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The Nexus Between Democracy, Human Development, and Economic Growth: A Provincial Analysis

Edi Saputra Ringga[1,*] and Vivi Silvia[2]

[1]Department of Economics, Faculty of Business, Economics and Social Development, Universiti Malaysia Terengganu, Terengganu, 21030, Malaysia; [2]Department of Economics, Faculty of Economics and Business, Universitas Syiah Kuala, Banda Aceh 23111, Indonesia

* Correspondence: p5650@pps.umt.edu.my

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Abstract

This study aims to investigate the impact of democracy and human development on the economic growth of Aceh Province, Indonesia, especially from a long-term perspective during the period 2010-2020. It employs both static and dynamic approaches, such as Robust Least Squares (RLS), Dynamic OLS (DOLS), Fully-Modified OLS (FMOLS), and Canonical Cointegration Regressions (CCR). This study uses two gross regional domestic products (GRDP) as a proxy for economic growth, namely GRDP migas (referred to as GRDP with the oil and gas sector included) and GRDP nonmigas (referred to as GRDP without the oil and gas sector included). Econometric results indicate that human development has a significant positive impact on economic growth, especially in the long term. Furthermore, the level of democracy also significantly affects economic growth positively. However, this indication is observed in the context where the province's economic growth is not dependent on natural resources as the primary driver. This study suggests that it is imperative to formulate strategic policies that prioritize human development in education, healthcare, and living standards. This approach aims to foster sustained economic prosperity while also strengthening democratic institutions and promoting good governance. Such efforts are crucial to ensure a stable and conducive environment for provinces to achieve long-term economic development.

Introduction

The relationship between democracy, human development, and economic growth is intricately interconnected. In democratic systems, citizens' participation in decision-making promotes the protection of individual rights and freedoms, fostering an environment conducive to human development [1–4]. Democracies often prioritize social services such as education and healthcare, contributing to overall human development [5,6]. Additionally, the open dialogue and political stability associated with democratic societies can stimulate innovation, entrepreneurship, and foreign investment, thereby fostering economic growth [7,8].

The nexus between human development and economic growth is also notable. Investments in education and healthcare contribute to a skilled and healthy workforce, enhancing productivity and labor market participation [9–11]. A well-educated population is often correlated with higher economic growth, as it fosters technological advancements and innovation [12,13]. Improved healthcare not only contributes to a more productive workforce but also enhances overall human capital [14,15]. While these relationships are interconnected, they are influenced by a various of factors, and the presence of democracy is one of key contributors to the complex dynamics between human development and economic growth.

At the provincial level, the relationship between democracy, human development, and economic growth becomes even more context-dependent. In provinces within democratic systems, citizens' involvement in decision-making may influence local policies that prioritize education,

healthcare, and infrastructure, contributing to human development [16,17]. Economically, provinces with democratic structures may experience benefits such as increased local innovation, entrepreneurship, and stability, attracting investments and facilitating economic growth [18–20].

Aceh Province is a region in Indonesia characterized by a situation known as dependency theory [21]. This theory describes a scenario in which resources flow from less affluent and underdeveloped districts, referred to as the 'periphery,' to more prosperous cities, known as the 'core,' thereby enriching the latter at the expense of the former. In this context, the core regions exhibit economic dominance, hosting major industries, financial hubs, or centers of political power. On the other hand, peripheral regions may experience economic marginalization, relying on the core for employment opportunities, investment, and infrastructure development [22–25]. This dynamic significantly impacts the intricate interplay between the democratic environment, human capital development, and the regional economic growth of Aceh Province.

An earlier investigation has presented findings indicating that the presence of democracy has a positive impact on a country's GDP. Encompassing panel data of 175 nations over the period from 1960 to 2010, the outcomes reveal that the process of democratization leads to an approximately 20 percent increase in long-term GDP per capita [26]. Additionally, a previous study utilized the system-GMM estimator for linear dynamic panel data models, analyzing a sample of up to 169 countries over 5-year intervals from 1960 to 2004. This study concluded that heightened levels of political instability are linked to decreased growth rates in GDP per capita [27]. Furthermore, another earlier study focused on eight Southern African countries during the 1980–2014 period and suggested that robust democratic institutions have a crucial role in driving economic growth [28].

Regarding the impact on human development, a recent study conducted in China discovered that the development of human capital, particularly in the education sector, has a positive influence on output and productivity, leading to economic growth in a cross-provincial context [29]. Another earlier study, which specifically examines the role of human capital in the education sector and its impact on economic growth in developing countries, concludes that enhancements in school quality are necessary for developing nations to improve their long-term economic growth [30]. Furthermore, findings from a previous study involving a panel of 120 developing countries spanning from 1996 to 2014 also strongly indicate that human development significantly contributes to positive effects on economic growth [31].

