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Impact of HDI on Economic Growth in Ethiopia: Regional Analysis

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Abstract
Human development encompasses much more than just economic growth. While human development focuses on expanding all human alternatives, such as education, health, a clean environment, and material well-being, economic growth concentrates on improving one option, such as income or product. Ethiopia is ranked 175th out of 191 nations and territories with an HDI value of 0.498 for 2021, placing it in the Low human development category. Ethiopia's HDI score has always been lower than the world average and Sub-Saharan Africa average. Compared to all regions in Ethiopia, Afar, and Somali registered the least average HDI score during 2000-21. The Ethiopian Gender Development Index (GDI) noted 0.921, which is the ratio of female HDI to male HDI, indicating that on average, female HDI is 8 percent lower than male HDI. Stated another way, the female HDI value is on average 92 percent of the male HDI. From the panel regression, there is a significant and systematic relationship between HDI and LGNPCI because the HDI has positive coefficients and probability values less than 0.01 in the three estimated regression models. This suggests that the Human Development Index positively impacts the per capita income of each of Ethiopia's 11 regions. Increasing public investment in health and education can lead to better health and skill outcomes for the populace, raising life expectancy and income levels. Rising per capita income and life expectancy can help a nation's economy grow.

Keywords: HDI, Per capita Income, GDI, Ethiopia, Regions, Panel Regression.

1. Introduction

An overview of average performance in important areas of human development is provided by the Human Development Index (HDI). Three fundamental components of the Human Development Index (HDI) are knowledge, a good standard of living, and a long and healthy life. The inaugural Human Development Report revealed a new strategy for enhancing human welfare in 1990. Human development aims to increase the richness of human life rather than only the economy in which people live. It is a strategy that is centered on individuals, their potential, and their options. The quality of the population has a significant impact on economic growth. Therefore, investment in human capital through social initiatives for health, education, and other issues is advantageous. The improvement of people's skills, knowledge, and talents through human resource development increases productivity.

According to the United Nations Development Programme (UNDP), human development may be defined as "a process of enlarging people's choices." At all levels of development, the three essential choices for people include having access to the resources required for a respectable level of living, learning more, and leading long, healthy lives. Numerous more opportunities to enhance one's quality of life will remain unavailable if these crucial options are not available. The two facets of human development are the acquisition of human capabilities and their application for leisure, production, and other objectives. Since people are at the heart of human growth, the advantages extend well beyond increases in income and material accumulation. There is much more to human progress than merely economic expansion. Economic growth focuses on improving one option i.e., income or product while human development focuses on enlarging all human options including education, health, a clean environment, and material well-being. The quality of economic growth in its widest meaning, therefore, affects the potential for improving people's lives, and this influence is not limited to the quantitative aspects of such growth. In other words, economic growth needs to be seen as a means, albeit an important one, and not the goal, of development. If the advantages of income are converted into happier, more fulfilling lives, then it significantly contributes to human well-being in the widest sense. However, income increase is a continuous process. For human well-being, growth's quality rather than just its quantity is essential.

Therefore, the idea of human development focuses primarily on making it possible for people to live better lives, which is the aim of human endeavor. emphasises that achieving this objective will require more than just increases in money or material well-being. As stated in the Human Development Report of 1996, growth can be cruel instead of decreasing poverty, jobless instead of creating jobs, voiceless instead of participatory, rootless instead of culturally embedded, and futureless instead of environmentally benign. A jobless, cruel, voiceless, rootless, and futureless economic expansion is not good for human development. A person can be impoverished in many ways, such as having a short and sick life, being illiterate or unable to participate, feeling insecure, etc. Lack of money or income poverty is just one facet of poverty.

2. Review of Literature

According to *Sen (1988),* growth and development are two distinct concepts. Economic growth is concerned only with improvement in GDP per capita and does not explain the distribution of GDP among the population. It is possible that a country or a society has greater expansion in GDP per capita but has an unequal distribution of income. The poor section of society may get little benefit from GDP per capita growth. He says GDP is only a means to achieve well-being but not an end. Development is a very broad concept. It relates to "what people can actually do and be." He argues that a basic distinction should be made between the means and the ends of development. Development focuses directly on the lives of people. The development process is more linked with the elimination of different ills of society such as hunger, undernutrition, and child mortality. *Baldacci, Emanuele. (2008).* He explores If the capital region's development is based on its people resources, then having enough teachers or teaching staff is essential to the development's success. The achievement of human development will be positively impacted if the quantity of available educators is equal to the number of schools. Human growth will proceed more slowly if there are not enough instructors.

