Asian Journal of Applied Economics Vol. 32 No. 2 (July-December 2025): 33–61

ISSN: 2985-1610 (Online)

Received: 27 November 2024
Received in revised form: 19 May 2025
Accepted: 4 June 2025

Human Development, Freedom, and Income Inequality: Evidence from ASEAN Countries

Emre Gökçeli*
Department of Economics, Kütahya Dumlupınar University, Türkiye
Serhat Gözen
Department of Public Finance, Kütahya Dumlupınar University, Türkiye

Abstract

Income inequality reflects the uneven distribution of income within a country's population, with high inequality levels often leading to social and economic instability. Among the potential determinants of income inequality, the Human Development Index (HDI) has received increasing attention for its multidimensional approach to development. Rooted in Amartya Sen's Capabilities Approach, HDI expands beyond GDP by incorporating indicators of health and education. However, it omits Sen's core emphasis on freedom—defined as individuals' ability to realize and express their capabilities. This study introduces an Extended Freedom-based HDI (EFHDI), which includes a freedom component, and examines its effect on income inequality compared to the standard HDI. Using the ARDL-PMG model, the analysis covers ASEAN countries from 1995 to 2020. The findings indicate that while neither HDI nor EFHDI significantly affects income inequality in the short run, both exert a significant negative effect in the long run. Notably, the long-run impact of EFHDI is nearly twice that of the standard HDI, underscoring the enhanced role of freedom in promoting equitable income distribution. These results are confirmed through robustness checks using the CS-ARDL model, and Granger causality tests further reveal a bidirectional relationship between both HDI variants and the Gini index. Based on these findings, the study recommends that ASEAN policymakers integrate freedom-related reforms—such as safeguarding civil liberties, strengthening rule of law, and improving access to fair markets—into broader human development strategies to reduce long-term income inequality.

Keywords: income inequality; human development index; economic freedom
JEL Classification Codes: D30; D31; O15

*Corresponding Author, Department of Economics, Faculty of Economics and Administrative Sciences, Kütahya Dumlupınar University, Türkiye.
Email:emre.gokceli@dpu.edu.tr

1. Introduction

Debates over the functions of the state have persisted for many years. In the Classical economics framework, pioneered by Adam Smith in the late 18th century and endorsed by the leading economists of the time, it was argued that the principles of the free-market economy should prevail and that the state should avoid interventions that might disrupt market equilibrium. From this perspective, the state's role was limited to providing fundamental services such as security and justice (Irwin, 2020). In contrast, the Neoclassical economics approach, while adopting the core principles of Classical economics, contends that the market economy alone may not ensure efficient resource allocation. Therefore, in cases of market failure—such as the presence of public goods, externalities, imperfect competition, asymmetric information, and natural monopolies—state intervention is considered necessary (Sen & Sagbas, 2017).

Institutional economics, introduced by Thorstein Veblen in the late 19th century, views the state's role in the economy as primarily regulatory and supervisory, focusing on the functioning of the market economy (Commons, 1936; Veblen, 2017). While acknowledging that markets have self-regulating mechanisms, this approach also recognizes the occasional occurrence of market failures. To mitigate these failures, it emphasizes the importance of institutions—both formal and informal—including laws, regulations, property rights, contracts, customs, and social norms—in ensuring economic efficiency (North, 2002). Accordingly, Institutional economics argues that the state should establish, strengthen, and regulate such institutions without undermining market efficiency (Fukuyama, 2005).

By the mid-20th century, the New Institutional Economics (NIE) approach emerged, led by scholars such as Ronald Coase, Douglass North, Oliver Williamson, and James M. Buchanan. Unlike classical institutional economics, NIE integrates microeconomic analysis and analytical tools such as game theory to examine how institutions affect economic behavior (Olsson, 1999). This approach emphasizes the state's role in upholding property rights, ensuring institutional functionality, enforcing the rule of law, and strengthening regulatory effectiveness (North, 1994).

However, the dominance of the market economy was challenged by the Great Depression of 1929, which revealed the limitations of Classical economics in resolving issues like depression and unemployment. In response, the Keynesian economic approach gained prominence, advocating for demand-side policies and a more active role for the state. According to Keynesian theory, the state should not be restricted to providing only basic services such as justice and defense; instead, it should intervene to address insufficient demand, stimulate employment, support private sector investment, and regulate market operations (Fisunoglu & Tan, 2009).

Over time, however, Keynesianism also came under criticism for its inability to resolve emerging economic crises, leading to the development of new schools of thought. Although each economic approach proposes different roles for the state, most revolve around the foundational principles of the Classical and Keynesian paradigms. Today, there are simultaneous calls for liberal economic policies and for expanded state

responsibilities. While it is widely accepted that the state should refrain from directly producing or supplying private goods and services, there is a prevailing consensus that it should maintain a regulatory and supervisory role to ensure proper market functioning. Additionally, the state bears fiscal responsibilities aimed at enhancing public welfare. These include ensuring efficient resource allocation, promoting economic growth and stability, and achieving a fair distribution of income.

High income inequality reflects a widening disparity in earnings between the rich and the poor, which can lead to a variety of individual and societal problems. In a context where economic resources are limited, increasing inequality implies a redistribution of income from one social group to another. As a result, while a small segment of society enjoys a high standard of living, the majority struggles to survive on low incomes, often falling below the poverty line. Thus, income inequality also serves as an indicator of poverty risk (Alpdogan, 2023). The growing gap between rich and poor can exacerbate poverty and threaten social cohesion (ÇalışKan, 2010; Dogan, 2023).

To address or reduce income inequality, governments may implement various monetary and fiscal policies aimed at increasing the incomes of low-income groups. They can also enhance public access to key services such as education and healthcare to build human capital, which in turn improves income levels. Easier access to quality education and healthcare enables individuals to become skilled laborers who earn higher wages, thereby improving their well-being and reducing inequality (Gregorio & Lee, 2002; Lustig, 2015; Martinez-Vazquez et al., 2012; Seefeldt, 2018; Yalçın et al., 2023; Younger, 1999). Moreover, improvements in human capital enhance productivity and efficiency, contributing to national development.

Although nations increasingly strive to boost national income and secure a larger share of global trade, rising income levels do not necessarily translate to equitable income distribution among citizens. After World War II, economic growth and development goals were largely income-focused, with little attention given to human aspects. Until the 1970s, development was often equated with per capita income or gross national product (GNP) (Gürses, 2009). However, many developing countries during this period experienced economic growth accompanied by rising unemployment, deepening poverty, and worsening income distribution (Bucak, 2021). This discrepancy sparked a conceptual distinction between economic growth and development, giving rise to a broader understanding that development encompasses more than income alone (Trabold-Nübler, 1991).

The primary goal of development is to expand individuals' capabilities and broaden their choices (Mazumdar, 2003; UNDP, 1990). Sen (1999) introduced the "Capabilities Approach," emphasizing that people should be free to make choices, access quality education, live healthy lives, have adequate food and shelter, and enjoy personal freedoms. Anand and Sen (2000) also stress the importance of individuals' skills and efforts in development, highlighting the need for opportunities to freely exercise these capabilities. Sen (1999) links the lack of freedom to deprivations in education, health, food security, and economic opportunity, underscoring freedom's role in development. While income growth supports individual freedom, freedom itself is

multidimensional, dependent on economic, social, political, and civil rights. Capability refers to the freedom to pursue valued ways of life (Walker, 2005), and according to Sen, the expansion of positive freedoms is a key driver of development (Boz, 2012).

Building on Sen's framework, the United Nations Development Programme (UNDP) established the Human Development Index (HDI) in 1990 as a composite measure of well-being that extends beyond income. HDI includes three key dimensions: health, education, and income, measured through indicators such as average and expected years of schooling, life expectancy at birth, and per capita GNP (UNDP, 1990).

Higher HDI levels often correlate with lower income inequality, suggesting that societies with higher HDI levels tend to exhibit more equitable income distributions (Alvan, 2009). However, improvements in only one of HDI's three dimensions may not yield significant reductions in inequality. Focusing solely on income can produce misleading conclusions. The 1990 UNDP report emphasized that income is merely a tool, citing examples where countries achieved high human development at relatively low-income levels, and vice versa. Thus, income and human development are not linearly related (UNDP, 1990).

After World War II, Simon Kuznets (1955) introduced his inverted U-shaped hypothesis to describe the relationship between economic growth and income distribution. According to this hypothesis, inequality initially increases with growth but eventually declines once an economy reaches a certain threshold. In the early stages of development, income tends to favor capital owners, but as growth progresses, lower-income groups begin to benefit more significantly. The hypothesis also addresses the link between economic freedom (EF) and income inequality (Apergis, 2015). In market economies, income may initially concentrate among the wealthy, but over time, economic expansion improves overall living standards and reduces inequality. Economic freedom—defined as individuals' ability to work, produce, consume, and invest as they choose—facilitates this process and serves as a key indicator of prosperity (Miller et al., 2022). Policies that promote economic freedom have lifted millions out of poverty and raised global living standards (Miller et al., 2018).

The Economic Freedom Index, published annually by the Heritage Foundation and The Wall Street Journal, is a widely used measure of economic freedom. It is based on multiple sub-indicators grouped into categories assessing the rule of law, size of government, regulatory efficiency, and market openness. Scored on a scale from 0 to 100, higher values represent greater economic freedom and a more conducive business environment (Heritage Foundation, 2025).