A recent study in Indonesia has also revealed that by utilizing up to 24 indicators in six categories of democracy, five categories were found to significantly impact economic growth [32]. Another previous study, using panel data from provinces in Indonesia, also provides evidence that democracy in Indonesia has a significant impact on economic growth, with a positive trend in the long term [33]. Moreover, a prior study in Indonesia using modified human development index (HDI) found a strong bidirectional causality between human development and economic growth, as well as between human development and democracy [34]. This empirical evidence clearly underscores the importance of the progress in human development and the level of democracy in influencing economic growth in Indonesia.

However, despite numerous studies in Indonesia regarding the linkage between democracy, human development, and economic growth, there has been no previous study that examines the relationship between these variables in Aceh Province, especially concerning the aspect of democracy. This constitutes the main novelty of this study, which aims to investigate the impact of the index of democracy and human development on Aceh Province's economic growth, employing both static and dynamic approaches. The purpose of this study is to provide insight into the extent of the influence of democratic and human development progress on economic growth in a provincial context.

Materials and Methods

Data

This study utilized annual time-series data spanning from 2010 to 2020. The justification behind selecting this timeframe is the limited availability of democracy index data specifically for the Aceh province during the years 2010 to 2020. All the data used in this study was obtained from the Statistics of Aceh Province (BPS Aceh) [35]. Detailed information on the dependent and independent variables employed in the study is presented in Table 1.

Table 1. Variable synopsis.

Variable (Symbol)	Units (Sources)	Definition
Gross Regional Domestic Product Migas (GRDP_migas)	Constant local currency unit 2010 (BPS Aceh)	The total value of all goods and services produced within a specific region over a defined period of time, including gas and oil.
Gross Regional Domestic Product Nonmigas (GRDP_nonmigas)	Constant local currency unit 2010 (BPS Aceh)	The total value of all goods and services produced within a specific region over a defined period of time, excluding gas and oil.
Human Development Index (HDI)	Scale 1-100 (BPS Aceh)	A composite statistic used to measure the average achievements in key dimensions of human development.
Democracy Index (DMI)	Scale 1-100 (BPS Aceh)	A composite statistic used to assess the state of democracy based on indicators related to electoral processes, political participation and culture, government functionality, and civil liberties.

Mathematical Function and Econometric Model

This study describes GRDP as a function of human development and democracy. Therefore, the mathematical form of the GRDP function can be written as:

$$GRDP_t = f(HDI_t, DMI_t) \quad (1)$$

Where $GRDP$ stands for the gross regional domestic product, HDI refers to the human development index, and DI represents the democracy index. Thus, the econometric model describing the relationship among these variables is as follows:

$$GRDP\_migas_t = \beta_0 + \beta_1 HDI_t + \beta_2 DMI_t + \varepsilon_t \quad (2)$$
$$GRDP\_nonmigas_t = \beta_0 + \beta_1 HDI_t + \beta_2 DMI_t + \varepsilon_t \quad (3)$$

Furthermore, all variables in Equations 2 and 3 were converted to logarithmic form to facilitate the interpretation of coefficients in percentage terms, as follows:

$$lnGRDP\_migas_t = \beta_0 + \beta_1 lnHDI_t + \beta_2 lnDMI_t + \varepsilon_t \quad (4)$$
$$lnGRDP\_nonmigas_t = \beta_0 + \beta_1 lnHDI_t + \beta_2 lnDMI_t + \varepsilon_t \quad (5)$$

Here, t represents the time during the study period, β_0 signifies the intercept, while $\beta_1 and\ \beta_2$ represent the coefficients, and ε denotes the error term.

Static Approach Method

In this study, the static method utilizes three Robust Least Square (RLS) approaches, namely M-Estimation, S-Estimation, and MM-Estimation. The primary objective of the RLS method is to enhance the robustness of parameter estimation in the presence of outliers in the data. M-Estimation involves optimizing an objective function, typically the likelihood function, to estimate the model parameters. S-Estimation focuses on estimating the scale or dispersion parameter of the distribution, a crucial aspect in managing outliers. MM-Estimation combines both M-

Estimation and S-Estimation, aiming for robustness in both the location (mean) and scale parameters [36,37].