Miraç Eren (2014), This paper aims to examine the factors affecting the level of development of countries using various regression models for limited dependent variables including binary Logit, Probit, and Tobit analyses. In this manner, the paper may suggest a road map for high developed countries to achieve very high developed levels. For this purpose, Human Development Indices of 84 countries were involved in the analysis concerning nine independent variables. The results of all regression models indicate that determinants including life expectancy at birth, expected years of schooling, labor force participation rate (female-male ratio), and GDP per capita have statistically significant effects on the level of development. *R Ramesh (2014),* In his study, explores the reflection of recorded economic growth on human development in Ethiopia. The study's main goal is to determine whether life expectancy, educational attainment, and the decline in economic poverty during the previous ten years are positively correlated with per capita income levels. We have tried to draw comparisons between Ethiopia and a few Eastern African nations to place Ethiopia in a broader context. The exercise's outcomes demonstrate how Ethiopia's economic expansion has aided in the advancement of humanity. Although life expectancy increases more quickly than educational attainment, income, life expectancy, and school attainment all advance in tandem. *Capital News (2019),* the news report, launched on Tuesday, December 10, 2019, at Skylight Hotel in Addis Ababa under the theme: "Beyond income, beyond averages, beyond today: inequalities in human development in the 21st century," the 2019 Human Development Report (HDP), says, new inequalities are becoming more pronounced, particularly around tertiary education, seismic effects of technology and the climate crisis making it harder for those already behind to catch up. The most recent survey data publicly available for Ethiopia's MPI estimation refers to 2016. In Ethiopia, 83.5 percent of the population are multidimensionally poor while an additional 8.9 percent are classified as vulnerable to multidimensional poverty. Ethiopia is ranked 173 out of 189 in the 2019 version of the Human Development Index (HDI) placing it at the back of the pack when it comes to the HDI criteria.

Klara Shinta Claudia, Muhammad Arif (2022), The main purpose of this research is to characterize the extent and direction of the effects of educators, healthcare professionals, and government spending on social assistance, health care, and education on the Human Development Index (HDI) for residents of Semarang between 2016 and 2020. It also employed a quantitative approach with the descriptive design using the analysis of panel data regression. The results showed that the region with the highest level of human development was Salatiga city of Semarang Residency. Based on the significant test, the educators (TENDIK) and government expenditure on health (KES) had a positive effect on the Human Development Index (HDI) while the health workers (NAKES), government expenditure of education (PEND), and social aid (BANSOS) took a negative effect on the (HDI). *Gemeda, F. T. (2023*), in this paper, the review examined Ethiopian human development concepts, theories, techniques, and practices to make recommendations on how to enhance both the current situation of human development and its potential applications in Ethiopia. Ethiopia therefore had a lower human development index (HDI) than sub-Saharan African nations and those with low HDI. Compared to other emerging nations, it also has lower averages for predicted school years, mean school years, and birth weight. Also, on average, its gross national product per person is lower. Most people run the risk of going hungry because they do not have access to enough food to survive. The government will therefore be urged to adopt policies that will increase society's output and productivity and implement human-centered development projects. Saifaddin Galal (2024), in this article, reviewed the human development index from Ethiopia during 2000-2022. In 2022, Ethiopia scored almost 0.5 in the Human Development Index (HDI), which indicated a low level of development. The country experienced no change in the HDI score since 2019. However, an improvement was recorded from 2000 onwards. That year, Ethiopia's score was 0.29, meaning that the country had a lower human development. The country's categorization was low throughout the period under review.

Given the significance and necessity of human development, several scholars have tried to examine the evolution of HDI in Ethiopia. Nevertheless, regional HDI analysis in Ethiopia is not described in the above research rewires. This study assessed the HDI's increase and variance in Ethiopia and all other regions between 2000 and 21. This study used panel data regression analysis to evaluate how the HDI affected log gross national per capita income across all Ethiopian regions from 2000 to 21.

3. Objectives of the study

The Ethiopia HDI and its regional performance from 2000 to 21 were the primary subjects of this article. The second is to examine Ethiopia's and the region's HDI's increase and fluctuations from 2000 to 21. Third, to explore Ethiopia's and all regions' Gender Equality Index from 2000 to 21. Ultimately, panel data regression analysis was used to evaluate how the HDI affected log gross national per capita income across all Ethiopian regions from 2000 to 21.

4. Data Set, Variables and Methodology

The Human Development Index (HDI), Education Index (EI), Health Index (HI), Income Index (II), Gender Development Index (GDI), and Log Gross National Per capita Income (LGNPCI) are among the data used in this research paper that are based on secondary sources. The data was collected from the global data lab (www.globaldatalab.org). Data for this study was gathered between 2000 and 2021 for all 11 regions in Ethiopia.

The HDI disparity and gap between Ethiopia, Sub-Saharan Africa, and the rest of the world were first noted in this research. Secondly, ascertain the trends and basic forecast for Ethiopia's HDI and verify the rankings of every region in Ethiopia. Third, use the compound growth model to obtain the Annual Compound Growth Rates (ACGR) for each region in Ethiopia. Fourth, each region's observed Gender Development Index. In the end, use a panel regression model to evaluate the relationship between each of the 11 regions of human development and economic growth. In order to analyze the relationships between HD and EG, the HDI were used as independent variables. The dependent variable was Log Gross National Per Capita Income (LGNPCI) rather than GDP since foreign nationals in many nations make substantial contributions to the growth of their economy; these contributions are recorded in the LGNPCI rather than the GDP.

The Panel Regression Model

The functional expression of the panel regression model is presented in Eq. (1). In the model, Log Gross National Per Capita Income (LGNPCI) is the predicted variable while Human Development Index (HDI), is the predictor variable of the model.

$$LGNPCI = f(HDI) \ldots\ldots\ldots (1)$$

Eq.1 The functional model can be expressed in Panel Regression Model form as in Eq. (2)

$$LGNPCI_{it} = \alpha_0 + \alpha_1 HDI_{it} + u_{it} \ldots\ldots\ldots (2)$$

Equation (2) is the principal equation that is used to conduct regressions and other calculations for data analysis. In Eq. (2), α_0 shows the constant term, while α_1 represents the coefficient that specifies the relationship between the predicted variable and the predictor variable; u_{it} is the error term for region i at time t.