Figure 1 presents annual trends in the HDI, EF, and a newly created index—EFHDI—which incorporates economic freedom into the traditional HDI components. These indices are reported for seven ASEAN countries (Thailand, Indonesia, Vietnam, Singapore, the Philippines, Malaysia, and Myanmar) over the 1995–2020 period. The figure shows that HDI has improved steadily throughout the study period, with its lowest value at 0.645 in 1995 and highest at 0.783 in 2019. The EF index displays a more fluctuating pattern, with a consistent upward trend beginning in 2014. Its lowest value (0.615) occurred in 2005 and the highest (0.707) in 2020. The EFHDI index also demonstrates steady growth, from 0.642 in 1995 to 0.763 in 2020. Compared to HDI, the EFHDI

index shows more moderate changes, reflecting the influence of economic freedom alongside the traditional dimensions of human development.

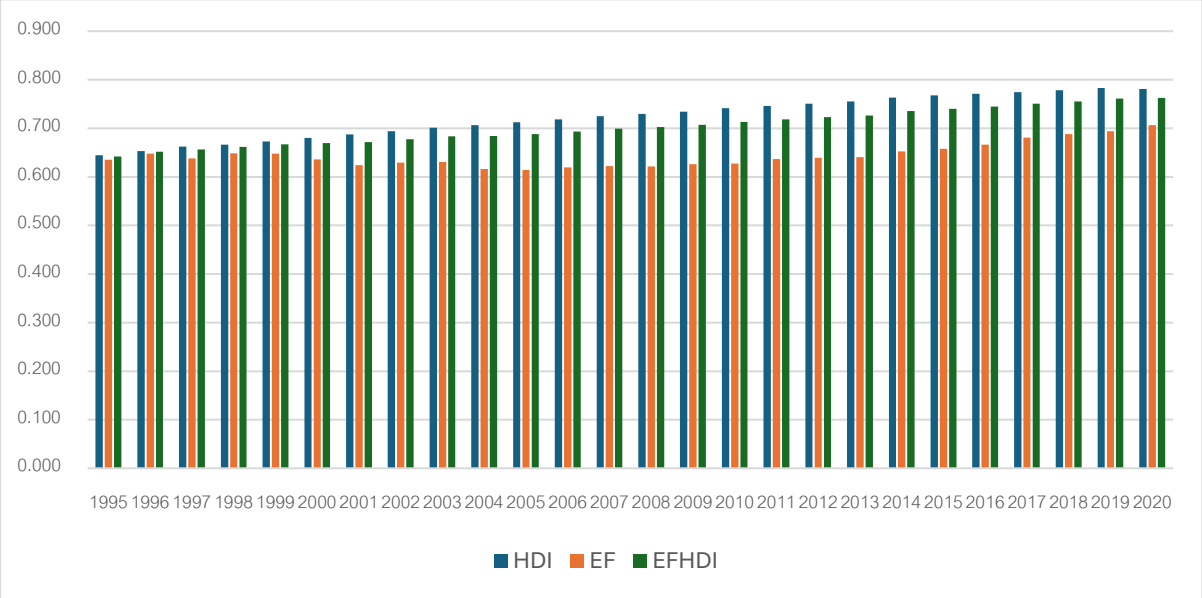

Figure 1: Annual Changes in HDI, EF, and EFHDI in ASEAN Countries

Source: United Nations Development Programme (UNDP, 2024); Heritage Foundation (2024)

Figure 2 presents the changes in the average Gini index for ASEAN countries over the 1995–2020 period. As shown in the figure, the Gini index has declined over time, indicating a slight improvement in income distribution. During the examined period, the highest Gini value was recorded in 1995 at 41.3, while the lowest occurred in 2020 at 39.8.

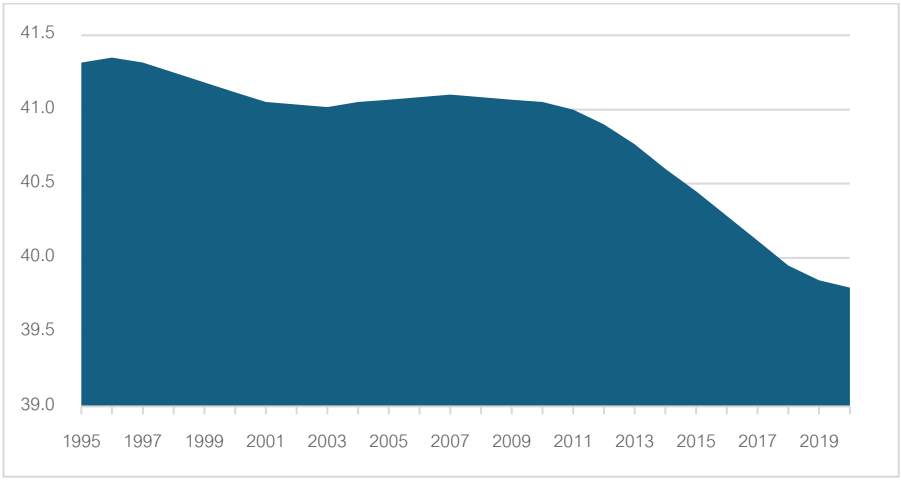

Figure 2: Annual Changes in Gini Index in ASEAN Countries

Source: Solt (2020)

This study, inspired by Amartya Sen's perspective, emphasizes that although the Human Development Index (HDI) incorporates critical dimensions such as income, health, and education, it omits the dimension of freedom that Sen viewed as essential. To address this gap, a modified version of HDI—referred to as EFHDI—is constructed by integrating economic freedom as a fourth component, measured by the Economic Freedom Index.

The study examines the impact of both the traditional HDI and the newly developed EFHDI on income inequality across seven Association of Southeast Asian Nations (ASEAN) countries from 1995 to 2020. The objective is to determine whether incorporating freedom alters HDI's influence on income distribution. Through this approach, the study offers novel empirical insights into how freedom, when considered as part of human development, affects income inequality in the ASEAN context.

Methodologically, the study makes a significant contribution by employing the Panel Pooled Mean Group–Autoregressive Distributed Lag (PMG-ARDL) model. This approach accounts for potential endogeneity and enables the analysis of both long- and short-term dynamics, thus enhancing the reliability of the results. In addition, the Dumitrescu-Hurlin panel Granger causality test is used to explore the directional relationships between the Gini index, HDI, EFHDI, and other control variables such as inflation and employment.

To the best of our knowledge, this is the first empirical study to assess the relationship between HDI and income inequality within the ASEAN region, thereby providing a further contribution to the literature.

The remainder of the study is structured as follows: Section 1 introduces the theoretical framework. Section 2 provides a review of the related literature. Section 3 describes the data and research methodology. Section 4 presents and discusses the empirical findings. Finally, Section 5 concludes the study by summarizing key results, offering policy implications, and suggesting directions for future research.

2. Literature Review

HDI is a composite measure with three dimensions and 18 indicators, widely used today as a core indicator of development. Generally, countries with high HDI scores are expected to have higher levels of development, which ideally correlates with higher individual income levels across society. In other words, economic growth should be distributed in a way that benefits all individuals, reducing income inequality. However, the Kuznets hypothesis suggests that in the early stages of economic growth, distribution of income may initially favor higher-income groups, only to become more equitable as the development level increases. Therefore, if HDI is used as a measure of development, an increase in HDI could initially worsen income inequality. But as development progresses, in line with the Kuznets hypothesis, this trend may reverse, with distribution of income becoming more equitable. This implies that the relationship between HDI and distribution of income may vary depending on a country's development stage.

This study investigates the impact of the HDI, constructed by the UNDP with insights from Sen's views, and an EFHDI created by us to include an index of freedom, on distribution of income. Following this approach,

the literature review is divided into two sections. The first section compiles studies examining the effects of HDI on distribution of income. Since there is no HDI that directly incorporates a freedom index, the second section presents studies that explore the impact of EF on distribution of income and their findings.

Employing data from 58 countries between 1965 and 1975, Mbaku (1997) examined the link between income inequality and development within the framework of the Kuznets hypothesis. Regression results showed that HDI and the Physical Quality of Life Index initially increased income inequality before eventually reducing it, thus supporting the Kuznets hypothesis. Alvan (2009), using data from 90 countries between 1950 and 2001, found a negative correlation between income inequality and human development, with bidirectional causality, indicating that as human development improves, distribution of income becomes more equitable and vice versa. Similarly, Theyson and Heller (2015), analyzing data from 147 countries from 1992 to 2007, found that initial growth in human development reduced income inequality, followed by a brief increase, and then another decline in inequality, suggesting a nuanced relationship.

