Original Article

Public Spending and Sustainable Human Development in Cameroon: Does corruption matter?

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Abstract: This study analyzes the effect of public spending on Human capital on human development in Cameroon by controlling the impact of corruption. After using quantitative methods, the ARDL model was applied with the bounds testing approach with time series data from 2000 to 2021. The results indicated that public spending on education and health positively impacts the change in the human development index. Similarly, economic growth (GDP) positively affects the variation of the human development index. Meanwhile, corruption and foreign direct investment (FDI) negatively correlate with the human development index. However, these results are only valid in the short term. In the long term, there is no relationship between the variables. The government should increase the expenditure budget and expand the target sector to reach the industry needed for human development. An improvement could follow this implementation in transparency in fiscal policy management, which can help reduce the corruption perception index. One of the limitations of this research is the use of a short observation period due to data availability. Therefore, the relationship between public expenditure, corruption, and human development in the CEMAC zone is another critical issue that could be investigated.

Keywords: Corruption; Human development; Public spending; Cameroon

1. Introduction

Human capital has been recognized globally as one major factor responsible for nations' wealth. According to Folloni and Vittadini (2010), human capital refers to the acquired and functional abilities of all the inhabitants or members of society. The importance of human capital development to economic growth has motivated scholars to examine the subject matter. Since then, various economic theories linking human capital to development have been put forward. These theories agree that poor countries can optimally use human capital to escape poverty and sustain their economies (Ruzima & Veerachamy, 2021). Government spending refers to the public sector's spending on acquiring goods and providing services such as education, healthcare, social protection, and defense. The relationship between government spending and economic development has attracted much attention. Economists and politicians struggle to find the real impact of government spending on economic development. From a theoretical foundation, Keynesians, notably J.M.

Keynes (1929), support the necessity of government spending on economic development. Since the advent of the overproduction crisis in 1929 and the subprime mortgage crisis in 2008, economists have started to think about the role of government expenditure not only to regulate the market but also to boost the development of the economy. Because the government does not influence the economy, classical and Neoclassical theories support the notion that spending hurts economic development (Mankiw et al., 1986; Lowenberg, 1990). The third theoretical foundation is about the mixed effect. It means that government spending tends to positively impact economic development at a certain optimal level, which can be turned into a negative impact (Barro, 1990; Friedman, 1997).

According to UNDP (2018), the Human Development Index (HDI) is a combined indicator of life expectancy, education, and per capita income that summarizes the average performance of important human development characteristics. The HDI was created to emphasize that people and their potential should be considered when evaluating a country's development instead of just economic progress. One of the most significant indicators of economic development is the human development index. Rising economic progress, ways of life, and social welfare are all influenced by human development. Given that increasing human development produces output, employment, and productivity, it may result in sustainable growth (Ammad et al., 2012). The government is putting up effort to achieve sustainable development goals. The government spends money on health and education as some of its tools. Spending on health and education will significantly lengthen life expectancy and advance human development, given the role of government in the economy.

Cameroon had a Human Development Index score of 0.58 in 2020. This value places the country in the intermediate group and ranks it 153rd out of 189 nations and regions. From 1990 to 2020, Cameroon's Human Development Index score increased by 25.7%, from 0.448 to 0.58 (UNDP, 2020). Cameroon is currently classified as having a medium level of development, along with other African countries such as South Africa and Kenya. It shows potential challenges the country faces that must be considered. One solution to these challenges is to promote government investment in human capital. Human capital is invested when the government spends money on health and education.

Maharda & Aulia (2020). Ruzima and Veerachamy (2021) and Nkemgha et al. (2021) studied the effect of public spending on education and health on the human development index (HDI). They argued that there is a significant correlation between public spending on education and health and the human development index. Consequently, higher spending in these two industries promotes human development, which fuels economic growth (Gupta et al., 1998). Investment in government spending appears imperative to further advance economic and human development. From this, analysing the essence of public spending on human capital in Cameroon's human development appears imperative. Therefore, this research will further examine the influence of public spending on education and health on Cameroon's human development index (HDI). Consequently, the following inquiries will serve as the direction for this research: What is the effect of public spending in education on Cameroon's human development index? How does government spending in the health sector impact Cameroon's human development index? Therefore, this research aims to examine the effect of health expenditure on the human development index in Cameroon and investigate the impact of government spending on the education sector on the human development index. The rest of this paper is organized as follows: Section two will present a literature review and hypothesis development. The research methodology will be presented in section three. Section four will present and discuss the results. Finally, the last section will present the conclusion and policy recommendation.

2. Literature Review and Hypothesis Development

Numerous studies have been done on the human development index and government spending. We shall scrutinize the most pertinent of their empirical studies in the following parts.

