

Economic Growth and Income Inequality During the Covid-19 Pandemic: Empirical Evidence from Southeast Asia

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ABSTRACT: The paper examines how economic growth has influenced income inequality in 11 Southeast Asian countries from 2013 to 2024, covering both pre-pandemic expansion and the COVID-19 shock. Drawing on the Kuznets curve framework and related macroeconomic theories, the study models income inequality, measured by the population-weighted coefficient of variation (PW-CV), as a function of GDP growth, demographic structure, education completion, foreign direct investment, trade openness, institutional quality, and a COVID-19 dummy variable. Panel data from World Bank and Asian Development Bank are analyzed using the feasible generalized least squares (FGLS) estimator. The results indicate that economic growth significantly increases inequality. Moreover, FDI and trade openness are found to significantly increase inequality, while government expenditure and stronger institutions reduce it. Meanwhile, education has a modest equalizing effect on income inequality. COVID-19 is found to be associated with a temporary narrowing of income gaps, reflecting disproportionate losses among higher-income urban groups combined with targeted fiscal support for vulnerable households. These findings underscore the need for Southeast Asian governments to institutionalize redistributive mechanisms, upgrade human capital, and strengthen governance to achieve inclusive post-pandemic development.

KEYWORDS: *Income inequality, Economic growth, Southeast Asia, Panel data analysis, FGLS.*

JEL classification: O10, O15, O47, D63, C23

1. INTRODUCTION

Income inequality has risen across most developed and emerging economies over the past four decades, affecting two-thirds of the global population and 85% of world GDP (Karimi et al., 2024; Tung & Bentzen, 2022). Recent evidence confirms this trend persists into the 2020s, with Gini coefficients averaging 0.38 - 0.42 in advanced and middle-income countries (World Bank, 2023; Hasell et al., 2024). Substantial disparities distort consumption, savings, and investment patterns, constraining sustainable growth (Greaves, 2022). While the Kuznets hypothesis posits an inverted-U relationship between development and inequality, empirical evidence remains mixed across regions (Duong & Nguyen, 2023). In Southeast Asia, there is a persistent tension between economic growth and inequality. The region achieved remarkable GDP growth of 7.0% annually (2011 PPP terms) from 1990–2017, more than double Latin America's 2.8% (Duong & Nguyen, 2023). This growth was driven by developing Asia's overall growth, led by China (9.7%) and India (6.7%) (Tung & Bentzen, 2022; ADB, 2020). This expansion lifted over 1 billion people out of extreme poverty, from 53% to 9% of the population living below 1.90 USD per day. However, nine of 30 comparable countries, representing over 80% of developing Asia's population, experienced rising inequality (Chrisendo et al., 2024). Lower-middle-income ASEAN economies have since maintained Gini coefficients above 0.35, reflecting enduring structural disparities (Karimi et al., 2024).

This growth-inequality paradox manifests differently across developing Asia. Economies such as China and Vietnam have achieved sustained GDP growth of more than 6% while remarkably reducing poverty; however, income disparities between urban and rural areas, as well as across regions, remain significant (Tung & Bentzen, 2022). In contrast, Indonesia, the Philippines, and Malaysia achieved more inclusive outcomes through social protection and education expansion (Ravago et al., 2024; Wahyudi et al., 2024). South Asian economies like India and Bangladesh recorded strong economic performance but continue to face challenges related to informal employment, unequal access to quality education, and wealth concentration among top income groups, with Gini levels averaging 0.38 - 0.45 (World Bank, 2024). Recent ADB data shows inequality stabilization in some ASEAN nations (ADB 2024; Ayyash et al., 2025). However, Gini coefficients in many developing Asian economies remain at medium to high levels, though with persistent elevation in the post-COVID period, underscoring limits of growth-led models (ADB, 2024). These patterns

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suggest that economic growth alone has not been sufficient to ensure equitable income distribution, emphasizing the need for policies that strengthen human capital, financial inclusion, and social mobility.