Karas (2021) the studied the link between distribution of income and HDI in BRICS-T countries from 1990 to 2018 using panel causality analysis. His findings revealed bidirectional causality in China, India, Russia, and South Africa, a unidirectional causality from development to distribution of income in India, and from distribution of income to development in Brazil. In the long term, development and distribution of income showed bidirectional causality in Russia, India, China, and South Africa, while Brazil exhibited a unidirectional causality from distribution of income to development. Bucak and Saygılı (2022) examined the correlation between income inequality, trade openness, and HDI in 15 OECD countries during the period between 2004–2016 employing panel data analysis. The findings indicate that increased trade openness led to higher income inequality, while increases in HDI reduced inequality. Their Granger causality analysis indicated a causal link from trade openness and HDI to income inequality. Özden et al. (2022) used panel data analysis and support vector regression to analyse the link between HDI and distribution of income in MIST states from 1990 to 2019, concluding that improvements in HDI had a negative effect on income inequality. Ghifara et al. (2022) examined the effects of human development, public expenditure, and economic growth on income distribution in Indonesia's metropolitan cities during the 2012-2021 period using the panel regression method. The study concluded that only an increase in the human development index negatively affected income inequality.

In their study, Durgun and Durgun (2023) studied the impact of HDI on income inequality in Turkey from 1990 to 2019 employing the ARDL bounds test, revealing that improvements in HDI generally reduced inequality, with health indices negatively affecting inequality, while education indices had a positive effect; income indices were not statistically significant. Kılıç and Gökçeli (2024) analyzed the impact of HDI on distribution of income in Brazil and Ireland from 1990 to 2020 using the ARDL method. They found that in the short term, HDI improvements in Brazil reduced inequality, while in the long term, both Brazil and Ireland experienced reduced inequality with HDI improvements. Vo et al. (2024) examined the impact of human development on income justice in ASEAN countries during the 1992-2018 period using the ordinary least

squares (OLS) method. The study explained that improvements in the human development index reduced income inequality in the short term; however, the relationship reversed in the long term. Finally, Puspita et al. (2024) applied VAR analysis using data from the 2011-2022 period to investigate the relationship between corruption, economic growth, income inequality, and the human development index in ASEAN countries. The findings of the study indicated that there is a mutual interaction between the human development index, economic growth, and income inequality. Moreover, it was noted that improvements in the human development index had a negative effect on income inequality.

Öztürk and Oktar (2017) found contrary results in Turkey for the period 1990–2015; their ARDL bounds test indicated that increases in HDI worsened distribution of income, deviating from the Kuznets hypothesis. Similarly, Rachmawatie and Prakoso (2023) analyzed the relationship between the human development index and income inequality in DIY province (Yogyakarta) for the 2010-2020 period using the panel regression method. The findings of the study indicate that human development positively affected income inequality.

As indicated by the studies summarized above, there are relatively few investigations in the literature that examine the impact of changes in HDI on distribution of income. A review of these studies reveals a lack of consensus on this impact. Factors contributing to the varied findings include differences in the countries or country groups analyzed, the study periods, and the methodologies applied. Nonetheless, a general observation suggests that increases in HDI tend to have a negative effect on income inequality. These findings can be explained by the fact that the HDI includes fundamental factors of quality of life such as education, health, and income, and that improvements in these areas may contribute to a more equitable income distribution in the long term (Mbaku, 1997; Özden et al., 2022; Puspita et al., 2024; Theyson & Heller, 2015). However, if developments in the HDI benefit only a particular class or region by improving access to education and healthcare, while failing to benefit individuals in lower income groups or rural areas, income inequality may increase.

Another factor expected to influence distribution of income is EF. It reflects the conditions under which individuals can freely produce, consume, and invest according to their own preferences within a market economy. This allows individuals to easily engage in activities that maximize their benefits and incomes. Consequently, it becomes possible for individuals with lower incomes to achieve higher income levels. Therefore, in societies with high EF, a reduction in income inequality is anticipated. The second part of the literature review includes studies that examine the impact of EF on distribution of income.

Berggren (1999) examined the relationship between EF and distribution of income using regression analysis on data from 102 countries during the period from 1975 to 1985. The study concluded that, in the long term, EF positively affects equity in distribution of income. Scully (2002) analyzed data from 26 developed countries from 1975 to 1990 using the least squares method, finding that positive changes in EF positively impact distribution of income, while increases in economic growth have a negative effect on it. Ashby and Sobel (2008) used cross-sectional data from U.S. states to analyse the impact of EF on distribution of income for three

periods: 1980-82, 1990-92, and 2001-03. They found that increasing EF reduces income inequality by raising incomes, particularly for low-income groups. Clark and Lawson (2008) explored the effects of economic growth, tax policy, and EF on income inequality in 66 countries from 1990 to 2000 using a two-stage least squares method, concluding that EF positively affects equity in distribution of income. Apergis et al. (2014) investigated the relationship between income inequality and EF in U.S. states from 1981 to 2004 using a panel error correction model, finding a EF reduces income inequality in both the short and long term.

Bennett and Vedder (2013) analyzed the correlation between EF and income inequality in the 50 U.S. states from 1979 to 2004 employing regression analysis, concluding that increases in EF negatively affect income inequality. They also noted that in regions with low levels of EF, initial increases in freedom led to greater inequality; however, as improvements in EF continued, this trend reversed, which was linked to the inverted U-hypothesis. Apergis (2015) investigated the relationship between EF and income inequality in 58 countries from 1980 to 2010 using the Panel Smooth Threshold Regression method. The study concluded that that the linear long-run parameter estimates across all countries indicate a negative relationship, while the nonlinear long-run estimates reveal that the relationship between economic freedom and income inequality is negative above a certain threshold, but positive below that threshold. Öztürk Ofluoglu et al. (2018) analyzed the effects of EF, institutional quality, openness, globalization, foreign direct investment, democracy, and on income inequality in MINT countries using data from 2000 to 2012 with panel data analysis. The study concluded that increases in democracy and foreign direct investment contribute to higher income inequality, while developments in institutional quality, EFs, globalization, and openness reduce income inequality.

Nazirou et al. (2022) examined the impact of economic freedom and democracy on income inequality in Sub-Saharan African countries during the 2000-2017 period using the GMM method. The study found that both economic freedom and democracy had a negative effect on income inequality. Çoban and Durusu Çifçi (2024) analyzed the relationship between economic freedoms and income inequality in 148 countries during the 2008-2022 period using the GMM method. The study concluded that economic freedom had a negative effect on income inequality. Tsitouras and Papapanagos (2025) investigated the relationship between economic freedom, income inequality, and economic growth in Greece during the 1980-2019 period using the NARDL and Todo-Yamamoto causality methods. The study found that positive changes in economic freedom had a negative effect on income inequality and a positive effect on economic growth.

Carter (2007) studied the relationship between EF and distribution of income for 39 countries between 1980 and 2000, applying regression analysis, and reported a positive correlation between EF and income inequality. Bergh and Nilsson (2010) examined the relationship between globalization, economic freedom, and distribution of income in 79 countries from 1970 to 2005 using the system GMM method. Their findings indicated that developments related to EF (specifically international trade freedom) adversely affected distribution of income in developed countries. Konu (2017) studied the relationship between EF and income inequality in OECD member countries using cross-sectional analysis with data from 2015, finding that EF positively impacts

income inequality, indicating a deterioration in distribution of income. De Soysa and Vadlamannati (2023) studied the impact of economic freedom on income inequality in 128 developing countries during the 1990-2017 period using the GMM method. The results indicated that economic freedom had a positive effect on income inequality.

The findings summarized above indicate that there are relatively few studies in the literature examining the impact of EF on distribution of income. An analysis of these studies reveals a lack of consistent results regarding the effects of changes in EF indicators on distribution of income. Indeed, economic freedom not only enables market economies to function more efficiently but also encourages entrepreneurial activities. While this contributes to economic growth, it also leads to the emergence of new job opportunities. As a result, the incomes of small businesses and new ventures may increase, leading to an improvement in income distribution. On the other hand, economic freedom may disproportionately benefit certain groups while excluding others. In a highly liberal economic environment, some companies may monopolize markets, restricting competition. Consequently, small businesses may be unable to take advantage of economic opportunities and fail to increase their incomes (De Soysa & Vadlamannati, 2023). Thus, economic freedom can have a detrimental effect on income equality. However, a general assessment suggests that positive changes in EF tend to have a favorable impact on equity in distribution of income. While there are limited studies investigating the individual effects of HDI and EF on distribution of income separately, no research has yet been conducted that considers both variables together to explore their combined effects on distribution of income, which makes this study unique in the literature.