2.1. Public Health Expenditure and Human Development Index

Maharda & Aulia (2020), Ruzima & Veerachamy (2021), and Nkemgha et al. (2021) are among the relevant studies related to the effect of health expenditure on the human development index (HDI), which represents the human development sector. In 12 Indonesian provinces, Maharda and Aulia (2020) looked at the effect of government healthcare spending on the human development index. They discovered that the human development index is not significantly affected by health expenditure after applying a panel fixed effect model with period-sequence data from 2010 to 2018. This shows that the supervision must develop better health expenditure allocation rules that prioritize those with the greatest needs if it hopes further to improve the inefficiency of Indonesia's public health system. On the other hand, Nurjannah et al. (2022)

recently investigated how health spending affected the human development index in the Indonesian province of South Sulawesi. They discovered a substantial correlation between health spending and the human development index. Thus, the health sector is a public expense with a distinct economic function. Therefore, improving the health sector will inevitably lengthen life expectancy and lower population mortality. The level of human development will rise as a result. The study by Maharda and Aulia (2020) revealed the non-significant effect used in a short period (8 years of observation). Consequently, the impact could be difficult to observe directly. Contrary to this, the study of Nurjannah et al. (2022) used a broad period of observations and was conducted recently.

Ruzima and Veerachamy (2021) also investigated how India's health spending affected human growth. They employed an ARDL model with 1990–2018 worth of data. Their findings showed that while the short-term impact is negligible, long-term health spending has a noteworthy positive influence on human development. That is to imply that public health spending will raise the proportion of healthy individuals, which can help raise productivity. Therefore, productivity growth will eventually lead to growth in the production sector. Because establishing health programs will take time to achieve results in society, the influence will be minimal in the immediate term. Once more, Prasetyo and Zuhdi (2013) investigated the efficiency of government expenditure in health and education on human development in 81 countries by applying Data Envelopment Analysis (DEA). Their results suggested that most of the country is positioned for efficiency. Government expenditure on health and education has been found to affect human development positively. It suggests that investment in the education and health sectors will increase the level of skills and the population's life expectancy, leading to better productivity in the long run. Therefore, it implies an efficient relationship between government expenditure and human development.

In cross-country analysis, Bein et al. (2017) explored the relationship between healthcare spending and health outcomes such as life expectancy, mortality rate, and neonatal and infant mortality in selected East African countries. After examining cross-sectional and time series data using a panel data technique, they concluded that overall health expenditure increases male and female life expectancy and lowers mortality rates. It means that medical care services increase the population's quality of life while providing them the option to receive better health care. As a result, it is critical to determine if a higher allocation of resources to the healthcare business is worthwhile and whether to promote private healthcare investment. Investment in more private institutions, such as clinics and hospitals, is crucial from a management aspect for average-country health outcomes. Iheoma (2014) used a fixed effect model using time panel data to analyze the contribution of public health spending to human development in Sub-Saharan African nations. He contended that public health spending explains many of these countries' social development disparities. Private health spending, on the other hand, is shown to be small. Higher public health funding schemes have been effectively applied in these countries. Public health spending has increased the expected lifespan while also promoting economic development. It is advised that monies be raised from the private sector to ensure human development by developing programs connected to facilities for health care to improve the lives of the people in these countries.

In the case of Cameroon, there is only one study related to the effect of government spending in the health sector on human development, conducted by Nkemgha et al. in 2021. They investigated the effect of government spending on life expectancy in the public and private health sectors. They employed ordinary least squares regression on time series data from 1980 to 2010. They discovered that private health spending significantly and favorably affects life expectancy. This will lower the risk of mortality and enable people to retain a higher level of health. Lowering the disease incidence will minimize the burden by reducing health maintenance and cure expenses. Naturally, a longer and better life expectancy should follow from this. On the other hand, spending in the public sector has a negligible consequence on life expectancy. This shows that the private sector has the most significant influence over national spending while the governmental sector contributes less to health spending. Public health spending has less of an influence on the population than private health spending. As a result, it advises the government to get more involved in the health sector so that it can affect the population's life expectancy and, as a result, raise the human development index.
H1: Public health expenditure has a significant impact on the human development index in Cameroon.

2.2. Public spending on education and the Human Development Index

Numerous studies have been done on government spending on education and human development. We shall scrutinize the most pertinent of their empirical studies in the following parts. The positive substantial influence of education expenditure on the human development index has been found by the empirical

investigations of Ammad et al. (2012) in Pakistan, Patel & Annapoorna (2019) in India, Salman & Rasyidin (2020), and Nurjannah et al. (2022) in Indonesia. Ammad et al. (2012) conducted an empirical study on the impact of education expenditure on the human development index in Pakistan. The Times series data from 1972–2010. After applying the ECM model, they found that education expenditure positively impacted Pakistan's human development index. Education expenditure increases knowledge and skills, which can ameliorate labor productivity, labor demand, employment, and economic growth. Therefore, it provides social goods and services, which could increase welfare, reduce inequality, and overcome significant obstacles to development. Similarly, Patel and Annapoorna (2019) analyzed the Indian case using data from 1990–2014 and argued that education is a critical factor for human resource development.