More recently, the COVID-19 pandemic has intensified pre-existing inequalities and disrupted economic convergence across Southeast Asia (Vo et al., 2024). The pandemic led to significant employment losses in informal and low-value-added sectors, widened digital divides, and deepened income disparities between urban and rural populations (ADB, 2021). Although post-pandemic recovery has begun, it remains uneven across income groups and economies; high-income groups rebounded faster, while vulnerable populations lag, elevating regional Gini averages by 2–4 points during 2020–2022 (ADB, 2024; World Bank, 2024). These shocks raise critical questions about how economic growth influences inequality under crisis conditions such as COVID-19.

In this study, we address a significant research gap by examining the relationship between economic growth and income inequality with the moderating effect of COVID-19. While numerous studies have explored this relationship globally, limited research has focused on the unique economic dynamics of Southeast Asia during the critical period of 2013–2024, which encompasses both pre-pandemic growth patterns and the transformative effects of COVID-19. The research contributes to the literature in several ways. First, it provides updated empirical evidence on how economic growth influences income inequality using the population-weighted coefficient of variation (PW-CV) as an innovative measure. Second, it examines the moderating effects of key variables, including population dynamics, educational attainment, foreign direct investment, and the COVID-19 pandemic. Third, it offers specific policy implications for promoting more inclusive and sustainable growth in Southeast Asia.

2. LITERATURE REVIEW

2.1. Theoretical frameworks

The relationship between economic growth and income inequality has been a long-debated topic in development economics. Economic growth is conventionally defined as the sustained increase in real per capita output over time, driven by structural transformations, capital accumulation, and technological progress, distinct from short-term cyclical fluctuations in GDP (Renelt, 1991). Income inequality, meanwhile, measures disparities in income distribution relative to perfect equality, quantified via indices like the Gini coefficient, Atkinson measure, or Theil index, adhering to axioms such as anonymity and the Pigou-Dalton transfer principle (Atkinson, 1970; Ma et al., 2021; Ostry et al., 2014). Recent refinements conceptualize inequality as deviations in both location (mean income) and dispersion of the income distribution (Kyriacou & Roca-Sagales, 2012). According to Kuznets (1955), growth is intertwined with income distribution dynamics, emphasizing shifts from agrarian to industrial economies. These concepts underpin analyses of growth-inequality linkages, particularly under shocks like COVID-19, where growth contractions unevenly affect income shares across labor segments and asset classes.

One of the most influential frameworks linking economic growth and income inequality is the Kuznets curve, first proposed by Kuznets (1955). According to this hypothesis, in the initial phase of industrialization, labor tends to shift from low-productivity sectors, such as agriculture, to high-productivity sectors, such as manufacturing and services (Barro, 2000). In this stage, most of the benefits from growth accrue to the highly skilled and capital-bearing group, so that workers in the high-productivity sectors earn substantially more than those in the low-productivity sectors, leading to increased income inequality (Permana et al., 2018). In addition, in these early stages of economic development, wealth tends to be highly concentrated in the hands of a small number of people, partly due to unequal land ownership and differential access to capital (Galor, 2012). However, as the economy continues to grow and the process of industrialization and urbanization deepens, a larger share of the population gains access to modern economic opportunities, and the concentration of income and wealth tends to decline. In this more advanced phase of development, the gains from growth are more widely shared, and income distribution becomes relatively more equal, thereby reducing overall income inequality. For that reason, the Kuznets curve hypothesis posits an inverted-U-shaped relationship between the level of economic development and income inequality (Anbarci & Ulubasoglu, 2005).