Where LGNPCI is Log Gross National Per Capita Income; HDI is the Human Development Index.

Panel data techniques are now widely used to estimate dynamic econometric models to capture dynamic effects, which is its basic advantage over cross-sectional data (Bond, 2002). Its advantage over aggregate time series data includes the possibility that aggregate basis may obscure underlying microeconomics dynamics. Specifically, panel data offers options for investigating heterogeneity effects resulting from the cross-sectional components of the sample and the adjustment dynamic resulting from the time series component. The dynamics of the panel data are presented in fixed and random effects, and these effects are primarily based on the assumption about the error term. The OLS is used to stacked data for the pooled regression; this means that the data's cross-section and time series independence are ignored. The common intercept and slope vector are efficiently and consistently estimated by the model. This research analysis was conducted with the help of MS Excel, *SPSS, and EViews* and for visualization using MS Excel and Tableau software.

5. Results and Discussions

The Human Development Index (HDI) is a blend of numerous statistical factors such as life expectancy, education, and per capita income employed to stratify nations into four segments of human development. The HDI uses the average annual income and educational expectations to rank and compare with other countries to measure the level of development of individuals in all the countries.

A country's Human Development Index value is determined by aggregating the country's scores in various indicators including life expectancy, literacy rate, and standard of living. These indicators are compiled into a single number between 0 and 1.0, with 1.0 being the highest possible human development. HDI is divided into four layers: very high HDI (0.8-1.0), high HDI (0.7-0.79), medium HDI (0.55-0.70), and low HDI (below 0.55).

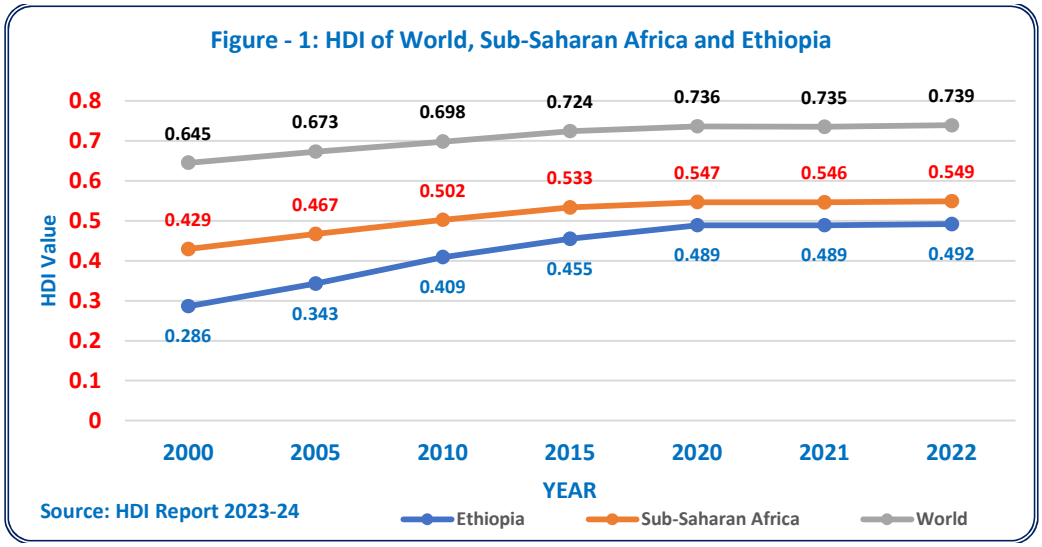
Switzerland, Norway, Iceland, Hong Kong, Australia, Denmark, Sweden, Ireland, Germany, and the Netherlands are among the top ten countries with the highest HDI scores in the world. Switzerland, Norway, and Iceland take the top three spots as the countries with the highest HDI scores, at 0.96. Hong Kong, Australia, Denmark, Sweden, and Ireland, all come next with HDI scores of 0.95. Germany and the Netherlands come in ninth and tenth position, with an HDI score of 0.94. Switzerland is well renowned for having a comprehensive social system that enables individuals to maintain their quality of living and an economy driven by banking and financial services, due to its diverse economy, which is focused

on oil production and export. Norway is one of the richest countries in the world and has a very low unemployment rate. Iceland is regarded as one of the most developed nations in Europe in terms of life expectancy, access to healthcare, and economic strength and diversification.

5.1 HDI Trends in Ethiopia

The United Nations Development Programme developed the Human Development Index, or HDI, as a tool to measure a nation's "average achievement in three basic dimensions of human development: a long and healthy life, knowledge, and a decent standard of living." Over 90 percent of the 191 countries examined for the 2021-22. HDI reports experienced a fall in total HDI in either 2020 or 2021, even though HDI tends to move upward globally over time. The COVID-19 pandemic and its residual consequences were mostly blamed on HDI, for these decreases.

From the UNDP report, HDI data reveals, Ethiopia, and the rest of the world between 2000 to 2022 show that though Ethiopia's HDI score has always been lower than the world average and Sub-Saharan Africa average, it has been converging, with the gap narrowing from 0.359 in 2000 to 0.247 in 2022 relative to the world HDI, and from 0.143 to 0.057 to the Sub-Saharan Africa' HDI. However, the gap between Ethiopia and the rest of the world has almost halved in the last 20 years. This was even though Ethiopia's HDI has remained broadly unchanged since 2020.