Salman and Rasyidin (2020) investigated the effect of government spending on education on the human development index of Aceh province in Indonesia. After applying multiple linear regression analysis to data from 2007–2017, the researchers found a significant effect of government spending in education on the human development index. Again, in the same country, Nurjannah et al. (2022) used multiple linear regression with time series data from 2009–2018. They concluded that education expenditure has an affirmative influence on the human development index. It suggests that investment in the education sector will increase human capital, attract intellectuals, and transform the quality of education. Therefore, this can help increase the human development index. Once more, education has a noteworthy influence on the economic prosperity of any nation. Therefore, investment in education will enable more individuals to access modern and scientific ideas. People's productivity and ability to learn new technology have both improved. Once more, it increases public knowledge of the choices and labor mobility available.

Moreover, in the case of developed countries, Annabi et al. (2011) analyzed the impact of marginal education spending on economic development in Canada by applying an overlapping generations model (OLGM). They argued that higher education expenditure positively influences the variation of human investment and can help reduce the negative impact of decelerating the labor force market. It suggests that, among the education expenditure sectors, spending on higher education is the most impactful on human development. It can be illustrated by the fact that a well-developed higher education will bring more research and development. From the perspective of enterprises, it could help them employ innovative managers to create new products and increase their competitiveness in the national and global economy. Consequently, with the increase in productivity, the demand for labor will increase, which could foster economic development with more wealth and full employment.

Baldacci et al. (2003) used data from selected developing and transition economies to look at the link between education spending and social outcomes proxies using social indicators, which can predict the human development sector. The study estimated the latent variable model. Their result suggested that public spending significantly predicts social welfare and provided more substantial evidence that increased education spending will positively affect social outcomes. Higher public education spending will lower illiteracy rates and boost social investment. Moreover, their results revealed that investing in the primary education sector is more sensitive to social outcomes than higher education. Unlike developed countries, developing countries need to improve their level of literacy in the short run. In the long run, they can catch up with improving higher education to foster research and development sectors. Therefore, this mechanism could lead to higher human development by including more people in the primary education sector and promoting the higher education sector for innovation and research.

From these findings, we can affirm the positive influence of government expenditure in the education sector on human development and the education sector's priorities in developing countries to impact human development. Iheoma (2014) examined the outcomes of social spending in the education sector on human development in 20 countries in sub-Saharan Africa. After applying the fixed effect estimation method, the results showed that only tertiary education spending influences human development in these countries. However, spending in the primary and secondary education sectors has a non-significant influence on human development. Surprisingly, contemporary human development theories emphasize the role of education expenditure in both the primary and secondary sectors in developing and developing countries. This study's results imply a lack of financial support for the elementary and secondary sub-sectors, poor administration of the minimal public financing for these sub-sectors, poor teacher salaries, and a high frequency of school dropouts in these nations.

From the literature mentioned above, we may deduce that spending on education sectors benefits changes in the human development index. Education expenditure is the most significant feature in determining the human development index. Nevertheless, most of these studies have been conducted in Asian countries. Empirical studies in African countries, particularly Cameroon, are so limited. In order to close this gap, this study will look at the effect of government expenditure in the education sector on the

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human development index in Cameroon. From the literature related to government expenditure and the human development index, we deduce that spending on the health and education sectors benefits changes in the human development index. Economic growth is the most significant feature in determining the human development index. Nevertheless, there have been very few empirical studies on the connection between government spending, economic expansion, and human development, for example, in Cameroon. In order to close this gap, this study will look at the impact of economic growth and government expenditure in the health and education sectors on the human development index in Cameroon. We will also look at how the variables are related causally.

H2: Public education expenditure has a positive impact on the human development index in Cameroon.

2.3. Corruption and human development index.

Few empirical research findings have examined the direct link between corruption and human development. The PNUD's first report on human development, published in 1990, stated unequivocally that poor governance in developing countries can hurt human development. Qizilibash (2001) and Salem (2003) investigated the conceptual relationship between corruption and human development in the aftermath of this report. Akçay (2006) examined the relationship between corruption and human development by analyzing data from 63 countries. His findings indicate a statistically significant link between corruption and human development. The empirical evidence in the study suggests that the poorest countries have lower levels of human development. El Jabri and El Kider (2020) recently investigated how corruption stifles human development in African countries. They used panel data economics to analyze a sample of African countries between 2000 and 2017 to demonstrate this impact. Their regression results show that corruption significantly and negatively impacts human development. Indeed, an increase of one point in the corruption index reduces life expectancy at birth by 0.004 years and the education index by 0.03%. It implies that corruption reduces human development by interfering with human development index components such as life expectancy and education. From the literature on government expenditure, corruption, and the human development index, we may deduce that spending on the health and education sectors benefits changes in the human development index. Moreover, it can be understood that corruption hurts the human development index. Nevertheless, there have been very few empirical studies on the connection between government spending, corruption, and human development in Cameroon. In order to close this gap, this study will look at the impact of government expenditure in the health and education sectors and on the human development index in Cameroon.

