita, Gini Coefficient, Health Expenditure and Interest Rate respectively.

2) Effect of investment in health on income inequality in kenya

The regression results for Table XI showed that investment in health had a detrimental and statistically significant impact on income inequality.This was in tandem with the objective, which examined the effect of health investments on inequality in income. The coefficient of -0.4705 and the p-value of 0.0026, which is less than 0.05, serve as proof of the effect of investment in health on the disparity in income. The outcomes are significant at a 1% significance level, according to the p-value. The independent variables were able to predict 86.97% of changes in income inequality in the model, according to the R^2 value of 0.8697.

TABLE XI: VECTOR ERROR CORRECTION MODEL RESULTS ON HEALTH EXPENDITURE AND INCOME INEQUALITY IN KENYA

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	9.942109	2.030153	4.897221	0.0000
lnHEXP	-0.470541	0.141038	-3.336277	0.0026
lnGDCAP	-0.448653	0.156288	-2.870680	0.0080
lnINT_R	-0.036125	0.056468	-0.639745	0.5279
Dummy1	0.096307	0.033420	2.881675	0.0078
R-squared	0.869538	Mean dependent var		3.798095
Adjusted R-squared	0.837929	S.D. dependent var		0.093082
S.E. of regression	0.072822	Akaike info criterion		-2.254894
Sum squared resid	0.137881	Schwarz criterion		-2.023606
Log likelihood	39.95085	Hannan-Quinn criter.		-2.179500
F-statistic	5.753478	Durbin-Watson stat		0.558237
Prob(F-statistic)	0.001871	-		-

The coefficients for the constant, the interest rate's natural logarithm, the gross domestic product per capita's natural logarithm, and the dummy variable that represented structural breaks in Kenya were 9.942, -0.449, -0.0361, and 0.0963, respectively. The value of income inequality is implied by the regression constant, 9.942, which is true when all other variables are equal to 0.

The Model 1 was represented as (2).

$$lnGINI = 9.942 - 0.471lnHEXP - 0.449lnGDCAP - 0.0361lnINT\_R + 0.0963Dummy \quad (2)$$

The natural logarithm of health expenditure had a significant negative effect on the natural logarithm of income inequality since a 100% change in the natural logarithm of health expenditure would result in a 47.1% change in the natural logarithm of income inequality in the reverse trend, ceteris paribus. There was an unfavorable and substantial relationship between income inequality and gross domestic product per capita, such that if GDP per capita moved by 100%, there would be a negative shift of 44.9% in income disparity. The interest rate's natural logarithm portrayed a negative, insignificant relationship in relation to income inequality, whereby a 100% increase in the interest rate leads to a 3.61% reduction in income disparity.

The outcomes are similar in unification with Anyanwu and Erhijakpor (2009) results, where researchers stated that economic evidence was offered by the researchers to relate two health results in African nations: infant death and below-five death, as well as total per capita spending on health care and per capita income. Health care investment negatively affects the death rates of babies and kids under five years old. The elasticity estimations in this current study agree with those in the literature. According to the results of the regression analyses, overall health spending, including the public part, significantly affects health outcomes in African nations. There are further considerations for the data's impact. In this case, an upsurge in the interest rate would lead to a rise in income equality of 3.61 percent for every 100 percent increase in interest rates, according to the natural logarithm coefficients.

The dummy variable representing structural breaks exhibited a positive effect on income inequality owing to the destruction of economic activities. The major structural breaks captured within the study period included the first tribal clashes of 1991, the 1992 multi-party clashes, the 2007–2008 post-election violence, and the 2009 international monetary calamity that affected income inequality positively. During these periods, income inequality kept on rising, broadening the gap between the affluet and the have-nots.

According to the first hypothesis, there is no correlation between health expenditures and income inequality. Expenditure on health has been found to have an inverse correlation with income inequality, as evidenced by a negative coefficient of 0.4705. A p-value of 0.0026 indicates that the coefficient is statistically significant (p-value less than 0.01). This demonstrates statistical significance at the 1% level. The null hypothesis, according to which there is no substantial connection between health spending and income disparity, was therefore rejected. The investment in health by the Kenyan government would reduce income disparity, as evidenced by the negative association amid income disparity and health expenditure in the research.

3) Effect of investment in education on income inequality in kenya

The second goal was accomplished because the results demonstrate that funds spent on education reduce the disparity in income by a factor of 0.065. However, the p-value of 0.727 is higher than 0.05, so these findings are not statistically significant. That is because there is a gap between graduating from school and earning a good living wage, so the impact of education on income disparity is delayed. Education's potential to lessen income disparity in Kenya is hampered, however, by the country's high unemployment rate. The independent variables in the model were able to predict 84.61% of changes in income inequality, according to the coefficient of determination (R^2), whose value was 0.8461.