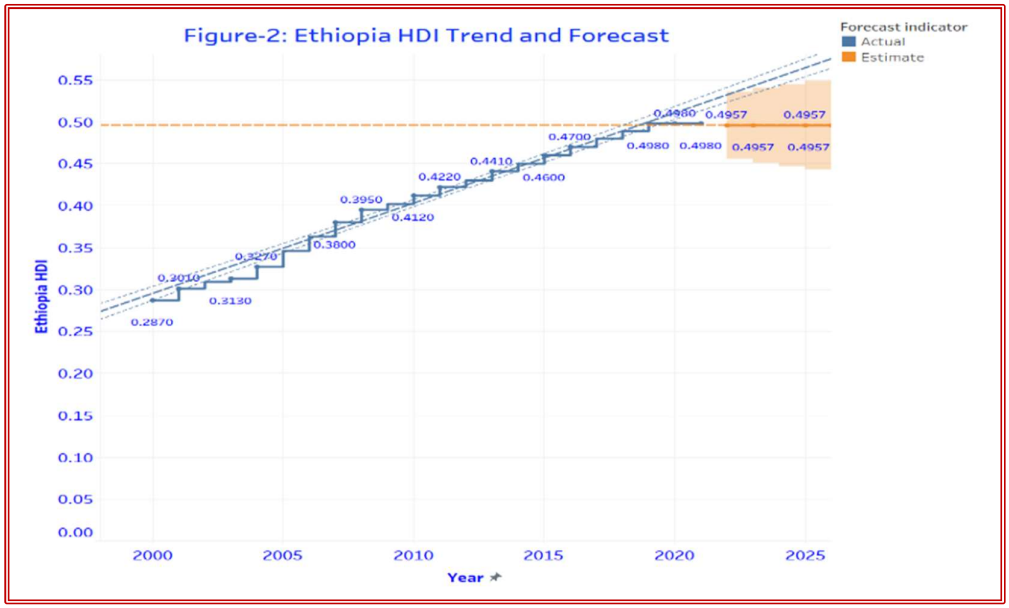


Ethiopia HDI trends from 2000 - 2021.

The criterion in the HDI is the standard of living, which means the level of wealth, comfort, and material goods available to people. Ethiopia's standard of living increased by more than 100 percent between 1985 and 2012 (UNDP, 2013). Despite this achievement, Ethiopia's standard of living remains one of the lowest in the world.

According to the UNDP report, the HDI is a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge, and a decent standard of living. Figure-2, presents Ethiopia's HDI trends during 2000-2021 and its forecast up to 2025. Ethiopia's HDI value for 2021 is 0.498 which put the country in the Low human development category positioning it at 175 out of 191 countries and territories.

Between 2000 and 2021, Ethiopia's HDI value changed from 0.287 to 0.498, a change of 73.5 percent. Between 2000 and 2021, Ethiopia's life expectancy at birth changed by 14.4 years, mean years of schooling changed by 1.7 years, and expected years of schooling changed by 5.3 years. Due to a history of poverty, drought, poor healthcare, disease, famine, and conflict, Ethiopia has one of the lowest levels of development in the world



Ranking of HDI and its Components for all Regions in Ethiopia during 2021.

This section presents the empirical results of the calculated Human Development Index (HDI), Education Index (EI), Health Index (HI), and Income Index (INI). Eleven regions of Ethiopia are ranked based on the current values of HDI, EI, HI, and INI. These ranks indicate the inequalities of human development.

The results of HDI have been presented in Table 1. The results indicate that overall Ethiopia is not in a better position in human development. The HDI value of Ethiopia is 0.498 which is not comparable with HDI developed nations. UNDP classification, Addis Ababa region joined with high HDI, accounting 0.741, Keeping in view UNDP criteria, three (Harari, Dire Dawa, and Gambela) regions club with medium HDI category. Whereas seven (Tigray, SNNP, Ben-Gumz, Oromiya, Amhara, Somali, and Afar) regions in Ethiopia fall in the low HDI category. During 2021, as per the ranking, Addis Ababa region occupied the first rank, followed by Harari, Dire Dawa, Gambela, Tigray, SNNP, Ben-Gumz, Oromiya, Amhara, and the last position reserved for both Somali and Afar regions. Figure 3 represents HDI falls in the different areas in Ethiopia. In Figure 3, Dark color and large bubbles represent the High HDI region, and medium color, and medium size bubbles represent the medium HDI region. Finally, light color and small size bubbles fall into the Low HDI regions in Ethiopia.