3. Data and Methodology

In this study, two different ARDL-PMG estimations were conducted by establishing two models to examine whether the HDI that includes EF has a different effect on distribution of income compared to the HDI provided by the UNDP, which consists of income, health, and education components. As is well known, since 1990, the United Nations Development Program (UNDP) has been publishing HDI. According to the UNDP (2020) report, the HDI is calculated by taking the geometric mean of three components. The HDI index ranges between 0 and 1, where values close to 0 indicate poor living conditions, and values approaching 1 reflect improved living conditions. The overall EF used to represent the freedom index ranges between 0 and 100. To align the scale with the HDI, these values were divided by 100. Since the components of the HDI are equally weighted at 33%, to adhere to the original structure, an equal weight of 25% has been assigned to each component of the newly created EFHDI, which includes the additional fourth category (economic freedom). To create the EFHDI index, the arithmetic mean is used, which is a commonly used technique for creating new variables in the literature, such as the Environmental Performance Index, the Financial Inclusion Index, and the Corruption Perceptions Index. As a result, the newly developed EFHDI index builds on the original HDI by adding freedom as a fourth component, alongside health, education, and income. Each of the four components

has an equal weight of 25 percent, and the index is calculated using the arithmetic mean. The calculation is based on the following formula:

EFHDI = 0.25 × Education + 0.25 × Health + 0.25 × GDP + 0.25 × Economic Freedom

To evaluate whether EF affects the link between HDI and income inequality, two different models are employed as follows:

$$\ln Gini_{i,t} = a_i + ß_1 \ln HDI_{i,t} + ß_2 X_{i,t} + e_{i,t} \quad (1)$$

$$\ln Gini_{i,t} = a_i + ß_1 \ln EFHDI_{i,t} + ß_2 X_{i,t} + e_{i,t} \quad (2)$$

lnGini represents the income inequality of country i at time t and is used as the dependent variable in both models. The data is sourced from the Standardized World Income Inequality Database (SWIID) provided by Solt (2020). a represents the intercept term in both models. lnHDI in model 1 refers to the HDI provided by the UNDP and is used as an independent variable. lnEFHDI in model 2 signifies a newly modified HDI that includes the aspect of freedom, as detailed earlier. ß symbolizes the coefficients of the variables, while X denotes the control variables, namely inflation (Inf) and employment rate (Emp), commonly used in the literature as determinants of income inequality (see Mehic, 2018; Siami-Namini & Hudson, 2019). Inflation is calculated using the Consumer Price Index (CPI), and the employment rate refers to the ratio of employed people to the labor force. Both data points are obtained from the World Bank Indicators.

The descriptive statistics of the data used in both models are summarized in Table 1. As observed, the volatility of the data is generally low, as their standard deviations are close to 0, except for inflation, which shows greater dispersion than the other variables.

Table 1: Summary Statistics of Variables

Variables	Mean	Obs. Numbers	Std. Deviation	Min	Max
lnGini	3.7075	156	0.0657	3.5945	3.8586
lnHDI	-0.3328	156	0.1312	-0.5978	-0.0565
lnEFHDI	-0.3618	156	0.1403	-0.6601	-0.0701
Inf	4.2668	156	5.7354	-1.7103	58.4511
lnemp	1.0262	156	0.6204	-1.3903	2.0869

Source: Author's calculation

The correlation matrix for both models is also presented separately. Table 2, which includes lnHDI, shows that the link between the Gini index and HDI is negative, as expected. The table also plays an important role in identifying potential multicollinearity among the variables. Since no values reach 0.8 or higher, there is no need to worry about multicollinearity.

Table 2: Correlation Matrix of Model 1

	lnGini	lnHDI	lnf	lnemp
lnGini	1.000			
lnHDI	-0.1903	1.000		
lnf	-0.1077	-0.4226	1.000	
lnemp	0.3865	-0.0095	0.1366	1.000

Source: Author's calculation

Table 3 presents the correlation matrix for Model 2. The reason for presenting two separate tables for the correlation matrix is that the correlation between lnHDI and lnEFHDI exceeds 90%, which would lead to a multicollinearity issue if both were included in the same regression. The coefficient of lnEFHDI is negative, like lnHDI. Again, there is no need to worry about multicollinearity among the variables, as there are no values over 80%.

Table 3: Correlation Matrix of Model 2

	lnGini	lnEFHDI	lnf	lnemp
lnGini	1.000			
lnEFHDI	-0.1051	1.000		
lnf	-0.1077	-0.3927	1.000	
lnemp	0.3865	-0.0410	0.1366	1.000

Source: Author's calculation

This study employs the ARDL-PMG technique to examine if there is an effect of EF on the relationship between HDI and the Gini index for ASEAN countries during the period spanning 1995-2020. The time period is selected based on full data availability for all countries. The reasons for the selection of this method can be summarized as follows:

Firstly, the characteristics of the data played a crucial role in the choice of methodology. Roodman (2006) noted that when the time dimension (T) is smaller than the number of countries (N), the results of GMM estimators may not be reliable. Studies with such datasets are more likely to achieve reliable results using the ARDL method. Another advantage of ARDL over other traditional methods (such as fixed effects, random effects, GMM, etc.) is evident in unit root analysis. While other analyses require all series to be stationary either at the level or at the first difference, the ARDL method can be applied in cases where some variables are I(0) and others are I(1). Additionally, this method allows for both short-term and long-term analysis. One of its most important advantages is that it is a dynamic model, which mitigates potential endogeneity problems by using lagged values of the dependent and independent variables (Pesaran et al., 1999). The ARDL method has three commonly used forms: Dynamic Fixed Effects (DFE), Pooled Mean Group (PMG), and Mean Group (MG),

The PMG estimator enables for heterogeneity in both short-run coefficients and intercepts, while assuming that long-run coefficients are homogeneous (Gökçeli, 2023). The assumption of heterogeneity is reasonable considering local regulations and norms, as explained by Samargandi et al. (2015). The assumption of long-run coefficient homogeneity is more reasonable than the MG and DFE assumptions, which assume heterogeneity in long-run coefficients. This is because, in the modern economic system, with extensive international trade and financial mobility, economic or financial crises, as well as supply or demand shocks, tend to spread globally (Pesaran et al., 1999). Asteriou et al. (2021) suggest that the MG estimator is more appropriate for studies with a larger cross-section (greater than 50). In our case, PMG is more suitable considering the sample size of six ASEAN countries. Finally, the MG technique is more susceptible to outliers when the number of cross-sectional dimensions is small (Samargandi et al., 2015). Due to these reasons, the PMG estimator is considered superior to others, and therefore it was selected for the analysis.

The PMG estimator is applied to Model 1 based on the following equation:

$$\Delta \ln GINI_{i,t} = \alpha_i + \lambda_i(\ln GINI_{i,t-1} - \gamma_i \ln HDI_{i,t-1} - \delta_i X_{i,t-1}) + \sum_{j=1}^{\rho-1} \theta_{ij} \Delta \ln GINI_{i,t-1} + \sum_{j=1}^{q-1} \beta_{ij} \Delta \ln HDI_{i,t-1} + \sum_{j=1}^{q-1} \varphi_{ij} \Delta X_{i,t-1} + \mu_i + \varepsilon_{it} \quad (3)$$

In addition, the technique of the PMG estimator is also applied to Model 2, which includes lnEFHDI instead of lnHDI, based on the following equation:

$$\Delta \ln GINI_{i,t} = \alpha_i + \lambda_i(\ln GINI_{i,t-1} - \gamma_i \ln EFHDI_{i,t-1} - \delta_i X_{i,t-1}) + \sum_{j=1}^{\rho-1} \theta_{ij} \Delta \ln GINI_{i,t-1} + \sum_{j=1}^{q-1} \beta_{ij} \Delta \ln EFHDI_{i,t-1} + \sum_{j=1}^{q-1} \varphi_{ij} \Delta X_{i,t-1} + \mu_i + \varepsilon_{it} \quad (4)$$

where i and t signify country and time, in that order. λ stands for error correction term. θ, β, and φ denote the coefficients of short run while γ and δ refer to the long run coefficients. Group effects are presented by μ and error term is shown by ε.

To scrutinize the causal relationships among all variables included in both models, the Dumitrescu-Hurlin Panel Granger Causality Test, developed by Dumitrescu and Hurlin (2012), is applied based on the following equation:

$$\ln GINI_{i,t} = \alpha_i + \sum_{k=1}^{\rho} \beta_{ik} \ln GINI_{i,t-k} + \sum_{k=1}^{\rho} \lambda_{ik} \ln HDI_{i,t-k} + \sum_{k=1}^{\rho} \delta_{ik} \ln EFHDI_{i,t-k} + \sum_{k=1}^{\rho} \gamma_{ik} \ln X_{i,t-k} + \varepsilon_{it} \quad (5)$$

4. Empirical Results

Some preliminary tests were conducted before selecting the most appropriate method to assess the role of freedom in the link between HDI and income equality for ASEAN countries over the period 1995-2020.

4.1. Findings of Preliminary Tests for Both Models

The first test assessed cross-sectional dependence (CD) using the method developed by Pesaran (2015), which is crucial for selecting the appropriate unit root tests. The findings of the CD-Pesaran (2015) test, presented in Table 4, cover both models. As shown, there is no evidence of cross-sectional dependence in

either model. As a robustness check for the presence of CD, an alternative test, Breusch-Pagan LM test (Breusch & Pagan, 1980), is applied, and the findings are reported in Table 4 as well. In contrast to the Pesaran CD test, the results indicate the presence of CD for both models. Therefore, while we can proceed with first-generation unit root tests based on the Pesaran CD test results, it would also be more appropriate to apply second-generation tests, considering the presence of CD as indicated by the Breusch-Pagan LM (B-P LM) test.