Model 2 was denoted as (3).

$$ln\text{GINI} = 6.26 - 0.0654ln\text{EDEX} - 0.233ln\text{GDCAP} + 0.0525ln\text{INT\_R} + 0.0806\text{Dummy} \quad (3)$$

The natural logarithm of education expenditure had a substantial negative impact on the natural logarithm of income inequality since a 100% change in the natural logarithm of health expenditure would result in a 6.54% change in the natural logarithm of income inequality in the same direction, holding other factors constant. There was a significant negative correlation between income inequality and gross domestic product per capita, such that a 100% positive change in GDP would cause a negative change of 23.3% in income disparity. The interest rate's natural logarithm portrayed a significant positive relationship in relation to income inequality, whereby a rise of 5.25% in income disparity would follow from a 100% increase in interest rates.

The dummy variable demonstrating structural breaks exhibited a positive effect on income inequality owing to the destruction of economic activities. The major structural breaks captured within the study period included the first tribal clashes of 1991, the 1992 multi-party clashes, the 2007–2008 post-election violence, and the 2009 international economic disaster that affected income inequality positively. During these periods, income inequality kept on rising, spreading the gap between the needy and the affluent.

TABLE XII: VECTOR ERROR CORRECTION MODEL RESULTS ON EDUCATION EXPENDITURE AND INCOME INEQUALITY IN KENYA

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	6.262323	3.170389	1.975254	0.0589
LnEDEX	-0.065419	0.185528	0.352607	0.7272
LnGDCAP	-0.233066	0.238459	-0.977383	0.3374
lnINT_R	0.052475	0.067649	0.775689	0.4449
DUMMY1	0.080556	0.041008	1.964402	0.0603
R-squared	0.846050	Mean dependent VAR		3.798095
Adjusted R-squared	0.830058	S.D. dependent VAR		0.093082
S.E. of regression	0.086818	Akaike Info Criterion		-1.903316
Sum squared resid	0.195971	Schwarz Criterion		-1.672027
Log likelihood	34.50139	Hannan-Quinn Criter.		-1.827921
F-statistic	2.121264	Durbin-Watson Stat		0.472055
Prob(F-statistic)	0.001798	-		-

The results are similar to those of Abdullah *et al.* (2015); using all of the available empirical data, the researchers reexamined the impact of schooling on income disparity. The two tails of the income distribution were found to be affected by education. As a result of education, the top earners' share of income decreases, whereas that of the bottom earners increases. In Africa, education has had a significant impact on reducing inequality. Secondary schooling appears to have a greater impact than primary schooling; however, this conclusion is not always consistent. The changes in the econometric model's specification and measures of inequality and education explain a major part of the heterogeneity in the reported estimates.

There was shown to be a statistically insignificant connection between financial investment in education and income inequality, refuting hypothesis 2. According to the findings, income inequality is inversely proportional to the expenditure on education. The negative value of the coefficient (-0.065) demonstrates this aspect. The p-value for the coefficient is 0.727, meaning it is statistically insignificant. This demonstrates that it is too small to be noticed statistically. Thus, the lack of a correlation between spending on education and income inequality failed to be rejected as a null hypothesis. The study's finding that there is a negative correlation between income inequality and education spending indicates that the Kenyan government's investment in education will result in a reduction in economic disparity.

4) Effect of human capital investment on income inequality in kenya

Table 13 displays the findings of a regression analysis looking for a long-term relationship between the natural logarithms of human capital investment (*ln*HDI) and income inequality (*ln*GINI). Consistent with the study's overarching goal, which was to examine how investments in human capital affected disparity in income, the researcher included this robust check. The findings indicated that progress in investment in human capital has a negative and statistically significant influence on disparity in income. As evidence for this, the p-value was 0.0003 (less than 0.01) and the coefficient was -3.508. According to the p-value, the results are statistically significant at the 1% level. It is inferred that the human capital development index and the control variables affect 84.41 percent of the change in income inequality.

The model 4 was presented as shown in (4).

$$lnGINI = -8.8512 - 3.5075lnHDI + 1.2461lnGDCAP - 0.08567lnINT\_R + 0.0732Dummy \quad (4)$$

The human capital development index exemplified a negative connection with income disparity, implying that the two variables grew in opposite directions. A positive relationship between the dummy variable representing structural economic breaks and income inequality was identified owing to the possibility of inequality thriving in an unstable economic environment. The control variables were gross domestic product and interest rate, whose relationships to income inequality were positive and negative, respectively.