H3: Corruption negatively affects the human development index in Cameroon.

3. Materials and Methods

3.1. Data sources and selected variables

Using the econometric tool in economic analyses of time series requires a certain number of statistical data reflecting the past and a certain number of variables selected, preferably according to the characteristics of the economic space in which we are interested. Here, we successively present the sources of the data as well as the selected variables. We used time series data from 2000–2021 collected through the OIC statistics and World Bank databases. The human development index is chosen as a dependent variable, while government expenditure in education and health is considered an explanatory variable and our variable of interest. Economic growth, the corruption perception index, and foreign direct investment will be used as control variables to understand the situation of corruption and the financial sector to implement fiscal policy by the government. Economic growth, the corruption perception index, and foreign direct investment will be used as control variables to understand the situation of corruption and the financial sector to implement fiscal policy by the government.

The dependent variable human development index (HDI) was defined by UNDP in 1990 as a compound indicator of life expectancy, education, and per capita income that summarizes the average performance of major human development characteristics. According to Oluwatobi and Ogunrinola (2011) and Prasetyo and Zuhdi (2013), economic growth and government spending affect the human development index. The level of the human development index will rise even further as economic growth and increased government spending on health and education take place. In order to capture the consequence of economic growth and government spending on the Cameroonian education and health sectors, we used the human development index (HDI) as the dependent variable for this purpose.

We used two variables for government expenditure. First, health expenditures represent the costs associated with providing health services, family planning, nutrition, and emergency help with a health

focus. Second, education expenditure includes spending on public and private educational institutions, including schools and universities. Nurjannah et al. (2022) argued that government expenditure in the education sector significantly impacts human development in Indonesia. Nkemgha et al. (2021), who discovered that health spending positively influenced life expectancy in Cameroon, made similar findings. In order to scrutinize the actual influence of government spending on the human development index in Cameroon, we focused on government expenditures in the education and health sectors. Gross domestic product (GDP) was chosen to measure economic growth. It serves as the benchmark for measuring the value added produced by producing products and services throughout time in a particular nation. Gross domestic product (GDP) has a positive and significant impact on the human development index in the cases of India and Nigeria, respectively, according to Khodabakhshi (2011) and Chikalipah and Okafor (2019). In order to evaluate the impact of economic growth on the human development index in Cameroon, it is crucial to utilize GDP as a representation of that sector of the economy.

According to Thach et al. (2017), Hysa (2016), Murshed and Mredula (2018), and El Jabri and El Kider (2020), corruption hurts human development. They argued that corruption lowers the efficacy of government spending and hinders the growing sector of the economy. This implies that government decisions lack transparency when it comes to the management of fiscal policy. Once more, it suggests that corruption can be a barrier to attracting foreign direct investment because countries with high corruption indices tend to receive less foreign investment, which can hinder economic development. Given the facts of this empirical analysis, we use the corruption perception index to understand the effect of corruption on Cameroonian government expenditure on education and health. Finally, Foreign Direct Investment (FDI) inflow Inward foreign direct investment can support human development in a host country through three mechanisms: increased employment and income, increased government revenue, and technology diffusion by foreign firms. Such growth drivers collectively contribute to increased national economic competitiveness and human development in the host country (Cervantes et al., 2022). For that reason, it is used as a control variable to examine its impact on the human development index, giving the effect of public spending and corruption on human development.

Table 1. Expected Sign of the Variables

Variables		Expected sign
HD	Human Development Index	+
PES	Public Education Spending	+
PHS	Public Health Spending	+
Controls variables		
CPI	Corruption perception Index	-
GDP	Gross Domestic Product	+
FDI	Foreign Direct Investment	+

3.2. Econometric Models and Estimation Methods

We assume that the model of Ruzima and Veerachamy (2021) seems too simple to support the specificity of Cameroon's public spending and human development. This leads us to a much more detailed model consistent with the study's hypotheses. We have therefore introduced control variables such as the GDP growth rate, foreign direct investment (FDI), and corruption perception index (CPI). These variables would be very relevant insofar as they would consider the country's political, economic, and financial realities. In doing so, the functional form retained is as follows:

$$\sum HDI_t = a_0 + a_1 \sum HDI_{t-1} + a_2 \sum PSE_{t-1} + a_3 \sum LGDP_{t-1} + a_4 \sum FDI_{t-1} + a_5 \sum CPI_{t-1} + e_t \quad (1)$$

$$\sum HDI_t = \beta_0 + a_1 \sum HDI_{t-1} + \beta_2 \sum PSE_{t-1} + \beta_3 \sum LGDP_{t-1} + \beta_4 \sum FDI_{t-1} + \beta_5 \sum CPI_{t-1} + \mu_t \quad (2)$$

Where: HDI: Human development index, PSE: public spending in education, PSH: Public spending on health, LGDP: logarithmic of gross domestic product, FDI: foreign direct investment, CPI: Corruption perception index, t: temporal index, i: lags and ϵ_t, μ_t: Error term.