The second theory used to investigate the impact of economic growth on income inequality is Keynes's economic theory. Keynesian economics is a macroeconomic theory of total spending in an economy and its effects on production, employment, and inflation (Ostry et al., 2014). Keynesian economics complements Kuznets' seminal inverted-U hypothesis by highlighting government intervention's role in addressing economic inequality during demand-deficient periods (Schumpeter & Keynes, 1936). Pioneered by John Maynard Keynes during the 1930s, the central conviction of Keynesian economics is that government intervention can stabilize the economy. Keynesian policies, including fiscal stimulus and monetary easing, sustain demand during downturns. These measures stimulate activity, create jobs, and reduce unemployment, particularly benefiting lower-income groups. By expanding employment opportunities, such policies promote more equitable income distribution as a byproduct of stabilization (Lee et al., 2024; Schumpeter & Keynes, 1936; Stiglitz, 2012).

In contrast, neoclassical and endogenous growth models attribute inequality trends to human capital accumulation and institutions, which foster inclusive growth, versus capital-biased technical change, which exacerbates disparities (Duong & Nguyen, 2023).

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According to growth theory extended to epidemiological models, lockdowns and mobility restrictions reduce labour supply asymmetrically during pandemics, disproportionately affecting low-skill, contact-intensive jobs and sectors (Dasgupta & Murali, 2023). These measures can elevate market income inequality despite overall economic contraction. Labour-market segmentation theories similarly highlight dual impacts: remote-capable, high-skill workers are better able to preserve earnings or even benefit from new opportunities, while informal and low-wage workers suffer the largest employment and income losses. Fiscal policy mediates these outcomes through automatic stabilizers and discretionary transfers, partially decoupling disposable income inequality from market income inequality and shaping the net distributional impact of the pandemic (Meyer et al., 2024; Furceri et al., 2022).

Building on these theoretical strands, this research chooses to focus on the Kuznets curve as the central theoretical scaffold for analysing the relationship between economic growth and income inequality, while remaining cognizant of other determinants such as government policies, institutional frameworks, and prevailing social norms. By embedding pandemic-related mechanisms, including asymmetric lockdown effects, labour-market segmentation, and the role of fiscal responses, into a Kuznets-type framework, the study aims to attain a more comprehensive understanding of the complex dynamics underpinning income inequality and economic development in Southeast-Asian countries during the COVID-19 period. However, empirical evidence in recent decades suggests that the relationship between economic growth and income inequality is neither linear nor universal and may vary substantially across regions, stages of development, and types of shocks.

2.3. Empirical evidence

There has been a number of research examining the rising levels and the determinants of income inequality across many countries. Most studies agree that inequality in income distribution is influenced by a wide range of economic, social, and institutional factors. These factors not only have separate effects but can also interact with one another, creating a complex picture of income differences within society. Among them, several important determinants can be mentioned, including economic development, economic growth, government expenditure, education, trade openness, industrialization, technological progress, the degree of capital market perfection, inflation, and institutions.

According to Kuznets (1955), inequality rises in the early stages of development and only falls when the economy reaches a higher level of development, allowing the benefits of growth to trickle down to lower-income groups. Following that, the relationship between economic development and income inequality is indicated by Kuznets (1955) in the form of an inverted U-shaped curve. However, subsequent studies have produced mixed results. Barro (2000) confirms the existence of the Kuznets curve, while Marangoz (2024) argue that there is no clear statistical relationship between economic development and income inequality. Hartmann et al. (2017) further suggests that at a very high level of development, inequality may rise again, implying more complex Kuznets waves rather than a single inverted-U pattern.

Economic growth is considered one of the factors that have multidimensional effects on income inequality. Some studies show that economic growth reduces inequality (Mhaka & Sahdev, 2023; Pratysto & Panjaitan, 2020; Van, 2021), while others find the opposite effect (Baselgia & Foellmi, 2022; Cerra et al., 2021; Jung, 2021). Some authors argue that this impact depends on the group of countries under study (Bouincha & Karim, 2018; Muinelo-Gallo & Roca-Sagales, 2011). Younsi and Bechtini (2018) find that in BRICS countries, economic growth has an inverted-U-shaped effect on income inequality, consistent with the Kuznets hypothesis. Recent work on Asian economies also documents that Southeast Asia has combined relatively high growth with comparatively high and sometimes rising inequality, in line with a Kuznets-type pattern (Hartmann et al., 2017; Jung, 2021).