Table 4: Outcomes of the Cross-Sectional Dependence Assessment for Model 1 and Model 2

Model 1			
Test Types	Statistics	P-Value	H_0: No Cross-Section Dependence
Pesaran CD	-0.0953	0.9141	Not Rejected
B-P LM	168.4810	0.000	Rejected
Model 2			
Test Types	Statistics	P-Value	H_0: No Cross-Section Dependence
Pesaran CD	-0.0327	0.9739	Not Rejected
B-P LM	170.0103	0.000	Rejected

Source: Author's calculation

One of the most used unit root tests is the IPS test. We opted for the IPS test to examine each variable, with the results presented in Table 5. As shown, two of the five variables (lnHDI and Inf) do not have a unit root at level [I(0)], while three variables (lnGini, lnEFHDI, and lnEmp) are non-stationary at level. However, they become stationary once their first difference is taken [I(1)]. As a result, the findings indicate a mixed order of integration [I(0) and I(1)], allowing us to use the ARDL method as explained earlier.

Table 5: IPS Unit Root test

	Level [I(0)]		Level [I(1)]	
Variables	Statistics	P Value	Statistics	P Value
lnGini	19.5040	0.0771	43.6360***	0.0000
lnHDI	121.7973***	0.0000	---	---
lnEFHDI	17.3416	0.1372	84.7263***	0.0000
Inf	53.5186***	0.0000	---	---
lnemp	17.4368	0.1339	89.5191***	0.0000

Source: Author's calculation

Notes: *, **, and *** indicates the 10%, 5%, and 1% significance level, respectively.

As a robustness check, another unit root test (CIPS) developed by Pesaran (2007) was applied. The CIPS test relaxes the assumption of cross-sectional dependence required by the IPS test (Asteriou et al., 2021). Considering the presence of CS, according to the B-P LM test, the results of the CIPS test seem to yield more

reliable results. The results, reported in Table 6 demonstrate that all variables, except for lnInf, have a unit root at the level but become stationary once their first differences are taken. In conclusion, the CIPS test largely confirms the findings from the IPS test, showing a mixed order of integration [I(0) and I(1)].

Table 6: CIPS Unit Root test

	Level [I (0)]		First Difference [I (1)]	
Variables	CIPS Statistics	Critical Value (%5)	CIPS Statistics	Critical Value (%5)
lnGini	-1.606	-2.33	-5.285***	-2.33
lnHDI	-1.835	-2.33	-3.685***	-2.33
lnEFHDI	-2.211	-2.33	-4.052***	-2.33
lnf	-3.418***	-2.33	----	----
lnemp	-1.858	-2.33	-5.480***	-2.33

Source: Author's calculation

Notes: *, **, and *** indicates the 10%, 5%, and 1% significance level, respectively.

The Pedroni cointegration test (Pedroni, 1999) is applied before using the ARDL-PMG method to examine if a long-run relationship exists between the variables in both models. The results for Model 1 are shown in Table 7. As indicated, the null hypothesis of no cointegration is rejected, demonstrating a long-run link between the variables. Similarly, the cointegration test for Model 2 is conducted, and the results are presented in Table 8, showing evidence of cointegration for this model as well.

Table 7: Pedroni Cointegration test for Both Models

	Statistic-value	t-stat	H_0: No Cointegration
Model 1			
MPP	2.4114***	0.0079	Rejected
PP	2.0123**	0.0221	Rejected
ADP	3.3514***	0.0004	Rejected
Model 2			
MPP	1.9867**	0.0235	Rejected
PP	1.7431**	0.0435	Rejected
ADF	1.7302**	0.0418	Rejected

Source: Author's calculation

Notes: *, **, and *** indicates the 10%, 5%, and 1% significance level, respectively.

In addition, the Westerlund (2007) cointegration test, which accounts for the presence of cross-sectional dependence (CD), is applied to both models, and the findings are reported in Table 8. As seen, the statistics Gt, Pt, and Pa indicate a long-run relationship among the variables. However, the null hypothesis cannot be

rejected for the Ga statistic due to its p-value, which is below 0.05. Nevertheless, it would be more accurate to rely on many of the statistics, as they also indicate the presence of cointegration among the variables.

Table 8: Westerlund Cointegration test for Both Models

Statistics	Value	Z-Value	p-value	H_0: No Cointegration
Model 1				
Gt	-2.869***	-2.744	0.000	Rejected
Ga	-0.185	2.991	0.999	Not Rejected
Pt	-6.088**	-2.184	0.015	Rejected
Pa	-5.584**	-1.799	0.036	Rejected
Model 2				
Gt	-2.120***	-3.373	0.000	Rejected
Ga	-0.243	2.968	0.999	Not Rejected
Pt	-6.625***	-2.593	0.005	Rejected
Pa	-5.551**	-1.774	0.038	Rejected

Source: Author's calculation

Notes: *, **, and *** indicates the 10%, 5%, and 1% significance level, respectively.

4.2. ARDL-PMG Test Findings for Both Models

The Hausman test is first applied to determine the most appropriate estimation method among the three options: PMG, MG, and DFE. The results for Model 1 are reported in Table 9. As shown, the Hausman test suggests selecting PMG over MG, as the null hypothesis is not rejected, indicating that PMG is the more efficient estimator. Similarly, when comparing PMG and DFE, the test results also favor PMG due to the failure to reject the null hypothesis.

Table 9: Results of the Hausman Tests for Model 1

Choosing Between Methods	Chi^2	P-Value	H_0: PMG is efficient and consistent
PMG - MG	5.04	0.1691	Not rejected
PMG - DFE	0.14	0.9873	Not rejected

Source: Author's calculation

Notes: *, **, and *** indicates the 10%, 5%, and 1% significance level, respectively.

We begin by interpreting the results estimated using the PMG technique for Model 1, considering both the short and long runs. Table 10 indicates that the HDI coefficient is positive, suggesting that a higher HDI level is associated with a more unequal income distribution in the short run, at the 10%significance level. Inflation enters the regression negatively and significantly, suggesting that higher inflation is associated with more unequal distribution of income in these countries in the short run. Employment does not have a significant

effect on income inequality in the short run. The insignificant effect of employment on income inequality may be due to the prevalence of part-time or temporary work. In other words, if employment growth is mainly in part-time jobs, it does not lead to a significant income increase for low-income groups (OECD, 2015), resulting in no meaningful impact on income inequality in the short run.

The error correction term (ECT) represents the speed at which the system returns to long-run equilibrium after a short-run shock (Bosah et al., 2021). Its coefficient is expected to be negative and statistically significant. As shown in the table, the coefficient of ECT is -0.0557, indicating the existence of long-run cointegration among the variables. In other words, the significant and negative sign of the ECT implies that the system converges to long-run equilibrium.

The coefficient of HDI is significant and negative, demonstrating that an increase in HDI is associated with better income equality in the long term. Specifically, a 1% increase in HDI corresponds to an approximate 0.66% decrease in the Gini index, indicating a more equitable distribution of income. These findings are consistent with studies conducted by Mbaku (1997), Alvan (2009), Bucak and Saygılı (2022), Özden et. al. (2022), Durgun and Durgun (2023) and Kılıç and Gökçeli (2024). As explained by Kılıç and Gökçeli (2024), the positive impact of HDI on the Gini index can be explained as follows: HDI comprises three components, namely health, education, and income that contribute to the overall HDI score.

Regarding the health component, increased access to healthcare facilities relatively more enables low-income groups to become healthier individuals, which enhances their productivity in the labor market. As productivity rises, wages are expected to increase as well. This wage increase allows low-income groups to close the gap with higher-income groups, thus promoting a fairer distribution of income. This argument is consistent with the studies (Deaton, 2003; Sabir & Aziz, 2018).

Regarding the education component, the increase is more closely related to rising education levels among low-income groups. As these individuals extend their duration of education, they become more skilled workers, enabling them to play a more effective role in production. This, in turn, increases the share of national income received by this group, helping to close the income gap in their favor. Consequently, the education component also contributes to greater equity in distribution of income. This argument is supported by Abdullah et al. (2015).

The final component, income per capita, is similarly related to rising income among low-income groups as well as other groups. As members of this low-income group earn more, they will have a chance to increase their savings, which may eventually allow them to start their own businesses. This further increases their share of income, thereby contributing to greater equity in distribution of income (Kılıç & Gökçeli, 2024).

Regarding the control variables, lnemp enters the regression positively and significantly, indicating that an increase in the level of employment is associated with worse income inequality. A possible explanation for this finding could be that, given the large number of employed people working at minimum wage in Asia where more than 68 percent of the workforce is engaged in the informal economy (International Labour Organization

[ILO], 2018) and therefore likely to earn near or below minimum wage levels, an increase in the number of minimum-wage workers may allow employers to earn more, thereby widening the gap between higher-income and lower-income groups.

The other control variable, Inf, shows a similar pattern to lnemp. Specifically, an increase in the inflation rate is related to worse distribution of income, as expected. As prices rise, particularly for essential goods like food and beverages, people with low incomes are forced to spend more on necessities, leaving them with little or no money to save or invest. This, in turn, allows higher-income individuals to invest more and earn more, further widening the income gap between the groups. To conclude, both employment and inflation contribute to more unequal distribution of income in ASEAN countries in the long run.

Table 10: ARDL-PMG Results for Model 1

Short-run Results				
Variables	Coefficients	Std.Error	Z-Stat	Prob. Value
lnHDI.D1	0.0906*	0.0501	1.81	0.070
Inf.D1	-0.0002**	0.0001	-2.23	0.026
lnemp.D1	-0.0015	0.0034	-0.45	0.655
Constant	0.1894***	0.0682	2.78	0.005
Error Cor. Term	-0.0557***	0.0201	-2.77	0.006
Long-run Results				
lnHDI	-0.6591***	0.0868	-7.59	0.000
Inf	0.0042***	0.0015	2.77	0.006
lnemp	0.0546***	0.0103	5.26	0.000

Source: Author's calculation

Notes: *, **, and *** indicates the 10%, 5%, and 1% significance level, respectively. The number of observations is 150.