To estimate the impact of public spending in the education and health sectors on human development, we will use the ARDL model developed by Pesaran et al. (2001). He suggested that the ARDL model is a

novel methodology for improved estimations. It is better suited for evaluating the existence of long-term and short-term associations in a small sample, and, unlike Johansen and Juselius (2009), it allows for testing across variables with varied integration orders.

3.3. Model Diagnostics Tests

We performed some diagnostics tests to see how our estimation results can be considered. We used the following tests: autocorrelation, heteroscedasticity, and normality. The results of these tests are presented in the Table 2 below.

Table 2. Diagnostics tests

Diagnostics Tests	Type of tests	Importance of the tests
Autocorrelation Test	Breusch–Godfrey Test	autocorrelation in the errors in a regression model
Heteroscedasticity Test	White Test	Checking the variances of the error term.
Normality Test	Jarque-Bera	Distribution of the data
Ramsey Reset Test	Reset Test	Detect error specification

For the autocorrelation test, we used the Breusch–Godfrey test. It is a test for autocorrelation in the errors in a regression model. It uses the residuals from the model considered in a regression analysis, and a test statistic is derived from them. The null hypothesis is that there is no serial correlation of any order up to p. Secondly, for the heteroscedasticity test, the null hypothesis of the white test is that the variances for the errors are equal. Finally, for the normality test, the Jarque-Bera test's null hypothesis is a joint hypothesis of the skewness being zero and the excess kurtosis being zero. With a p-value >0.05, one would usually say that the data are consistent with having skewness and excess kurtosis zero.

4. Results

4.1. Descriptive Statistics

Table 3 above shows the summary of descriptive statistics of the variables of study. We observe that, the Human Development Index (HDI) is 0.51. It shows the average of Cameroonian development index. It implies that Cameroon human development is classified as a middle range during 2000-2021. This score let the country being in middle income countries. The minimum value was 0.44 and the maximum was 0.58. it suggests that human development index was quite stable and increase recently.

Table 3. Summary of Descriptive Statistics (N=22)

Statistics	CPI	FDI	HD	LGDP	PES	PHS
Mean	3.522727	1.665665	0.519091	10.41222	2.721484	3.883012
Median	3.500000	1.831411	0.515000	10.46274	2.681894	3.887046
Maximum	4.000000	4.068984	0.580000	10.65551	3.166161	4.297622
Minimum	3.000000	-0.106527	0.440000	10.02393	1.702850	3.465106
Std. Dev.	0.287736	0.956536	0.046179	0.187632	0.323803	0.253617
Skewness	0.012682	0.060488	-0.041502	-0.813048	-1.228068	0.050916
Kurtosis	3.140715	3.504296	1.636256	2.568491	5.596149	1.964729
Jarque-Bera	0.018740	0.246537	1.711130	2.594520	11.70821	0.991975
Probability	0.990674	0.884026	0.425043	0.273280	0.002868	0.608969
Sum	77.50000	36.64464	11.42000	229.0689	59.87266	85.42626
Sum Sq. Dev.	1.738636	19.21418	0.044782	0.739317	2.201812	1.350753

The public education spending is amounted on average at 2.72% of GDP which is very low to meet the needs of the population. Inversely, public health spending is amounted at 3.88% of GDP in average during 2000-2021, it shows that due to Covid-19, public health sector gain more expenditure than education sector but still this percentage is low to meet the significant needs of the population. The control variable CPI showed an average of 3.5, measured on a scale of 1-5, ranging from low to high. It suggests that the level of corruption in the fiscal policy sector is high. Especially recently, it has shown a maximum value of 4 points. For the variable, Foreign Direct Investment (FDI) contributed on average 1.66% of GDP during

2000-2021, which is very low. That means Cameroon was not attractive for foreign direct investment because of the high level of corruption shown during the period.

4.2. Stationarity Testing

Pesaran et al. (2001) stated that Contrary to other co-integration strategies, such as the Johansen approach, the autoregressive Distributed Lags (ARDL) approach does not necessitate univariate root tests on the variables included in the model. However, as noted by Ouattara (2004), if the order of integration of the variables is more significant than one, for example, a variable I(2), the critical values tabulated by Pesaran et al. (2001) are no longer relevant because they are calculated on the assumption that the variables are I (0) or I (1). In other words, it is necessary to ensure that no variable of order 2 (I(2)) is included to adhere to the ARDL method's underlying hypothesis. In this approach, we begin econometric analysis by examining the order of integration of variables using the Augmented Dickey-Fuller (ADF) and Phillips and Perron tests (PP).