TABLE XIII: VECTOR ERROR CORRECTION MODEL RESULTS ON HUMAN CAPITAL INVESTMENT AND INCOME INEQUALITY IN KENYA – A ROBUST CHECK ANALYSIS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	-8.851196	4.199997	-2.107429	0.0449
lnGDCAP	1.246063	0.395033	3.154326	0.0040
lnINTR	-0.085669	0.056723	-1.510289	0.1430
lnHDI	-3.507513	0.845657	-4.147678	0.0003
DUMMY1	0.073193	0.030919	2.367277	0.0256
R-squared	0.844098	Mean dependent var		3.798095
Adjusted R-squared	0.823959	S.D. dependent var		0.093082
S.E. of regression	0.067511	Akaike info criterion		-2.406364
Sum squared resid	0.118501	Schwarz criterion		-2.175076
Log likelihood	42.29864	Hannan-Quinn criter.		-2.330970
F-statistic	7.757454	Durbin-Watson stat		1.091103
Prob(F-statistic)	0.000297	-		-

Kuznets analysis was used to supplement the research, and the results showed that exogenous variables contributed to the explanation of the endogenous variable—the natural logarithms of GDP per capita and GDP per capita squared—to an extent of 83.43 percent. In contrast to the negative association represented by the natural logarithm of GDP per capita squared, a significant positive link was found between the natural logarithms of GDP per capita and income inequality, demonstrating that their relationship shifts in the same direction. The inverted U point on the Kuznets curve served to illustrate this fundamental idea. Both the p-values (0.9477 and 0.9232) are greater than 0.05, indicating statistical significance is lacking. In addition, the Kuznet test confirms that there is a negative and statistically significant association amid the human development index and income inequality at the 1% level, with a coefficient of -2.804072 and a p-value of -0.0009, which is less than 0.01. Income inequality worsens when the economy encounters disruptions, as indicated by a positive correlation between the dummy variable reflecting structural changes in the economy and income inequality.

TABLE XIV: VECTOR ERROR CORRECTION MODEL RESULTS ON ESTIMATION OF KUZNET CURVE

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	12.21859	197.0504	0.062007	0.9510
lnGDCAP	2.202818	33.25330	-0.066244	0.9477
$lnGDCAP^2$	-0.136517	1.402574	0.097333	0.9232
lnHDI	-2.804072	0.745255	-3.762566	0.0009
Dummy	0.085970	0.031108	2.763587	0.0104
R-squared	0.834283	Mean dependent var		3.798095
Adjusted R-squared	0.828018	S.D. dependent var		0.093082
S.E. of regression	0.070397	Akaike info criterion		-2.322635
Sum squared resid	0.128850	Schwarz criterion		-2.091347
Log likelihood	41.00085	Hannan-Quinn criter.		-2.247241
F-statistic	6.612310	Durbin-Watson stat		0.950511
Prob(F-statistic)	0.000825	-		-

V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A. Conclusion

This research sought to determine how human capital affected income disparity in Kenya. Findings demonstrated a long-term correlation between health care costs and income disparity as measured by the natural logarithm. Therefore, the study observed that government spending on healthcare significantly affects the disparity in income among the people. Poverty prevents the ability to afford healthcare and contributes to the mortality rate when people are unable to access much-needed medical attention during times of sickness. The unhealthy workforce is characterized by a reduced level of productivity, hence low earnings, which, if not addressed, will result in a vicious cycle of poverty passed from generation to generation.

Examining how Kenyan income disparity may be affected by investments in education was the second objective. The regression indicates that there is no meaningful association between the natural logarithms of education spending and income inequality. Based on the results of this research, educational attainment has an insignificant effect on income inequality since the impact of education is delayed by the time lag between completion of education and getting a job. However, more evenly distributed schooling between 1990 and 2019 has reduced income inequality significantly. Government expenditure on education also has a substantial effect on increasing education supply and, consequently, income distribution.

B. Recommendations

There must be strict adherence to the Abuja Declaration on Health Investment, which requires that 15% of government expenditure be allocated to health since the Kenyan government currently spends only 6% of the total government expenditure on health. The county government must devote at least 15% of its budget to healthcare, as it is a devolved obligation, since this will complement the national government's efforts to increase the health stock. The government should firmly support universal health coverage to ensure greater levels of health among the populace, as this will be perfect for raising the level of economic equality in the nation. Education policy should be embraced to ensure strict adherence to the 100% transition level from primary to secondary institutions. To underscore the value of the investment in education, policymakers should bring back the mandatory NYS program for graduates, which will hasten the effects of education investment on the expansion of the economy.

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CONFLICT OF INTEREST

The authors affirm that there are no conflicts of interest.

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