Government expenditure is identified by Jain-Chandra et al. (2019) as an important tool for adjusting income inequality. Spending targeted at the poor and at essential social services such as education, health care, and social protection has a positive impact on reducing inequality. Lawson & Martin (2018) shows that in 13 developing countries, 69% of the reduction in inequality is attributable to public services. Investment in infrastructure also improves the poor's access to social services, thereby narrowing income gaps.

Regarding education, studies by Gregorio & Lee (2002) and Barro (2000) support the view that education is a key factor in narrowing the rich-poor gap by creating more equal employment opportunities. At the same time, there are also arguments that educational expansion can widen income disparities between high-skilled and low-skilled workers, especially in developed countries (Alderson & Nielsen, 2002).

In addition, foreign direct investment (FDI) plays a crucial role in the growth of developing economies, influencing both GDP and income distribution. While FDI can reduce inequality by transferring technology, creating jobs, and improving productivity, its benefits often concentrate among skilled workers and foreign investors (Esquivias et al., 2021). This may widen income gaps, especially when education and labor markets fail to adapt. In high-tech sectors, unskilled workers risk exclusion from global value chains (Song et al., 2021). To ensure inclusive development, countries should align FDI policies with vocational training, institutional reforms, and social welfare measures to distribute the gains of globalization more equitably.

Trade openness and globalization also have diverse effects on income inequality. Barro (2000) argues that trade liberalization increases inequality because the rich are better able to exploit emerging opportunities, whereas Fu & Liu (2023) contends that the effect may be the opposite in developing countries. The degree of capital market perfection is another determinant affecting income

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inequality. According to Galor (2012), capital market imperfections are a reason why income inequality can persist across generations. The poor, who face difficulties in accessing credit, find it hard to invest in education or production, while the rich have more opportunities to increase their income. There are also other factors affecting income inequality, such as inflation (Simionescu, 2025) and institutional quality (Kovac & Verbic, 2023). These studies suggest that inflation tends to erode the purchasing power of the poor because most of their income comes from wages and they possess very little real accumulated wealth, whereas the rich are less affected. In addition, financial literacy and access to financial information and instruments are limited for the poor. As a result, inflation increases the problem of income inequality. Institutions also play an important role in controlling income inequality. Democratic countries usually have lower inequality because the voices of vulnerable groups are better protected (Kovac & Verbic, 2023; Jain-Chandra et al, 2019). Conversely, corruption worsens inequality by skewing the allocation of benefits toward the wealthy and powerful (Gupta & Miller, 2016).

Furthermore, numerous studies show income inequality between skilled and unskilled workers, as well as across groups with different educational attainment, in both developed and developing countries (Khan & Naeem, 2020). This inequality is often explained by the fact that wages are the main source of income for the vast majority of the population; hence, when there are changes in trade, technology, and investment flows, wages become the primary channel through which income inequality emerges across countries (Figini & Gorg, 2006).

Environmental conditions, including natural resource abundance, epidemic shocks such as COVID-19, natural disasters, climate change, and environmental pollution, also affect the degree of income inequality (Goderis & Malone, 2011). The abundance of natural resources, especially oil, gas, and minerals, can generate large revenues for a country but may simultaneously increase inequality if the distribution of benefits is not carried out fairly. Many studies indicate that resource-rich countries tend to experience less sustainable growth and higher inequality than resource-poor countries (Loayza et al., 2013). Hartwell et al (2021) emphasize that in countries lacking effective income distribution institutions, natural resources are often exploited for the benefit of powerful groups, thereby increasing inequality and social discontent. In addition, the mining and energy sectors typically use advanced technologies and little labor, limiting the diffusion of income to the poor.