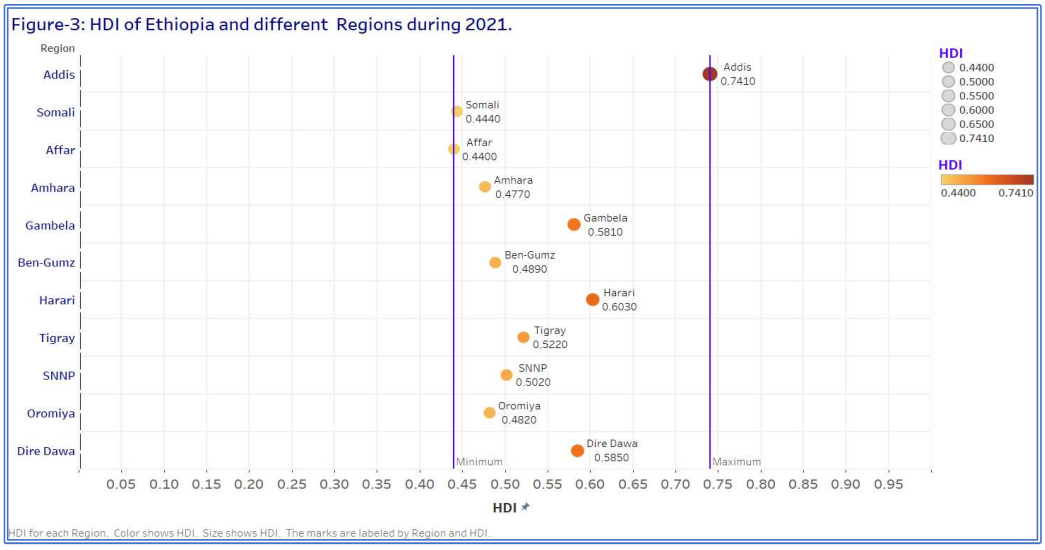


Table 1: Human Development Index [HDI] Rank of all Regions in Ethiopia during 2021.

All Regions in Ethiopia	*HDI*	*Rank*	*Education Index*	*Rank*	*Health Index*	*Rank*	*Income Index*	*Rank*
Addis	0.741	1	0.69	1	0.797	1	0.74	1
Afar	0.440	11	0.289	10	0.607	11	0.484	6
Amhara	0.477	9	0.348	8	0.684	5	0.456	11
Ben-Gumz	0.489	7	0.385	7	0.658	10	0.461	8
Dire Dawa	0.585	3	0.493	4	0.668	8	0.607	3
Gambela	0.581	4	0.571	2	0.678	6	0.507	4
Harari	0.603	2	0.507	3	0.712	3	0.609	2
Oromiya	0.482	8	0.344	9	0.698	4	0.467	7
SNNP	0.502	6	0.408	5	0.677	7	0.457	10
Somali	0.444	10	0.287	11	0.665	9	0.459	9
Tigray	0.522	5	0.386	6	0.745	2	0.495	5
Source: globaldatalab.org								

To help the lowland regions of Somalia, Oromia, and the Southern Nations Nationalities and Peoples afflicted by the drought, the World Bank has been collaborating closely with the Ethiopian government. During 2023, support was accelerated through ongoing operations focusing on pastoral livelihoods, productive safety nets, and water. In early 2022, World Bank-financed operations working on water, livestock, and safety nets were reprogrammed to deliver $121 million in rapid financing. Longer-term solutions in these areas will be supported by recent operations that concentrated on groundwater management and animal markets. As per the global data lab for Ethiopia from 2000 to 2021. The average value for Ethiopia during that period was 0.407 points with a minimum of 0.283 points in 2000 and a maximum of 0.498 points in 2021. From the analysis, the growth registered 2.70 per annum and was statistically significant at a 1 percent level.

All region's HDI growth during 2000-2021 in Ethiopia

From Table 2, the lowest average HDI score recorded in the Somali and Afar regions accounted for 0.351 points from 2000 to 2021. Compared to all regions in Ethiopia, Afar, and Somali registered the least average HDI score during 2000-21.

Table 2: Human Development Index [HDI] trend during 2000-2021

Ethiopia and All Regions	***Average HDI***	***STDEV***	***CV***	***R^2-val***	***ACGR***	***t-val***	***p-val***
Ethiopia	0.40777	0.070534	17.2975	0.963	2.70	22.704	0.000**
Addis	0.63436	0.073509	11.5879	0.982	1.80	33.498	0.000**
Afar	0.35100	0.077622	22.1145	0.913	3.50	14.482	0.000**
Amhara	0.38423	0.073577	19.1492	0.957	3.00	21.009	0.000**
Ben-Gumz	0.39268	0.070247	17.8891	0.983	2.80	34.355	0.000**
Dire Dowa	0.50664	0.061589	12.1564	0.946	1.90	18.781	0.000**
Gambela	0.45773	0.089288	19.5067	0.969	3.00	24.938	0.000**
Harari	0.51241	0.069525	13.5682	0.956	2.10	20.791	0.000**
Oromiya	0.39923	0.064545	16.1674	0.953	2.60	20.094	0.000**
SNNP	0.40814	0.072649	17.8000	0.966	2.80	23.843	0.000**
Somali	0.35077	0.084356	24.0488	0.899	3.80	13.322	0.000**
Tigray	0.42441	0.075990	17.9049	0.964	2.80	23.115	0.000**

Source: Authors calculations, ACGR: Annual Compound Growth Rate, STDEV: Standard Deviation,
CV: Coefficient of Variation, **-Significant at 1 % Level, *- Significant at 5 % Level, NS-Not Significant.