Table 4. Result of ADF test and PP

Variable	Level		1st difference		Order of integration
	ADF	PP	ADF	PP	
HDI	0.5295	0.4712	0.0001	0.0000	I(1)
PES	0.0158	0.0080	0.0002	0.0001	I(0)
PHS	0.4196	0.0078	0.0001	0.0005	I(0)
LGDP	0.0055	0.0000	0.0088	0.0109	I(0)
CPI	0.3763	0.6241	0.0002	0.0001	I(1)
FDI	0.0068	0.0067	0.0000	0.0000	I(0)

Note: Prob values, 5% significance level

Table 4 presents prob values of ADF and PP tests. It shows that the series is not in the same order. While some of them are stationary at level (I(0)), others are integrated at order 1 (I(1)). Order 2 does not include any of these variables. Therefore, the method of co-integration that we intend to use in this study is the ARDL approach.

4.3. Co Integration Test

We may now apply Pesaran et al. 's (2001) co-integration test to determine the existence (or absence) of a long-term link between the variables in the two models employed in this study. When the null hypothesis of no co-integration relationship is rejected, there is an ARDL link between the model variables. The Fisher test evaluates this hypothesis, which compares the statistical value to the critical values simulated by Pesaran et al. (2001). These writers provide two values, one for the upper and one for the lower boundaries. When the estimated Fisher statistic value exceeds the upper limit, the absence of the co-integration hypothesis is rejected. If it is greater than the lower limit, it is not rejected and cannot be concluded if it is between the two limitations. Because it is more equitable than the Akaike information criterion (AIC), the Schwarz information criterion (SIC) technique was chosen. The co-integration test findings are shown in Table, and the ARDL empirical results (1, 0, 0, 0, 1, 0) are shown in Table 4, along with the short-term coefficients.

One conclusion can be derived using Fisher's statistics and the Wald test. In both the two models, there is no long-term association between the human development index, public education spending, public health spending, gross domestic product (GDP), Foreign Direct Investment (FDI), and Corruption Perception Index (CPI). Indeed, the Fisher statistic associated with the absolute value of the Wald test (-1.63) is lower than the upper bound of the absolute value of the critical value of the test limit (-3.43). Therefore, this enables us to confirm the existence of a long-term relationship between the human development index, public spending in education (PSE), public spending in Health (PSH), gross domestic product (GDP), Foreign Direct Investment (FDI), and Corruption Perception Index. Therefore, in Cameroon, the corruption perception index and public education and health spending affect the human development index only in the short run, not in the long run. The second step is to identify the short-term coefficients of the models estimated using the ARDL approach, as there is no long-run relationship.

Table 5. Co-integration Test Rest

Model	Critical values						F-wald test
	1%		5%		10%		
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	
HDI (PSE, PSH LGDP, CPI, FDI)	-3.43	-4.79	-3.13	-4.46	-2.57	-3.86	-1.63

4.4. Estimation of ARDL Model

The estimation results of the short-run effects are presented in Table 6. It shows that R2=90%. It means that the models are statistically significant overall. Therefore, the PSE, PSH, CPI, GDP, AND FDI explain 90% of the variation of HDI. These relationships are not valid in the short run. In the long run, the variables are not co-integrated. The coefficients of the short run are presented in the following table.

Table 6. Short Run Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
HDI(-1)	0.720273	0.189889	3.793130	0.0022
CPI	-0.010600	0.015873	-0.667794	0.0515
FDI	-0.007762	0.004385	-1.770262	0.1001
LGDP	0.147551	0.053136	2.776864	0.0157
PSE	0.004319	0.002313	1.867339	0.0846
PSE(-1)	-0.004992	0.001733	-2.881116	0.0129
PSH	0.002953	0.001194	2.472148	0.0280
C	-1.370231	0.532671	-2.572377	0.0232
R-squared	0.901488	Mean dependent var		0.513263
Adjusted R-squared	0.848443	S.D. dependent var		0.036621
S.E. of regression	0.014257	Akaike info criterion		-5.380864
Sum squared resid	0.002642	Schwarz criterion		-4.982951
Log-likelihood	64.49907	Hannan-Quinn criteria.		-5.294507
F-statistic	16.99475	Durbin-Watson stat		2.387965
Prob(F-statistic)	0.000013			

Based on the above results, For the first hypothesis, the p-value (0.08) of PSE is less than 0.1 at the 10% level, and the p-value (0.01) of PSE lag one is also less than 0.05. Therefore, we reject the null hypothesis; we accept the alternative one. This means that public education spending affects the variation of the human development index in Cameroon. Similarly, for the second hypothesis, the p-value (0.02) of PSH is less than 0.05. Consequently, we reject the null hypothesis and accept the alternative one. That means public health expenditure directly affects the variation of the human development index in Cameroon. On the other hand, specific hypothesis validation tests are required to confirm not only the correct specification of models but also the coefficient stability. It is the test of error autocorrelation, normality test, specification test, and heteroscedasticity test.