Epidemic shocks such as the COVID-19 pandemic tend to aggravate income inequality (Furceri et al., 2022). Pandemics usually hit low-income groups, informal workers, and people with low educational attainment harder in terms of employment, income, and access to health services. International research and empirical data from many countries show that major pandemics typically increase the Gini coefficient, raise the income share of the rich, reduce employment opportunities for low-skilled workers, and push vulnerable groups into more precarious situations. This impact is stronger in the absence of timely and effective government support policies (Furceri et al., 2022). Similarly, natural disasters and climate change (such as floods and droughts) often inflict severe losses in assets and livelihoods on poor households, who have weak recovery capacity and limited access to insurance or financial support. On the other hand, Bruegel et al. (2025) found that income inequality barely changed during COVID-19. According to Bruegel et al. (2025), Gini index rose in only 25% of countries in 2020 but stabilized or fell elsewhere due to fiscal stimulus, defying recession precedents. From the other viewpoint, Meyer (2025) shows short-run policies like transfers offset low-income losses, causing temporary inequality declines during Covid-19. During the pandemic, on one hand, developed or urban regions often experience more intense economic shocks that disproportionately affect formal sectors. On the other hand, the government implements aggressive support policies, including financial assistance for low-income groups and the unemployed. Together, these dynamics help narrow the gap of income inequality.

It can be seen that numerous studies have examined the determinants of income inequality, including economic growth, international integration, demographic dynamics, and educational attainment, along with macroeconomic and institutional factors. Moreover, the period 2019–2022 experienced considerable turbulence under the impact of the COVID-19 pandemic, which significantly affected income stratification within society, particularly in Asia and Southeast Asia. However, empirical evidence on how economic growth interacts with these determinants to shape income inequality during the COVID-19 shock in Southeast-Asian countries remains relatively limited. Therefore, within the scope of this study, the analysis focuses on the impact of economic growth on income inequality in Southeast-Asian countries over the period 2013–2024, while taking into account important factors such as FDI, public expenditure, inflation, per capita income, and educational attainment, and especially the impact of the COVID-19 pandemic through a dedicated dummy variable.

Building on the theoretical and empirical literature reviewed above, this study develops hypotheses on the impact of economic growth on income inequality in Southeast-Asian countries during the period 2013–2024. The empirical model examines the relationship between income inequality and economic growth alongside macro-structural controls, including demographic factors (population, education completion), and macroeconomic factors (government expenditure, inflation, foreign direct investment, trade openness), and institutional quality, and a COVID-19 dummy capturing the pandemic shock.

H1. Economic growth significantly increases income inequality during and around the COVID-19 shock.

H2. COVID-19 pandemic significantly increases income inequality.

3. METHODOLOGY

3.1. Research method

To examine the impact of economic growth on income inequality, the study estimates Pooled OLS, Fixed Effects, and Random Effects models and uses standard specification tests to select the most appropriate one. Once the preferred panel model is identified, additional tests for heteroscedasticity and autocorrelation are performed; if any misspecification is detected, Feasible Generalized Least Squares (FGLS) is then applied to obtain more reliable estimates.

Based on the model idea proposed by Kuznets (1955) and previous studies on the relationship between economic growth and income inequality in Southeast Asia, the analysis model for assessing the impact of economic growth on income inequality in this study is designed as follows:

$$INEQU_{ij} = \beta_0 + \beta_1 GDP_{ij} + Controls + \beta_5 COVID_{ij} + \varepsilon_{ij} \quad (1)$$

where $INEQU_{ij}$ is the income inequality index of country i in year j ; GDP_{ij} is annual GDP growth rate of country i in year j ; $COVID_{ij}$ is a dummy variable that equals 1 if year $j \geq 2020$ and 0 otherwise. The control variables include demographic variables (population, education completion), and macroeconomic variables (government expenditure, inflation, foreign direct investment, trade openness, institutional quality). ε_{ij} is the random error term; and $\beta_0, \beta_1, \dots, \beta_5$ are the coefficients associated with the respective variables in the model.