From the analysis, the highest average HDI score for Addis Ababa region was at 0.6344 points, followed by Harari (0.51241), Dire Dawa (0.50664), Gambela (0.45773), Tigray (0.4244), SNNP (0.40814), Oromiya (0.39923), Ben-Gumz (0.39268), and Amhara (0.38423). From the growth analysis, the highest growth was registered in Somali and Afar regions accounting for 3.80 and 3.50 percent per annum during 2000-2021, but compared to all regions both regions scored least average HDI score during the same period. From the overall observation, on average, all regions registered low HDI scores except the Addis Ababa region.

5.2 Gender Development Index in Ethiopia: All Regions

The Gender Development Index measures the gender gap in human development achievements by accounting for disparities between women and men in three basic dimensions of human development such as a long and healthy life,

knowledge, and a decent standard of living. The GDI is the ratio calculated as female HDI to male HDI. Table 3 revealed the regional Gender Development Index and three dimensions in Ethiopia during 2021.

The Ethiopian gender development index noted 0.921, which is the ratio of female HDI to male HDI, indicating that on average, female HDI is 8 percent lower than male HDI. Stated another way, the female HDI value is on average 92 percent of the male HDI. The GDI was calculated for 11 regions in Ethiopia. There is a wide range of variation among regions. There is huge Gender inequality in HDI values is highest in the Somali region where the GDI value is only 0.848. In other words, female human development achievement is only 84.8 percent of males, which means female HDI is 16 percent lower than male HDI. In the Afar region, Gender inequality value is only noted at 0.882, which means, female human development achievement is only 88.2 percent of males. The Oromiya, Harar, and Dire Dawa region's gender development index was 0.89, which means the female HDI is 11 percent lower than the male HDI. In the Ben-Gumz region, the Gender inequality value is only 0.867, which means, that female human development achievement is 86.7 percent of males, in other words, the female HDI is 14 percent lower than the male HDI. The gender inequality value is lowest in the Addis Ababa region where the GDI value is only 0.966, which means female human development achievement is 96.6 percent of males, followed by Amhara (0.958-Women achievement is 95.8 percent), Tigray (0.948-Women achievement is 94.8 percent), Gambela (0.933-Women achievement is 93.3 percent), and SNNP (0.910-Women achievement is 91.0 percent).

Table 3: Regional Gender Development Index in Ethiopia during 2021

Region	GDI	HDI female	HDI male	Health index females	Health index males	Educational index females	Educational index males	Income index females	Income index males
Ethiopia	0.921	0.478	0.519	0.704	0.683	0.345	0.407	0.448	0.502
Addis	0.966	0.730	0.756	0.830	0.780	0.666	0.720	0.704	0.770
Afar	0.882	0.411	0.466	0.598	0.599	0.256	0.332	0.455	0.509
Amhara	0.958	0.466	0.487	0.695	0.676	0.342	0.356	0.427	0.479
Ben-Gumz	0.867	0.452	0.521	0.662	0.650	0.322	0.449	0.432	0.485
Dire Dawa	0.898	0.552	0.615	0.675	0.660	0.435	0.557	0.574	0.634
Gambela	0.933	0.560	0.600	0.687	0.670	0.535	0.605	0.477	0.532
Harari	0.897	0.571	0.636	0.729	0.703	0.443	0.577	0.576	0.636
Oromiya	0.897	0.455	0.507	0.712	0.689	0.301	0.384	0.438	0.492
SNNP	0.910	0.478	0.525	0.686	0.669	0.371	0.449	0.428	0.481
Somali	0.848	0.407	0.480	0.671	0.657	0.234	0.348	0.43	0.483
Tigray	0.948	0.510	0.538	0.769	0.733	0.371	0.409	0.465	0.519

Source: Globaldatalab.org, GDI-Gender Development Index, HDI-Human Development Index

5.3 Impact of HDI on Economic Growth in Ethiopia: Regional Analysis

Panel Stationary Test

We employ the Johansen panel co-integration test for Log Gross National Per capita Income (LGNPCI) and HDI in the present study. Still, before this test, the data must be examined for panel stationary or non-stationary.

If the variables in a panel data set are nonstationary, estimators are inefficient unless cointegrated. The literature has investigated these topics in detail. For this purpose, we used the panel unit root test. The stationary test is helpful to avoid spurious and biased results, which may lead to false conclusions. To avoid this problem, the study conducted unit root tests for all the variables. Before the Panel regression estimation, it is essential to check whether the included variables are stationary or not. To identify the order of integration of the variables used in the study, four-panel unit root tests are employed: Levin, Lin, and Chu "LLC" (2002); Im, Pesaran, and Shin "IPS" (2003); Augmented Dickey-Fuller (ADF); and Phillip-Perron (PP). The results are reported in Table 4, the result of all LLC, IPS, ADF, and PP shows that is stationary at the first difference for LGNPCI, which means it is stationary at I(1). HDI variable is stationary at the second difference, which means it is stationary at I(2).