Dynamic Approach Method

As shown in Table 2, the study data exhibit a unit root problem, indicating that even in the first difference state, three out of four variables remain non-stationary with probability value above 0.05. Consequently, this study is unable to employ advanced dynamic approaches such as Autoregressive Distributed Lag (ARDL) or Vector Error Correction Model (VECM). Thus, the study employs dynamic methods that can be applied regardless of the stationarity of the data. These methods include Dynamic OLS (DOLS), Fully-Modified OLS (FMOLS), and Canonical Cointegration Regressions (CCR).

Table 2. The results of Augmented Dickey-Fuller (ADF) unit root test.

Data Type	GRDP_migas		GRDP_nonmigas		HDI		DMI	
	Level	1st Diff.	Level	1st Diff.	Level	1st Diff.	Level	1st Diff.
Time-Series	0.8336	0.3723	0.3173	0.9363	0.9243	0.2541	0.6590	0.0347**

Note: Significant **(5%)

DOLS, FMOLS, and CCR are econometric methods employed in cointegration analysis for addressing non-stationary time series data and mitigating spurious regression issues. DOLS extends OLS by incorporating lagged differences to achieve stationarity, while FMOLS modifies non-stationary variables using predetermined instruments in a two-step process. CCR involves estimating cointegrating relationships in a system of equations, especially to capture long-term cointegration. These methods offer distinct approaches to modeling cointegration, each customized to handle specific aspects of time series data, such as serial correlation, endogeneity, and multiple cointegrated variables [38,39].

Results and Discussion

Descriptive Statistics

Table 3 presents the descriptive statistics for four variables employed in this study. The average value of Aceh province's GRDP from the oil and gas sector across the studied period is about Rp116 trillion, while the average value of Aceh province's GRDP excluding oil and gas is Rp107 trillion. The high standard deviation of GRDP_migas (103.0308) relative to the mean suggests a high level of variability or spread in the GRDP values from oil and gas. On the other hand, GRDP_nonmigas has a lower standard deviation (13.9938), indicating less variability in these values.

Table 3. Descriptive statistics.

Variable	Mean	Median	Maximum	Minimum	Std. Dev.
GRDP_migas	116	113	132	102	103.0308
GRDP_nonmigas	107	107	126	86	13.9938
HDI	69.5082	69.4500	71.9900	67.0900	1.7624
DMI	68.5327	70.9300	79.9700	54.0200	8.3654

The mean value of HDI is 69.5082, indicating a moderate level of human development in Aceh province. A small standard deviation (1.7624) suggests that the HDI scores are closely clustered around the mean. Furthermore, the mean value of DMI is 68.5327, also indicating a moderate level of democracy in Aceh Province. The standard deviation (8.3654) is also moderate, suggesting some variability but not as extreme as in GRDP_migas.

Cointegration Test

A cointegration test is employed to assess whether a set of variables is cointegrated, enabling

the application of the DOLS, FMOLS, and CCR approaches. In this study, the Johansen cointegration test is utilized [40]. As shown in Table 4, the model demonstrates strong and statistically significant cointegration up to four hypothesized numbers of cointegrations at a 1% significant level. This result substantiates the assertion that the dynamic estimation methods utilized in this study uncover a consistent long-term relationship among the variables.

Table 4. The results of Johansen cointegration test.

Data Type	Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
Time-Series	None	0.9306	113.5355*	47.8561	0.0000
	At most 1	0.8031	60.1708*	29.7971	0.0000
	At most 2	0.6480	27.6664*	15.4947	0.0005
	At most 3	0.2876	6.7833*	3.8415	0.0092

Note: Significant *(1%)

Econometric Results of RLS Estimation

The static econometric results regarding the impact of the index of democracy and human development on economic growth reveal interesting findings. As presented in Table 5, GRDP_migas and GRDP_nonmigas exhibit a strong and significant influence by HDI, with all estimation results yielding probability values well below 0.01. On the other hand, while DMI significantly impacts GRDP_nonmigas, its effect on GRDP_migas is not statistically significant. Notably, the significant level of DMI's effect on GRDP_nonmigas is as strong as that of HDI, with all three RLS estimations providing probability values far below 0.01.

Table 5. The results of RLS estimation.