4.5. Model diagnostics tests

Table 7. Diagnostics test results

Diagnostics Tests	Type of tests	P-value
Autocorrelation Test	Breusch–Godfrey Test	0.203
Heteroscedasticity Test	White Test	0.295
Normality Test	Jarque-Bera	0.350
Specifications Errors	Ramsey RESET test	0.0853

4.5.1. Autocorrelation Test

The autocorrelation of residues was investigated using the Breusch-Godfrey Lagrange multiplier test for residues of order n. Under the null hypothesis, all autocorrelations are statistically null. Acceptance of

the null hypothesis demonstrates that there is no residual autocorrelation. The null hypothesis is rejected if the calculated Breusch-Godfrey statistic is less than the critical value. If the critical probability of this statistic exceeds the 5% significance level, the null hypothesis is accepted. The p-value associated with the Breusch-Godfrey test statistics is 0.203, higher than 0.05. As a result, the error autocorrelation null hypothesis is accepted.

4.5.2. Heteroscedasticity Test

Several tests can detect heteroscedasticity, including the Breusch-Pagan test, the Goldfeld test, the Gleisjer test, and the White test. In our study, we use the white test to assess heteroscedasticity. The following are the decision criteria: H0: homoscedasticity. H1: heteroscedasticity; The homoscedasticity hypothesis is rejected if the test probability is less than 5% (H0). If the probability is greater than 5%, the null hypothesis is confirmed, and we can assume homoscedasticity of the residuals. The p-value (0.295) is greater than 5% in our case. As a result, we do not reject the null hypothesis of homoscedasticity. Consequently, the variance of the errors is homoscedastic.

4.5.3. Normality Test

JARQUE et BERA's J-B test was used to determine the normality of the residues. This test is based on a two-degree-of-freedom Chi-square distribution. He developed the normal residue distribution null hypothesis, which is accepted only if the p-value of J-B statistics is less than 0.05. This residue normality is also reached when the critical probability exceeds 5%. As a result, the p-value for J-B statistics (0.350) is higher than 0.05 at a 5% significance level. The conclusion is that residues are typically distributed.

4.5.4. Specification test

The Ramsey RESET test was used to determine whether there were any missing variables in the model and whether the specification was correct. This test employs successive regression by adding additional variables to the initial regression. The estimated coefficients of additional regressors are statistically null under the null hypothesis, implying no specification errors or missing variables. The null hypothesis is also accepted if the F-RESET statistical probability is greater than the significance threshold (currently 5%). The probability of F-RESET is 0.0853, according to our calculations. As a result, the model has no missing variables, and the specification is satisfactory.

5. Discussion

In this part, we will discuss the findings of this study based on theoretical and empirical studies conducted on this topic. After that, we will draw policy recommendations based on our discussion of the findings.

5.1. Public Spending in Education and Health

Public spending in the education and health sectors is positively related to the human development index. Because the p-value (0.08) of PSE is less than 0.1 at a 10% level, and the p-value (0.01) of PSE lag 1 is also less than 5%. Similarly, the p-value (0.02) of PSH is less than 0.05. It shows that when public spending on education increases by one unit, the human development index will increase by 0.004. Likewise, when public spending on health increases by one unit, the human development index will increase by 0.002. These results contradict the Classical, Neoclassical, and public choice theorists' views on government expenditure. They argued that government spending is detrimental to economic development because of the crowding-out effect, which occurs when government spending displaces vital investments by the private sector due to resource restrictions. As a result, the two have a negative association (Lowenberg, 1990). According to public choice theorists, as government size grows and given the distortionary effects of taxation, government levels of inefficiency are sure to rise. So, government spending is bound to hinder economic growth. As a result, it tends to be detrimental to economic development. Once more, government spending results from the "crowding out effect." The interest rates rise as soon as the government borrows to finance an increase in the deficit. So, the higher interest rates discourage or "crowd out" private investment, which causes a decrease in growth (Lowenberg, 1990). Similarly, the rise of the public sector will be driven by the decrease in the private sector due to resource constraints.