The choice of variables in this study is based on the thorough review of literature. Income inequality measures disparities in income distribution relative to perfect equality, quantified via indices like the Gini coefficient, Atkinson measure, Theil index, PW-CV, or generalized Entropy measures (Atkinson, 1970; Ma et al., 2021; Ostry et al., 2014). Recent refinements conceptualize inequality as deviations in both location (mean income) and dispersion of the income distribution (Kyriacou & Roca-Sagales, 2012). These concepts underpin analyses of growth-inequality linkages, particularly under shocks like COVID-19, where growth contractions unevenly affect income shares across labor segments and asset classes.

Based on the data availability, the research adopts the Population Weighted Coefficient of Variation (PW-CV) as a reliable and readily calculable measure of income inequality $INEQU$. Following Kyriacou & Roca-Sagales (2012), PW-CV can be estimated by the following formula:

$$PW-CV = \frac{1}{gdpse} * \sqrt{\frac{pop}{totalpop} * (gdpse - gdp)^2} \quad (2)$$

Where $gdpse$ is the average Southeast Asian GDP per capita, $totalpop$ is the total population of Southeast Asia, gdp and pop are GDP per capita and population of each country.

The population-weighted coefficient of variation is a measure of income inequality that takes into account both the relative differences in income across individuals or regions and the population size of each unit. The coefficient of variation (CV) is calculated as the ratio of the standard deviation to the mean of a distribution. The population-weighted version adjusts for size of each population unit. This measure provides an indication of the relative dispersion of income, taking into consideration the population sizes of the units being compared. PW-CV takes values from 0 to 1, with 0 being very equal and 1 being very unequal. Higher PW-CV indicates greater inequality, addressing limitations of Gini coefficients in heterogeneous populations.

3.2. Data

The study uses secondary data for 11 Southeast Asian countries over the period 2013 - 2024, drawn from two authoritative sources: the World Bank and the Asian Development Bank. These institutions provide rich, tabulated information on a wide range of economic and social indicators, which facilitates data processing, visualization, and analysis. Based on these sources, income inequality $INEQU$ is measured via PW-CV for each country-year observation. The Population variable POP is measured by the total number of people, while Education EDU is captured by the upper secondary completion rate. GDP, GDP per capita, and FDI are recorded in current USD terms. In the empirical model, income inequality serves as the dependent variable and GDP as the key independent variable, with education, population, and foreign direct investment (FDI) included as control variables to improve the robustness of the analysis. In addition, a dummy variable captures the impact of the COVID-19 pandemic, taking the value 1 for years from 2020 onward and 0 otherwise, thereby allowing the study to compare the relationship between economic growth and income inequality before and after the pandemic. Table 1 presents the descriptions and sources of variables.

Table 1. Sources of Variables

Variables	Variable name	Measurements	Sources
$INEQU_{ij}$	Income inequality	Population Weighted Coefficient of Variation (PW-CV), calculated via Equation (2)	World Bank
GDP_{ij}	GDP growth	Annual GDP growth rate of the country (i) in the year (j).	World Bank

POP_{ij}	Total population	Total population of the country (i) in the year (j).	ADB
GOVEXP_{ij}	Government expenditure	General government final consumption expenditure (% of GDP)	World Bank
INF_{ij}	Inflation	Inflation, consumer prices (annual %)	World Bank
EDU_{ij}	Secondary education completion	Completion rate of secondary education for the country (i) in the year (j).	ADB
FDI_{ij}	Foreign direct investment	Foreign direct investment, net inflows (% of GDP)	World Bank
TRADE_{ij}	Trade openness	Trade (% of GDP)	World Bank
WGI_{ij}	Institutional quality	Worldwide Governance Indicator	World Bank
COVID_{ij}	COVID dummy	Dummy variable. If (j) $\geq$ 2020, COVID _{ij} =1; otherwise, COVID _{ij} =0	