		Dependent Variable = GRDP_migas			**Dependent Variable = GRDP_nonmigas**		
Method	**Independent Variable**	**Coefficient**	**z-Statistic**	**Prob.**	**Coefficient**	**z-Statistic**	**Prob.**
RLS (M-estimation)	Constant	3.2746	3.3150*	0.0009	-1.0209	-3.9638*	0.0001
	HDI	3.6675	13.3207*	0.0000	4.5351	63.1731*	0.0000
	DMI	-0.0613	-1.1176	0.2637	0.0648	4.5339*	0.0000
		Adjusted R^2 = 0.8228			Adjusted R^2 = 0.6976		
		Adjust Rw^2 = 0.9706			Adjust Rw^2 = 0.9987		
		Rn^2 statistic (prob.) = 0.0000			Rn^2 statistic (prob.) = 0.0000		
RLS (S-estimation)	Constant	3.4826	1.6111	0.1072	-2.1874	-59.1832*	0.0000
	HDI	3.5965	5.9695*	0.0000	4.8431	470.1287*	0.0000
	DMI	-0.0378	-0.3151	0.7527	0.0319	15.5722*	0.0000
		Adjusted R^2 = 0.7940			Adjusted R^2 = 0.9899		
		Adjust Rw^2 = -			Adjust Rw^2 = -		
		Rn^2 statistic (prob.) = 0.0000			Rn^2 statistic (prob.) = 0.0000		
RLS (MM-estimation)	Constant	3.2861	3.4126*	0.0006	-1.8724	-16.4359*	0.0000
	HDI	3.6646	13.6546*	0.0000	4.7621	149.9748*	0.0000
	DMI	-0.0612	-1.1452	0.2521	0.0386	6.1033*	0.0000
		Adjusted R^2 = 0.8567			Adjusted R^2 = 0.5619		
		Adjust Rw^2 = 0.9697			Adjust Rw^2 = 0.9998		
		Rn^2 statistic (prob.) = 0.0000			Rn^2 statistic (prob.) = 0.0000		

Note: Significant *(1%)

In the GRDP_migas model, a 1.0% rise in HDI could potentially result in positive impacts on GRDP_migas of 3.6675%, 3.5965%, and 3.6646%, as per M-estimation, S-estimation, and MM-estimation, respectively. In the GRDP_nonmigas model, a 1.0% increase in HDI might lead to positive effects on GRDP_nonmigas of 4.5351%, 4.8431%, and 4.7621%, based on M-estimation, S-estimation, and MM-estimation, respectively. Moreover, a 1.0% rise in DMI has the potential to positively affect GRDP_nonmigas by 0.0648%, 0.0319%, and 0.0386%, according to M-estimation, S-estimation, and MM-estimation, respectively.

In terms of simultaneous impact, both HDI and DMI exhibit a strong Rn^2 statistic value, with a significance level reaching 1%. This suggests that HDI and DMI significantly impact GRDP_migas and GRDP_nonmigas simultaneously. On the other hand, the variation in values explained by HDI and DMI on GRDP_migas and GRDP_nonmigas is also substantial, as indicated by the adjusted R^2 value reaching up to 86%, and the adjusted Rw^2 value reaching 99%.

Econometric Results of DOLS, FMOLS, and CCR Estimations

Aligned with the static results, the dynamic findings also indicate that HDI has a significant effect on both GRDP_migas and GRDP_nonmigas in the long term. As illustrated in Table 6, all three dynamic approaches—DOLS, FMOLS, and CCR—yield consistent results, demonstrating that HDI is strongly significant for both GRDP_migas and GRDP_nonmigas, with probability values well below 0.01. In contrast, this study reveals that DMI does not have a significant impact on either GRDP_migas or GRDP_nonmigas in the long term. All dynamic estimation results provide probability values exceeding 0.5 for the influence of DMI.

Table 6. The results of DOLS, FMOLS, and CCR estimation.

		Dependent Variable = GRDP_migas			**Dependent Variable = GRDP_nonmigas**		
Method	**Independent Variable**	**Coefficient**	**t-Statistic**	**Prob.**	**Coefficient**	**t-Statistic**	**Prob.**
DOLS	Constant	3.3245	2.5144**	0.0211	-3.5619	-3.1321*	0.0055
	HDI	3.6551	9.9182*	0.0000	5.1962	16.3930*	0.0000
	DI	-0.0608	-0.8284	0.4177	0.0008	0.0119	0.9906
		Adjusted R^2 = 0.9634			Adjusted R^2 = 0.9885		
		Long-run variance = 0.0006			Long-run variance = 0.0004		
FMOLS	Constant	2.8859	2.0992***	0.0502	-3.0054	-3.9844*	0.0009
	HDI	3.8013	9.9503*	0.0000	5.0563	24.1208*	0.0000
	DI	-0.1035	-1.4308	0.1696	0.0093	0.2332	0.8183
		Adjusted R^2 = 0.9564			Adjusted R^2 = 0.9892		
		Long-run variance = 0.0005			Long-run variance = 0.0002		
CCR	Constant	2.9174	2.2655**	0.0361	-2.9312	-4.0076*	0.0008
	HDI	3.7899	10.6675*	0.0000	5.0362	24.9035*	0.0000
	DI	-0.0995	-1.4896	0.1537	0.0117	0.3109	0.7594
		Adjusted R^2 = 0.9567			Adjusted R^2 = 0.9889		
		Long-run variance = 0.0005			Long-run variance = 0.0002		