Table 4: Panel Unit Root Test

Variables	**Stationary Level**		**Tests**				**Status**
			LLC	**IPS**	**ADF**	**PP**	
Include in the test equation: Individual intercept							
LGNPCI	*At Level*	*Statistic value*	-0.4861	4.0448	2.4716	2.1713	**I(1)**
		P-value	0.3135^{NS}	1.0000^{NS}	1.0000^{NS}	1.0000^{NS}	
	At First difference	*Statistic value*	-8.0215	-6.0190	76.7411	58.5238	
		P-value	0.0000**	0.0000**	0.0000**	0.0000**	

HDI	*At Level*	*Statistic value*	-4.6096	0.0556	15.4284	26.7969	**I(2)**
		P-value	0.0000**	0.5222^{NS}	0.8432^{NS}	0.2190^{NS}	
	At First difference	*Statistic value*	-1.0729	-1.9662	32.0060	21.4240	
		P-value	0.1417NS	0.0246*	0.0773NS	0.4947NS	
	At Second difference	*Statistic value*	-5.77408	-6.8545	87.8257	118.453	
		P-value	0.0000**	0.0000**	0.0000**	0.0000**	
*Note: ** and * indicate 1% and 5% significance levels, NS indicates Not Significant. Source: Author's computation*							

Pedroni Panel Co-integration Test

The panel co-integration test is employed to determine if there is or is not a long-term association between the LGNPCI and HDI of all regions in Ethiopia. Under the null hypothesis of no co-integration, the Pedroni co-integration test was used in the study. According to Table 5, many of the results both within and between dimensions are insignificant, accepting the null hypothesis. The Pedroni co-integration test demonstrates no long-term link between LGNPCI and HDI.

Table 5: Pedroni Co-integration results

Trend assumption: No deterministic trend, Null Hypothesis: No cointegration				
Tests	***Within Dimensions***			
	Statistic	***Prob.***	***Weighted Statistic***	***Prob.***
Panel v-Statistic	0.4215	0.3367	0.5222	0.3008
Panel rho-Statistic	0.2237	0.5885	0.3140	0.6232
Panel PP-Statistic	-0.3676	0.3566	-0.2174	0.4139
Panel ADF-Statistic	-0.9039	0.1830	-1.0154	0.1549
Between dimensions				
Tests	***Statistic***	***Prob.***	--	--
Group rho-Statistic	1.7888	0.9632	--	--
Group PP-Statistic	0.6915	0.7554	--	--
Group ADF-Statistic	-0.4241	0.3357	--	--
The majority of Tests are Significant at a 1% level				
*Note: ** and * indicates 1% and 5% significance level, NS indicates Not Significant, Source: Author's computation.*				

Panel Regression Analysis

This section reveals the panel regression results and interpretations, this includes 11 cross-sectionals (regions) and the total panel observations (balanced) are 242. Table 6 shows the results of the panel regression which examines the effect of the Human Development Index (HDI) and Log Gross National Per Capita Income (LGNPCI) for 11 regions in Ethiopia.

Table 6: Panel Regression results

Variable	**Pooled OLS Model Estimates**	**Fixed Effect Model Estimates**	**Random Effect Model Estimates**
Constant	4.8109	4.7943	4.7948
t-stat	98.7315	128.4276	75.3739
p-value	0.0000**	0.0000**	0.0000**
HDI	5.9332	5.9711	5.9700
t-stat	54.9861	71.0659	71.6539
p-value	0.0000**	0.0000**	0.0000**
R^2	0.9264	0.9809	0.9555
Adj R-squared	0.9261	0.9800	0.9553
F-statistics	3023.4730	1075.3960	5155.5270
p-value	0.0000**	0.0000**	0.0000**
Housman test	--	--	0.0111
p-value	--	--	0.9159^{NS}
Note: ** and * indicates 1% and 5% significance level, NS indicates Not Significant. Source: Author's computation			

The variance in LGNPCI can be explained by the OLS and Random effect regression models' respective R^2 values of 92.64% and 95.55%. With the highest R^2 value for the fixed effect model, the Human Development Index accounts for

98.09% of the variation in LGNPCI between 2002 and 2021. We looked at the calculated coefficients to investigate how the HDI affected the LGNPCI. The HDI has positive coefficients and probability values less than 0.01 in the three estimated regression models. This suggests that the Human Development Index positively impacts the per capita income of each of Ethiopia's 11 regions. Because the p-values of all three estimates are less than 0.01 and indicate a significantly linear and systematic relationship between HDI and LGNPCI, the F-statistic for each estimate is significant. We accept the random effect model based on the Hausman test results, which indicates that the random effect model is appropriate based on all three techniques.

6. Conclusions and Recommendations

Inequality can be reduced by policies that prioritize the poor. Regardless of economic development, well-targeted social policies, improved access to education and healthcare, and ensuring that the labor market does not disproportionately punish the poor can help increase the income share for the poor and middle class. In 2022, Ethiopia scored almost 0.5 in the Human Development Index (HDI), indicating a low development level. The country experienced no change in the HDI score since 2019. But starting in 2000, there was a noticeable improvement. That year, Ethiopia's score was 0.29, meaning the country had a lower human development (Saifaddin Galal 2024). With an HDI score of 0.498 for 2021, Ethiopia is ranked 175th out of 191 nations and territories, placing it in the Low human development category. Ethiopia's HDI score has always been lower than the world average and Sub-Saharan Africa average. Ethiopia's HDI value changed from 0.287 to 0.498, from 2000 to 2021, a change of 73.5 percent. In Ethiopia, during 2021, as per the ranking, the Addis region occupied the first rank, and the last position was reserved for both the Somali and Afar regions. Compared to all regions in Ethiopia, Afar, and Somali registered the least average HDI score during 2000- 21. The Ethiopian Gender Development Index (GDI) noted 0.921, which is the ratio of female HDI to male HDI, indicating that on average, female HDI is 8 percent lower than male HDI. Stated another way, the female HDI value is on average 92 percent of the male HDI.