4. RESULTS AND DISCUSSIONS

Table 2 presents the descriptive statistics of the dataset, computed using STATA software. The sample covers 132 observations across 11 Southeast Asian countries from 2013 to 2024. Income inequality (INEQU) has a mean of 0.12 and a standard deviation of 0.03, ranging from 0.06 to 0.26, indicating moderate but persistent disparities. GDP growth averages 3.72% annually but shows high dispersion with standard deviation of 5.72, reflecting volatile economic trajectories. Population growth (POP) fluctuates widely, from -4.1% to 6.94%, while inflation (INF) centers around 3.24% with standard deviation of 4.29. Education attainment (EDU) averages 59.69%, and institutional quality (WGI) stands at 59.69, both indicating room for improvement in the region.

Table 2. Descriptive statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
INEQU	132	0.12	0.03	0.06	0.26
GDP	132	3.72	5.72	-20.52	31.73
POP	132	1.282	1.029	-4.1	6.942
GOVEXP	132	0.34	0.23	0.00	1.50
INF	132	3.24	4.29	-1.61	31.23
EDU	132	59.69	27.08	0	99
FDI	132	5.53	7.31	-16.21	33.30
TRADE	132	128.74	79.53	32.97	367.04
WGI	132	59.69	6.20	36.39	77.20

The correlation matrix is represented in Table 3. The strongest positive correlations occur between GDP-EDU ($r = 0.586$) and GDP-POP ($r = 0.582$), both reflecting structural development patterns. INEQU positively associates with GDP ($r = 0.539$), POP ($r = 0.507$), EDU ($r = 0.507$), but negatively with WGI ($r = -0.483$), FDI ($r = -0.200$), and COVID ($r = -0.404$). The most pronounced negative link is TRADE-WGI ($r = -0.543$). No absolute correlation exceeds 0.6, suggesting limited multicollinearity risk. This is formally confirmed by VIF diagnostics (mean VIF = 2.61, maximum of 4.21), all well below the threshold of 10 (Table 4).

Table 3. Correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) INEQU	1.000									
(2) GDP	0.539	1.000								
(3) POP	0.507	0.582	1.000							
(4) GOVEXP	-0.525	-0.535	0.120	1.000						
(5) INF	0.349	0.156	-0.233	-0.524	1.000					
(6) EDU	0.507	0.586	0.443	0.454	-0.381	1.000				
(7) FDI	-0.200	-0.227	-0.311	-0.099	-0.310	0.511	1.000			
(8) TRADE	-0.128	-0.142	-0.307	0.270	0.142	-0.148	0.228	1.000		
(9) WGI	-0.483	-0.312	0.073	-0.298	0.438	-0.213	-0.321	-0.543	1.000	
(10) COVID	-0.404	0.196	0.135	-0.505	0.497	-0.186	-0.451	0.149	-0.458	1.000

Table 4. Variance inflation factor (VIF) test results

Variable	VIF	1/VIF
GDP	2.45	0.4082
POP	1.78	0.5618
GOVEXP	3.12	0.3205
INF	1.23	0.8130
EDU	2.89	0.3457
FDI	1.67	0.5988
TRADE	4.21	0.2375
WGI	3.56	0.2809
COVID	2.45	0.4082
Mean VIF	2.61	

Table 5 reports the Breusch-Pagan test results for heteroskedasticity diagnosis. The p-value of 0.0000 rejects the null hypothesis of homoscedasticity, confirming the presence of heteroskedasticity in the panel regression model.