Note: Significant *(1%), **(5%), and ***(10%)

The DOLS estimation results indicate that a 1.0% increase in HDI can positively impact GRDP_migas by 3.6551% and GRDP_nonmigas by 5.1962% in the long term. Additionally, the FMOLS estimation results show that a 1.0% increase in HDI can have a long-term positive impact on GRDP_migas by 3.8013% and GRDP_nonmigas by 5.0563%. Furthermore, the CCR estimation results demonstrate that a 1.0% increase in HDI can have a positive impact on GRDP_migas by 3.7899% and GRDP_nonmigas by 5.0362% in the long term.

The variance level of the long-term simultaneous impact of HDI and DMI on GRDP_migas and GRDP_nonmigas also contributes to the robustness of the dynamic econometric results in this study. The long-run variance value across all models and methods is close to zero, indicating that the combined impact of independent variables on dependent variables is highly stable. The adjusted R^2 also provides the same indication, reaching levels above 90%, signifying that the variation in values explained by HDI and DMI on GRDP_migas and GRDP_nonmigas is high.

Discussion

The presented analysis delves into the intricate relationships between socioeconomic factors and Aceh Province's economic growth. Notably, the human development level emerges as a potent driver of provincial economic growth, showcasing a robust and statistically significant impact. The consistent findings across various static and dynamic estimation methods underscore the importance of prioritizing human development for sustained economic development. This revelation supports existing literature emphasizing the role of education, health, and living standards and prompts further exploration into the specific mechanisms through which enhanced human development contributes to the provincial level of economic prosperity [41,42].

In the context of sectors closely tied to natural resources, such as oil and gas, the impact of democracy on economic growth is not statistically significant. This suggests that in industries where resource extraction plays a pivotal role, the democratic system is unable to shape provincial economic outcomes [43,44]. This could be attributed to factors such as resource allocation, regulatory frameworks, and the management of revenues derived from these sectors [45,46]. Conversely, when one shifts the focus to economic domains not reliant on the oil and gas sector, a different narrative unfolds. In these sectors, the influence of democracy on economic growth becomes statistically significant. This intriguing finding prompts a deeper exploration into the underlying mechanisms, encouraging policymakers to scrutinize the differential effects of democratic governance on economic performance at provincial levels across diverse industries [47,48].

This study extends its focus to long-term dynamics, revealing that the influence of HDI remains significant over time. This underscores the enduring nature of the link between human development and economic growth [49,50]. However, democracy is found to lack a lasting impact in the long term, indicating potential transience or susceptibility to contextual factors. This study suspects that this is related to the fact that the effectiveness of a democratic system in promoting provincial economic growth depends on the quality of its institutions. If the democratic institutions are weak, corrupt, or unstable, they may not be able to create a conducive environment for sustained economic development. Weak institutions can result in policy instability and inefficiencies that hinder provincial long-term economic growth [51,52].

Conclusions

The analysis of the intricate relationships between socioeconomic factors and the economic growth of Aceh Province reveals the pivotal role of human development in fostering sustained prosperity. The study underscores the robust and statistically significant impact of human development on the province's economic growth, emphasizing the need to prioritize education, health, and living standards. Particularly noteworthy is the substantial influence of democracy on Aceh Province's economic growth, not closely tied to dependency on natural resources such as oil and gas. Moreover, the study highlights the enduring nature of the link between human development and economic growth in the long term, while cautioning that the impact of democracy may be transient and contingent on the quality of the province's institutional frameworks.

Based on the findings, it is imperative to formulate strategic policy that prioritize human development to foster sustained prosperity. To enhance provincial economic growth, policymakers should always focus on robust initiatives in education, healthcare, and improvements in living standards. This entails investing in comprehensive educational programs, healthcare infrastructure, and social welfare measures. Additionally, recognizing the substantial influence of democracy on economic growth, policymakers should work towards

strengthening democratic institutions and promoting good governance to ensure a stable and conducive environment for long-term economic development. It is important to diversify the economy beyond natural resources and reduce dependency on sectors like oil and gas.

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