To determine the best method for analyzing Model 2, the Hausman test is applied again, and the findings are presented in Table 11. Like the previous Hausman test results, PMG is found to be the most appropriate method when compared to MG and DFE.

Table 11: Results of the Hausman Tests for Model 2

Choosing Between Methods	Chi^2	P-Value	H_0: PMG is efficient and consistent
PMG - MG	0.53	0.7665	Not rejected
PMG - DFE	0.22	0.9744	Not rejected

Source: Author's calculation

Notes: *, **, and *** indicates the 10%, 5%, and 1% significance level, respectively.

The ARDL-PMG results for Model 2 are presented in Table 12. In the short run, the coefficient of lnEFHDI is negative but insignificant, indicating that the HDI index, including EF, does not affect income inequality. Similarly, the employment level has no significant impact on income inequality, as it does not enter the regression significantly. The negative coefficient for inflation suggests that increased inflation leads to greater income equality in the short run. The ECT coefficient is negative and significant, confirming cointegration among the variables in the long run, as discussed earlier.

Table 12: ARDL-PMG Results for Model 2

Short-run Results				
Variables	Coefficients	Std.Error	Z-Stat	Prob. Value
lnEFHDI.D1	-0.02438	0.0478	-0.51	0.610
Inf.D1	-0.0001 **	0.0001	-2.19	0.029
lnemp.D1	-0.0036	0.0047	-0.76	0.446
Constant	0.0911	0.0823	1.11	0.268
Error Cor. Term	-0.0279**	0.0012	-2.2401	0.025
Long-run Results				
lnEFHDI	-1.0918***	0.2133	-5.12	0.000
Inf	0.0056***	0.0017	3.33	0.001
lnemp	0.0683***	0.0162	4.23	0.000

Source: Author's calculation

Notes: *, **, and *** indicates the 10%, 5%, and 1% significance level, respectively. The number of observations is 150.

lnEFHDI has a negative and statistically significant coefficient in the long run, indicating that a 1% increase in lnEFHDI is associated with a 1.1% decrease in the Gini index. This result shows that a better score in lnEFHDI is related to greater income equality, similar to the pattern observed with lnHDI in the previous model. When comparing the coefficients of lnHDI and lnEFHDI, it is evident that the inclusion of freedom enhances the HDI's impact on income inequality. The coefficient of lnEFHDI is greater than that of lnHDI (-1.09 vs. -0.65), revealing that higher levels of EF amplify the HDI's positive effect on distribution of income equality. In other words, EF plays a significant role in enhancing the HDI's impact on reducing income inequality

The results underscore the importance of not neglecting the freedom aspect, as emphasized by Amartya Sen, who played a vital role in the development of HDI. Sen argued that an indicator measuring quality of life should not focus exclusively on income but should also account for other vital aspects of human life, such as education and health. Furthermore, Sen's concept of freedom, where individuals can freely express themselves and their ideas, is indispensable. Therefore, the inclusion of an EF index as a component of the HDI introduces a critical question regarding its impact on the relationship between the HDI and distribution of income equity. Our study's findings demonstrate that incorporating this index contributes to a more significant reduction in the

Gini index, thereby promoting greater income equality. Thus, while enhancing the HDI, it is essential not to overlook EF, as progress in this area can lead to substantial improvements in distribution of income equity.

4.3. Dumitrescu-Hurlin Panel Granger Causality Test

To specify the causal relationship between the Gini index and other independent variables, lnHDI, lnEFHDI, lnf, lnemp, the Dumitrescu-Hurlin (DH) test is applied. The DH test is chosen because of its ability to provide reliable results in the presence of cross-sectional dependence (CD) in panel data (Balogun et al., 2024). The results given in Table 13 indicate a bidirectional causality between the Gini index and HDI. In other words, HDI Granger causes the Gini index, and the Gini index also Granger causes HDI. A similar bidirectional relationship is observed between EFHDI and the Gini index. Regarding the control variables, INF does not Granger cause the Gini index at a 5% significance level, but the reverse causality is present. As for LnEMP, a bidirectional causality is also identified between LnEMP and the Gini index.

Table 13: Results of Panel Granger Causality Test

Direction of Causality	W-Stat	Z-Stat	P-Value	Null Hypothesis	
				H_0: X does not granger cause Y	
lnHDI ⟹ lnGINI	6.41***	5.39 6.02	0.000 0.000	H_0 is rejected.	H_0 is rejected.
lnHDI ⟹ lnGINI	6.92***				
lnEFHDI ⟹ lnGINI	5.88***	4.76	0.000	H_0 is rejected.	H_0 is rejected.
lnGINI ⟹ lnEFHDI	8.22***	7.62	0.000		
lnf ⟹ lnGINI	3.42*	1.74	0.080	H_0 is rejected.	H_0 is rejected.
lnGINI ⟹ lnf	6.56***	5.59	0.000		
lnUNE ⟹ lnGINI	4.81***	3.45	0.000	H_0 is rejected.	H_0 is rejected.
lnGINI ⟹ lnEMP	7.87***	7.18	0.000		

Source: Author's calculation

Notes: *, **, and *** indicates the 10%, 5%, and 1% significance level, respectively.

5. Robustness Check

To assess the robustness of the results obtained using ARDL-PMG, the CS-ARDL technique is applied to both models. This method is chosen because it provides accurate results in the presence of CD. As previously discussed, the B-P LM test confirms the presence of CD in both models, whereas the Pesaran CD test indicates otherwise.

The impact of standard HDI on income inequality is examined first and the findings are reported in Table 14. The short-run findings exhibit similar patterns to the results estimated for the long run. The coefficient of the error correction term (ECT) is negative and significant, confirming a long-term relationship among the variables. lnHDI enters the regression with a negative and significant coefficient at the 10% level, indicating that a higher HDI level is associated with a more equitable income distribution in the long run. This result aligns with the findings from ARDL-PMG.

Unlike the previous analysis, the control variables do not exhibit a significant effect. The insignificance of inflation's effect on income distribution can be explained by its offsetting influences. High inflation reduces the real purchasing power of fixed-wage earners, leading to increased income inequality. However, it can also decrease the debt burden of low-income borrowers, creating a counteracting effect. Additionally, through adaptive mechanisms, wages may be indexed to inflation, rising in proportion to price increases. In such cases, purchasing power remains stable, which could result in no significant impact on income distribution. Similarly, the insignificance of employment's effect on income distribution can be explained by the nature and sector of employment growth. If employment growth is mainly in part-time or low-skilled jobs, it does not lead to a significant income increase for low-income groups, resulting in no meaningful impact on income inequality.

Table 14: CS-ARDL Results for Model 1

Short-run Results				
Variables	Coefficients	Std.Error	Z-Stat	Prob. Value
Dl.lnGINI	0.0464	0.0305	1.53	0.127
DlnHDI	-0.0589*	0.0322	-1.83	0.067
DInf	0.0002	0.0008	0.25	0.801
DlnEMP	0.0028	0.0069	0.41	0.685
Error Cor. Term	-0.9135***	0.0304	-30.05	0.000
Long-run Results				
lnHDI	-0.0610*	0.0349	-1.75	0.081
Inf	0.0003	0.0009	0.40	0.692
lnEMP	0.0039	0.0077	0.52	0.605

Source: Author's calculation

Notes: *, **, and *** indicates the 10%, 5%, and 1% significance level, respectively. The number of observations is 144.

Next, the effect of lnEFHDI on income distribution is analyzed, and the results are presented in Table 15. Again, the short-run findings are consistent with the long-run results. Besides, the existence of a long-run relationship is confirmed by the ECT coefficient, which falls between 0 and -1. The coefficient of lnEFHDI is negative and significant, reaffirming its role in reducing income inequality. Specifically, a more developed ln EFHDI is linked to a more even income distribution, consistent with previous findings from ARDL-PMG. In contrast to the previous analysis, the control variables do not show a significant effect.

Comparing the coefficients of lnHDI and lnEFHDI, the latter's coefficient is twice as small as the former, demonstrating that incorporating freedom into standard HDI amplifies its impact on income inequality by a factor of two. This result further supports the estimates obtained using ARDL-PMG.

Table 15: CS-ARDL Results for Model 2

Short-run Results				
Variables	Coefficients	Std.Error	Z-Stat	Prob. Value
Dl.lnGINI	0.1375*	0.0719	1.91	0.056
DlnEFHDI	-0.1239**	0.058	-2.10	0.035
DInf	0.0001	0.0006	0.25	0.806
DlnEMP	0.0027	0.0072	0.38	0.706
Error Cor. Term	-0.8624***	0.0719	-11.98	0.000
Long-run Results				
lnEFHDI	-0.1465**	0.0667	-2.20	0.028
Inf	0.0001	0.0008	0.13	0.895
lnEMP	0.0054	0.0089	0.61	0.545

Source: Author's calculation

Notes: *, **, and *** indicates the 10%, 5%, and 1% significance level, respectively. The number of observations is 144.