The stationarity test shows that is stationary at the first difference for LGNPCI, which means it is stationary at I(1). HDI variable is stationary at the second difference, which means it is stationary at I(2). The Pedroni co-integration test was used to determine if there is or is not a long-term association between the LGNPCI and HDI of all regions in Ethiopia. the results both within and between dimensions are insignificant, accepting the null hypothesis. The Pedroni co-integration test demonstrates no long-term link between LGNPCI and HDI. From the panel regression, there is a significant and systematic relationship between HDI and LGNPCI because the HDI has positive coefficients and probability values less than 0.01 in the three estimated regression models. This suggests that the Human Development Index positively impacts the per capita income of each of Ethiopia's 11 regions.

Higher human development can result from economic progress, while more prospects for economic expansion can result from higher human development. A country's progress in three categories of human development, knowledge access, a long and healthy life, and a respectable level of living, is gauged by the Human Development Index (HDI). Ethiopia's economic development can benefit from the HDI in the following ways: A nation's standard of living, health, and access to information are just a few of the areas that the HDI can help pinpoint. Establishing a relationship of reciprocal influence such as higher human development can result from economic progress, while more prospects for economic expansion can result from higher human development. encouraging human growth in ways like the idea of human growth promotes liberties like freedom from fear, communal involvement, and movement.

Reference

1. Bond, S. (2002). Dynamic panel data models: a guide to micro data methods and practice, *Portuguese Economic Journal*, 1(2): 141-162.
2. Baldacci, Emanuele. (2008). "Social Spending, Human Capital and Growth in Developing Countries." *World Development*, 36(8), 1317-1341.
3. Crummey, D. E., Marcus, H. G., & Mehretu, A. Ethiopia. In Encyclopaedia Britannica. essay. https://www.britannica.com/place/Ethiopia/Economy.
4. Conacher, D. (1976). Medical care in Ethiopia. Transactions of the Royal Society of Tropical Medicine and Hygiene, 70(2), 141–144. https://doi.org/10.1016/0035-9203 (76)90176-0.
5. Conacher, D.G. (January 1976). "Medical care in Ethiopia". Transactions of the Royal Society of Tropical Medicine and Hygiene. 70 (2): 141–144. doi:10.1016/0035-9203(76)90176-0.
6. Capital News (2019), "Human Development Report says Ethiopia has work to do", https://capitalethiopia.com/2019/12/16/human-development-report-says-ethiopia-has-work-to-do/, December 16, 2019.
7. Gemeda, F. T. (2023). A perspective of human development theory and its applications in Ethiopia: A systematic review. European Journal of Sustainable Development Research, 7(4), em0229. https://doi.org/10.29333/ejosdr/13439.
8. Guardian (October 2014): Ethiopia's 'African tiger' leaps towards middle income: http://www.theguardian.com/global-development/pove...
9. Jolly, R. (2003). Human development and neo-liberalism: Paradigms compared. In S. Fukuda- Parr, & A.K. Shiver Kumar (Eds.), *Readings in Human Development: Concepts, Measures and Policies for a Development Paradigm.* New Delhi: Oxford University Press.

10. Klara Shinta Claudia1, Muhammad Arif, (2022), "Determinant Analysis of Human Development Index (HDI) in Semarang Residency ", Proceedings of the International Conference on Economics and Business Studies (ICOEBS 2022), DoI: 10.2991/aebmr.k.220602.008, ISBN: 978-94-6239-582-4, 13 June 2022.
11. Martinus Sen, J.(1996)."Introduction to the concept of human development",(http://www.husdyr.kvl.dk/htm/php/tune96/1Martinussen.htm).
12. Miraç Eren et all (2014), "Determinants of the Levels of Development Based on the Human Development Index: A Comparison of Regression Models for Limited Dependent Variables", Review of European Studies; ISSN 1918-7173 E-ISSN 1918-7181, Vol. 6, No. 1; 2014.
13. R Ramesh et all (2014), "Has Economic Growth Contributed to Human Development in Ethiopia?", Journal of Asian and African Studies, Volume 51, Issue 6, https://doi.org/10.1177/0021909614555348, November 3, 2014.
14. Saifaddin Galal (2024), "Human development index of Ethiopia 2000-2022", Published May 14, 2024, https://www.statista.com/statistics/1236824/human-development-index-of-ethiopia/#:~:text=In%202022%2C%20Ethiopia%20scored%20almost,was%20recorded%20from%202000%20onwards.
15. Sudan Tribune (2013), "Ethiopia records double-digit economic growth under GTP". [Online] http://www.sudantribune.com/spip.php?article45425 (accessed 2 June 2013).
16. Torrey, E. F. (1967). "Health Services in Ethiopia", The Milbank Memorial Fund Quarterly, 45(3), 275.https://doi.org/10.2307/3349007(link is external and opens in a new window).
17. UNDP Reports (2024), https://hdr.undp.org/data-center/human-development-index#/indicies/HDI, UNDP Human Development Report: 2024.
18. World Health Organization. (2017). (publication). Primary Health Care Systems: A case study from Ethiopia. Retrieved from, https://www.who.int/alliance-hpsr/projects/alliancehpsr_ethiopiaabridged.