Moreover, the empirical evidence of (Maharda & Aulia (2020)) in Indonesia, Laisina et al. (2015) in South Sulawesi, and Nkemgha et al.(2021) in the Cameroonian context showed that government spending in education and the education health sector does not influence human development index. It implies that government expenditure is blocked by other variables that could prevent the actual effect on the human development index. However, empirical evidence from Ammad et al. (2012) in Pakistan, Patel & Annapoorna (2019) in India, and Salman & Rasyidin. (2020) and Nurjannah et al.(2022)) confirmed the positive impact of government expenditure on the human development index. Their findings could be explained by the fact that their country of study possesses a high transparency index towards fiscal policies, and the percentage of public expenditure on GDP is also high compared to the Cameroonian context. Consequently, it will affect the target variables of human development, such as increasing life expectancy, literacy rate, and health condition.

5.2. Corruption Perception Index

The corruption perception index measures the degree of transparency in public policy. The index ranges between 1- and 6. A higher index value implies a higher level of non-transparency. The Corruption Perception Index (CPI) variable is also found to affect human development negatively. It suggests that the human development index decreases when the corruption perception index increases. Therefore, it shows that public policy is highly powered by corruption, especially the non-transparency of the policies. This finding validates the results of Hysa (2016), Murshed and Mredula (2018), and El Jabri and El Kider (2020). They argued that a statistically significant negative relationship exists between corruption perception and the human development index. Moreover, they demonstrated that poor countries have lower levels of human development because of corruption, which hinders the efficacy of public spending. However, Nguemegne (2011) demonstrated in her study of 40 African countries that countries with a level of corruption less than or equal to 4.577 on Transparency International's perception of corruption index positively impact human development. Nevertheless, these findings could not be generalized in single-country analysis.

5.3. Gross Domestic Product

The variable GDP is found to be positively significant on the human development index in Cameroon. It was used as a control variable to observe the indirect effect of public spending on the human development index. Similar results were found in The works of Elistia and Syahzuni (2018). In ten ASIAN countries, Khodabakhshi (2011) for India and Chikalipah & Okafor (2019) for Nigeria made similar findings. Their research indicated a significant association between the human development index and economic growth. Moreover, Ammad et al. (2012) in Pakistan and Maharda and Aulia (2020) in Indonesia suggested a strong relationship between economic growth and human development index. They claimed that a rise in economic growth would make it possible to plan investments in social, physical, and intellectual development to raise the overall human development index. They argued that economic growth considerably impacts the human development index after being used as an independent variable with fiscal policy variables. That suggests that improving economic growth will have a favorable impact on the standard of healthcare and education. As a result, these factors help to increase the human development index.

5.4. Foreign Direct Investment

FDI is used as a control variable to capture the indirect effect of public expenditure on the human development index. It is found to be negatively insignificant, affecting the human development index in Cameroon. It implies that the Cameroonian government is not able to use foreign investment to improve the human development sector. It is worth noting that the quality of institutions could not ease the circulation of foreign investment. Consequently, foreign investment has a negative influence on the human development sector. These results contradict the findings of (Cervantes et al., 2022). They argued that FDI has a positive influence on the human development index. However, the results of the present finding could be justified by the fact that there would be some issues, such as corruption and the quality of the institutions of Cameroon. Therefore, these factors can hinder attracting new investment, as the institutions are weak.

6. Conclusions

This study indicates that all variables are stationary regarding level or difference, which led to using the ARDL methodology. The limit test developed by Pesaran et al. (2001) enabled us to identify the presence

of a single short-term effect: the model in which public spending in education impact negatively affects the variation of the human development index while public spending in the health sector, does not have any significant relationship with human development index. However, Economic Growth (GDP) positively affects the variation of the human development index. Based on our findings, we made several recommendations. These recommendations aim to improve the investment climate, financial and economic governance, and public spending field. The government should increase the expenditure budget and expand the target sector to reach the needed sector for human development. This should be done by creating social projects in the vulnerable sector and creating projects to finance primary and secondary education. This implementation could be followed by improvement of transparency in fiscal policy management, which can help to reduce the corruption perception index. As a result, transparency in policy management will lead to sound management of government projects to achieve human development.

Moreover, the government should implement tax reduction policies in the sectors promoting increasing economic growth, such as SMEs and start-ups. These policies will improve the investment and production of the economy by providing a suitable environment for future innovation and welfare development. To that end, it is necessary to promote manufacturing equipment modernization, productivity improvement, access to financing, and the business climate, as well as promote local industry growth and economic diversification. These economic reforms could have a more significant positive impact on investment incentives in Cameroon. Finally, it is necessary to emphasize the importance of combating corruption and improving financial and economic governance to improve the efficiency of government expenditure in enhancing human development in Cameroon. Whether or not the intended goal is met, this work establishes preliminary research that will serve as a springboard for future, more in-depth studies. Among the limitations of this research is the use of one country of study and period of observation. This occurred due to the availability of the data. Future research should include more countries and use comprehensive years of observation and other variables not used in this study. Therefore, the relationship between public spending and human development in the CEMAC Zone is another critical question that could be researched as this work progresses.

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