6. Conclusion

Ensuring fairness in income distribution remains one of the core objectives of modern governments, as high levels of income inequality can generate serious social and economic problems. To mitigate these disparities, governments frequently employ monetary and fiscal policies that support low-income groups; however, these strategies often have limited long-term impact. A more sustainable solution lies in empowering individuals from lower-income segments to leverage their skills, knowledge, and experiences to improve their earnings, thereby narrowing the income gap and reducing inequality. At this point, Amartya Sen's capability approach becomes particularly relevant. Drawing inspiration from Sen's framework, the Human Development Index (HDI), introduced in the 1990 UNDP report, has gained prominence as a multidimensional measure of development. Comprising education, health, and income indicators, HDI offers a broader assessment than income-based measures alone.

According to the Kuznets hypothesis, income inequality tends to increase during the early stages of development, particularly during periods of industrialization and rapid economic growth, and then decreases as economies mature. This inverted-U hypothesis challenged earlier assumptions that rising income alone would lead to improved distribution. While HDI incorporates more holistic elements than per capita income alone, it notably omits the dimension of freedom, which Sen emphasized as central to development. To address this gap, the present study constructed a new index, EFHDI, which incorporates economic freedom as a fourth dimension alongside the traditional HDI components and examined whether this modified index exerts a different influence on income inequality across ASEAN countries compared to the standard HDI.

The findings from the ARDL-PMG estimation method reveal that neither HDI nor EFHDI significantly affects income inequality in the short run. However, in the long run, both indexes show a statistically significant negative relationship with the Gini index, implying that improvements in HDI and EFHDI are associated with

reductions in income inequality. These findings are further validated through the CS-ARDL method, confirming the long-run impact of both indexes. The results are also consistent with the downward-sloping portion of the Kuznets curve, suggesting that the ASEAN countries have reached the level of development at which income inequality begins to decline.

When comparing the coefficients, EFHDI has nearly double the effect of HDI in reducing inequality, according to the ARDL-PMG results. These finding highlights that while progress in health, education, and income promotes greater equity, including the dimension of economic freedom enhances this effect substantially. This conclusion is reinforced by the CS-ARDL analysis, demonstrating the robustness of the findings. The Dumitrescu-Hurlin panel Granger causality test further reveals bidirectional causal relationships between both HDI and EFHDI and the Gini index, indicating mutual influence between development measures and income distribution.

The stronger impact of EFHDI may be attributed to the role of economic freedom in empowering individuals to work, invest, and produce more freely. By reducing barriers to entrepreneurship and labor market participation, economic freedom creates opportunities for low-income groups to improve their earnings, leading to a more equitable distribution of income over time. Therefore, adding economic freedom to HDI strengthens its effectiveness in addressing inequality.

Based on these findings, the study offers several policy recommendations for ASEAN governments. While efforts to improve HDI should continue, special attention should be paid to enhancing economic freedom, which significantly amplifies the impact of development on income equality. Economic freedom in ASEAN countries has generally improved toward 2023 but still falls slightly below the global average. Policymakers should consider reforms aimed at lowering regulatory burdens for businesses, strengthening property rights, promoting open trade, improving financial access for small firms, reducing corruption, and reinforcing legal frameworks. These measures can help build a more inclusive and competitive economic environment, contributing to more balanced income distribution.

Furthermore, increasing economic freedom supports several Sustainable Development Goals (SDGs). It advances SDG 16 (Peace, Justice, and Strong Institutions) by fostering transparent and fair institutions, contributes to SDG 10 (Reduced Inequality) by closing income gaps, and supports SDG 5 (Gender Equality) by promoting equal opportunities across genders. These synergies also help address SDG 1 (No Poverty), as greater income equality enhances the share of national income received by low-income populations, thereby contributing to poverty alleviation.

This study has several limitations. First, its focus is limited to ASEAN countries, and the newly constructed EFHDI assigns equal weight (25%) to each component, which may not reflect the actual influence of each dimension. The model also includes only two control variables—employment and inflation—commonly used in inequality studies but not exhaustive. Implementing policies to improve HDI and EF may also face political

challenges, including resistance from groups adversely affected by reforms, weak institutional capacity, and the delayed effects of structural changes that may discourage short-term-oriented policymakers.

Despite these limitations, the study's findings and policy insights may be applicable to other developing countries with similar characteristics. Previous studies from various developing nations have found that improvements in HDI reduce income inequality, suggesting that the implications of this study can be generalized to broader contexts. For future research, it is recommended to compare the effects of EFHDI across countries grouped by different levels of economic freedom, examine the individual contributions of each HDI and EF component to income inequality, and explore alternative weightings for EF in the EFHDI index. Applying diverse econometric techniques and incorporating additional control variables would further enrich the understanding of the complex relationship between human development, freedom, and income distribution.

References

Abdullah, A., Doucouliagos, H., & Manning, E. (2015). Does education reduce income inequality? A meta-regression analysis. *Journal of Economic Surveys*, *29*(2), 301–316.

Alpdogan, H. (2023). The relationship between economic growth, income distribution and poverty in Türkiye. *Journal of Turkish Court of Accounts*, *34*(129), 259–290.

Alvan, A. (2009). Forging a link between human development and income inequality: Cross-country evidence. *Review of Social, Economic & Business Studies*, *7*(8), 31–43.

Anand, S., & Sen, A. (2000). The income component of the human development Index. *Journal of Human Development, 1*(1), 83–106.

Apergis, N. (2015). Economic freedom and income inequality: Further evidence from 58 countries in the long-run. *Financial Theory and Practice*, *39*(4), 349–370.

Apergis, N., Dinçer, O., & Payne, J. (2014). Economic freedom and income inequality revisited: Evidence from a panel error correction model. *Contemporary Economic Policy, 32*(1), 67–75.

Ashby, N.J., & Sobel, R.S. (2008). Income inequality and economic freedom in the U.S. states. *Public Choice, 134*, 329–346.

Asteriou, D., Pilbeam, K., & Pratiwi, C. E. (2021). Public debt and economic growth: Panel data evidence for Asian countries. *Journal of Economics and Finance, 45*(2), 270–287.

Balogun, A. M., Adelowokan, O. A., Ajayi, F. O., & Ogede, J. S. (2024). Trade openness, poverty, and sustainable development: Testing for causality using Dumitrescu-Hurlin approach. *Journal of Enterprise and Development, 6*(2), 280–289.

Bennett, D. L., & Vedder, R. K. (2013). A dynamic analysis of economic freedom and income inequality in the 50 US states: Empirical evidence of a parabolic relationship. *Journal of Regional Analysis & Policy, 43*(1), 42–55.

Berggren, N. (1999). Economic freedom and equality: Friends or foes? *Public Choice, 100*, 203–223.

Bergh, A., & Nilsson, T. (2010). Do liberalization and globalization increase income inequality? *European Journal of Political Economy, 26*(4), 488–505.

Bosah, C. P., Li, S., Ampofo, G. K. M., & Liu, K. (2021). Dynamic nexus between energy consumption, economic growth, and urbanization with carbon emission: Evidence from panel PMG-ARDL estimation. *Environmental Science and Pollution Research, 28*(43), 61201–61212.

Boz, Ç. (2012). Adam Smith ve Amartya Sen [Adam Smith and Amartya Sen]. *Gazi Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 14*(3), 71–96.

Breusch, T. S., & Pagan, A. R. (1980). The Lagrange multiplier test and its applications to model specification in econometrics. *The Review of Economic Studies, 47*(1), 239–253.

Bucak, Ç. (2021). Economic complexity index, human development index and carbon emissions in EU15 countries and in Turkey: Panel data analysis. *Ege Stratejik Arastırmalar Dergisi, 12*(1), 71–88.

Bucak, Ç., & Saygılı, F. (2022). The relationship between trade openness, income inequality and human development: A panel data analysis. *Ege Stratejik Arastırmalar Dergisi, 13*(2), 23–41.

Çalışkan, Ş. (2010). Income inequality and poverty in Turkey. *Journal of Social Policy Conferences*, (59), 89–132.

Carter, J. R. (2007). An empirical note on economic freedom and income inequality. *Public Choice, 130*(1), 163–177.

Clark, J. R., & Lawson, R. A. (2008). The impact of economic growth, tax policy and economic freedom on income inequality. *The Journal of Private Enterprise, 24*(1), 23–31.

Çoban, B., & Durusu Çiftçi, D. (2024). Economic freedom and income inequality: An empirical note for the Post-GFC period. *Ankara Hacı Bayram Veli Üniversitesi Iktisadi Ve Idari Bilimler Fakültesi Dergisi, 26*(3), 1049–1072.

Commons, J. R. (1936). Institutional economics. *The American Economic Review, 26*(1), 237–249.

Deaton, A. (2003). Health, income, and inequality. *NBER Reporter Online*, Spring 2003, 9-12. Retrieved from https://www.nber.org/reporter/spring-2003/health-income-and-inequality

De Soysa, I., & Vadlamannati, K. C. (2023). Free market capitalism and societal inequities: Assessing the effects of economic freedom on income inequality and the equity of access to opportunity, 1990–2017. *International Political Science Review, 44*(4), 471–491.

Dogan, H. (2023). Macro empowerment policies for poverty in promoting social justice. *Kahramanmaras Sütçü Imam University Journal of Social Sciences, 20*(2), 496–508.

Dumitrescu, E. I., & Hurlin, C. (2012). Testing for granger non-causality in heterogeneous panels. *Economic modelling, 29*(4), 1450–1460.

Durgun, B., & Durgun, Ö. (2023). The relationship between income inequality and human development: evidence from Türkiye. Kastamonu University Journal of Faculty of Economics and Administrative Sciences, 25(1), 45–73.

Fisunoglu, M., & Tan, B. K. (2009). Keynes's revolution and Keynesian economics. *Ekonomik Yaklasim, 20*(70), 31–60.

Fukuyama, F. (2005). State-building: Governance and world order in the 21st century (D. Çetinkasap, Trans.). Remzi Kitabevi. [In Turkish, original work published 2004]

Ghifara, A. S., Iman, A. N., Wardhana, A. K., Rusgianto, S., & Ratnasari, R. T. (2022). The effect of economic growth, government spending, and human development index toward inequality of income distribution in the metropolitan cities in Indonesia. *Daengku: Journal of Humanities and Social Sciences Innovation, 2*(4), 529–536.

Gökçeli, E. (2023). Institutional quality and foreign direct investment: Evidence from OECD countries. *Ekonomický Casopis, 71*(3), 222–257.

Gregorio, J. D. & Lee, J. W. (2002). Education and income inequality: New evidence from cross-country data. *Review of Income and Wealth, 48*(3), 395–416.

Gürses, D. (2009). Human development and Turkey. *Balıkesir University Journal of Social Sciences Institute, 12*(21), 339–350. [In Turkish]

Heritage Foundation. (2024). *2024 index of economic freedom* [Data set]. Retrieved from https://www.heritage.org/index/pages/all-country-scores

Heritage Foundation. (2025). *The index of economic freedom*. Retrieved from https://www.heritage.org/index/pages/about

International Labour Organization (ILO). (2018). *More than 68 per cent of the employed population in Asia-Pacific are in the informal economy*. Retrieved from https://www.ilo.org/resource/news/more-68-cent-employed-population-asia-pacific-are-informal-economy?utm_source=chatgpt.com

Irwin, D. A. (2020). Adam Smith's "tolerable administration of justice" and the Wealth of Nations. *Scottish Journal of Political Economy, 67*(3), 231–247.

Karas, G. (2021). Income distribution and development relationship: The case of BRICS-T countries. *Maliye Dergisi, 180*, 233–251.

Kılıç, R., & Gökçeli, E. (2024). A new perspective on income inequality through the human development index. *Kafkas University Economics and Administrative Sciences Faculty, 15*(29), 214–242.

Konu, A. (2017). Relationship between income inequality and economic freedom: An empirical evaluation for OECD countries. *Gaziantep University Journal of Social Sciences, 16*(4), 928–936.

Kuznets, S. (1955). Economic growth and income inequality. *The American Economic Review, 45*(1), 1–28.

Lustig, N. (2015). *The redistributive impact of government spending on education and health: Evidence from thirteen developing countries in the Commitment to Equity project* (CEQ Working Paper No. 30). Tulane University.

Martinez-Vazquez, J., Moreno-Dodson, B., & Vulovic, V. (2012). The impact of tax and expenditure policies on income distribution: Evidence from a large panel of countries. *Hacienda Pública Española/Review of Public Economics, 200*(1), 95–130.

Mazumdar, K. (2003). A new approach to human development index. *Review of Social Economy, 61*(4), 535–549.

Mbaku, J. M. (1997). Inequality in income distribution and economic development: Evidence using alternative measures of development. *Journal of Economic Development, 22*(2), 57–67.

Mehic, A. (2018). Industrial employment and income inequality: Evidence from panel data. *Structural Change and Economic Dynamics, 45,* 84–93.

Miller, T., Kim, A. B., & Roberts, J. M. (2018). *2018 index of economic freedom*. Washington, DC: The Heritage Foundation.

Miller, T., Kim, A. B., & Roberts, J. M. (2022). *2022 index of economic freedom*. Washington, DC: The Heritage Foundation.

Nazirou, S. C. M., Mousa, D. S. M., & Ahmed, A. T. (2022). The impact of economic freedom and democracy on income inequality: Empirical evidence from Sub-Saharan African countries. *Archives of Business Research, 10*(3), 217–234.

North, D. C. (1994). *Institutional change: A framework of analysis* (Economic History Working Paper No. 9412001). University Library of Munich, Germany. Retrieved from https://ideas.repec.org/p/wpa/wuwpeh/9412001.html

OECD. (2015). *In it together: Why less inequality benefits all*. Paris, France: OECD Publishing.

Olsson, O. (1999). *A microeconomic analysis of institutions* (Working Papers in Economics, No. 25). Department of Economics, Goteborg University, Gothenburg, Sweden.

Özden, E., Gültekin, Ö. F., & Bayramoğlu, T. (2022). An analysis on the relationship between income distribution and human development with panel data and machine learning. *Gaziantep University Journal of Social Sciences, 21*(2), 564–582.

Öztürk, E. & Oktar, S. (2017). Income inequality development relationship: The case of Turkey. *The Academic Elegance, 4*(8), 101–123.

Öztürk Ofluoğlu, N., Artan, S., & Kalaycı, C. (2018). The relationships of institutional quality, economic freedoms and income distribution: A case of the MINT countries. *Hak-İş Uluslararası Emek ve Toplum Dergisi, 7*(17), 90–107.

Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and Statistics, 61*(S1), 653–670.

Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Econometrics, 22*(2), 265–312.

Pesaran, M. H. (2015). Testing weak cross-sectional dependence in large panels. *Econometric reviews, 34*(6-10), 1089–1117.

Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American statistical Association, 94*(446), 621–634.

Puspita, Y., Nurazi, R., Ekaputri, R. A., & Armelly, A. (2024). Dynamic analysis of corruption, economic growth, income inequality, and human development index (HDI) in ASEAN countries: A vector autoregressive (VAR) approach. In *Proceedings of the Bengkulu International Conference on Economics, Management, Business and Accounting (BICEMBA)* (Vol. 2, pp. 887–898). Bengkulu, Indonesia: University of Bengkulu.

Rachmawatie, D., & Prakoso, A. Y. (2023). The influence of human development index on the income distribution inequality in Yogyakarta. *Jambura Agribusiness Journal, 4*(2), 67–75.

Sabir, S., & Aziz, N. (2018). Impact of health and education on income inequality: Evidence from selected developing countries. *Business and Economic Review, 10*(4), 83–101.

Samargandi, N., Fidrmuc, J., & Ghosh, S. (2015). Is the relationship between financial development and economic growth monotonic? Evidence from a sample of middle-income countries. *World Development, 68*, 66–81.

Scully, G. (2002). Economic Freedom, government policy, and the trade-of between equity and economic growth. *Public Choice, 113*(1), 77–96.

Seefeldt, B. (2018). *The impact of education expenditures on income inequality: Evidence from US States*. (Unpublished honors dissertation). Bryant University.

Sen, A.K. (1999). *Development as freedom*. Oxford: Oxford University Press.

Sen, H., & Sagbas, I. (2017). *Tax theory and policy* (3rd ed.). Ankara, Turkey: Barış Arıkan Publications. [In Turkish]

Solt, F. (2020). Measuring income inequality across countries and over time: The standardized world income inequality database. *Social Science Quarterly, 101*(3), 1183–1199.

Theyson, K. C., & Heller, L. R. (2015). Development and income inequality: A new specification of the Kuznets hypothesis. *The Journal of Developing Areas, 49*(3), 103–118.

Trabold-Nübler, H. (1991). The human development index-a new development indicator? *Intereconomics, 26*, 236–243.

Tsitouras, A., & Papapanagos, H. (2025). The relationships between economic freedom, income inequality, and economic growth: Empirical evidence from an asymmetric analysis in the case of Greece. *Portuguese Economic Journal*, 1–36.

United Nations Development Programme (UNDP). (1990). *Human development report 1990*. New York: Oxford University Press.

United Nations Development Programme (UNDP). (2024). *Human development index (HDI)* [Data set]. Human Development Reports. Retrieved from https://hdr.undp.org/data-center/human-development-index#/indicies/HDI

Veblen, T. (2017). *The theory of the leisure class.* New York: Routledge.

Vo, D. H., Vo, A. T., & Ho, C. M. (2024). The short-and long-run effect of human capital on income inequality: Empirical evidence in the ASEAN region. *Plos One, 19*(7), e0304678.

Walker, M. (2005). Amartya Sen's capability approach and education. *Educational Action Research, 13*(1), 103–110.

Westerlund, J. (2007). Testing for error correction in panel data. *Oxford Bulletin of Economics and Statistics, 69*(6), 709–748.

Yalçın, A. Z., Yılmaztürk, A. & Yıldız, F. (2023). The impact of public education expenditures reducing income inequality: The sample of selected OECD countries (2010–2019). *Journal of Administrative Sciences, 21*(48), 248–274.

Younger, S. D. (1999). The relative progressivity of social services in Ecuador. *Public Finance Review, 27*(3), 310–352.