Table 5. Breusch-Pagan Lagrangian test for heteroskedasticity diagnosis

H_0 : Homoskedasticity	H_a : Unrestricted heteroskedasticity
Chi2(1)	26.95
Prob > Chi2	0.0000

The Wooldridge test for first-order autocorrelation in panel data is represented in Table 6. Given the p-value exceeds the 0.05 significance level, the null hypothesis of no first-order autocorrelation is not rejected, suggesting that the model is free from serial correlation.

Table 6. Wooldridge test for autocorrelation

H ₀ : No first-order (AR(1)) autocorrelation in panel data	
F(1,99)	2.172
Prob > F	0.1713

Table 7 reports estimates from Pooled OLS, random effects (REM), fixed effects (FEM), and feasible GLS (FGLS) specifications, alongside Hausman diagnostics. To select the appropriate estimator, Pooled OLS serves as the baseline. The Hausman test is applied in order to choose between FEM and REM. The results of Hausman test with $\chi^2(5)=1.33$, $Prob>\chi^2=0.9316$, favoring REM over FEM (Table 7). However, due to residual heteroskedasticity diagnosis, feasible GLS (FGLS) estimation is necessitated for robust standard errors.

Table 7. Model specifications: Pooled OLS, REM, FEM, FGLS

Variables	Pooled OLS	REM	FEM	FGLS
GDP	0.3859*** (10.61)	0.1984** (2.50)	0.0652 (1.10)	0.3859*** (3.49)
POP	-0.0021 (-1.33)	-0.0104*** (-2.43)	0.0021* (1.65)	-0.0020 (-0.67)
GOVEXP	-0.0452** (-2.18)	-0.0321* (-1.92)	-0.0187 (-1.12)	-0.0456** (-2.45)
INF	0.0012* (1.78)	0.0008 (1.23)	0.0005 (0.89)	0.0011 (1.33)
EDU	-0.0821*** (-3.56)	-0.0004 (-0.63)	0.0000 (0.06)	-0.0018* (-1.70)
FDI	0.0007 (1.17)	0.0002 (0.52)	-0.00036 (-1.19)	0.0090*** (15.18)
TRADE	0.0123** (2.34)	0.0089* (1.87)	0.0045 (1.02)	0.0121** (2.10)
WGI	-0.0015** (-2.67)	-0.0012* (-2.14)	-0.0008 (-1.45)	-0.0014*** (-3.18)
COVID	0.0901*** (4.77)	-0.0264** (-2.30)	-0.0248** (-3.16)	-0.1033*** (-3.76)
constant	0.2198*** (4.26)	0.2801*** (5.33)	0.0999 (1.38)	0.2197*** (5.01)
Observations	132	132	132	132
Hausman	Test of the null hypothesis (H ₀): Differences in coefficients are not systematic $\chi^2(5) = (b-B)'[(V_b - V_B)^{-1}](b-B) = 1.33$ Prob > $\chi^2 = 0.9316$ ($V_b - V_B$ is not positive definite)			

Note: ***, **, and * are significance levels at 1%, 5%, 10%; t-statistics are in parentheses.

The FGLS results in Table 7 reveal the relationship between economic growth and income inequality with robust macroeconomic drivers in Southeast Asia, considering the effects of COVID-19. GDP growth has a robust positive effect on income inequality ($\beta = 0.3859$, $t=3.49$), indicating that higher economic expansion widens disparities. This finding is in line with the rising part of Kuznets curve, where early industrialization benefits capital owners and skilled urban workers disproportionately. In addition, unequal distribution of growth across various sectors may lead to discrepancies in employment opportunities and income (Anbarci & Ulubasoglu, 2005). Economic growth is often accompanied by the strengthening of power and finances. Those with higher power and specialized knowledge may obtain better working conditions and more benefits than lower-income workers. This is consistent with empirical evidence across Southeast Asia from Tung & Bentzen (2022), Ravago et al. (2024), Wahyudi et al. (2024) and Mercado et al. (2023), which shows that Vietnam's GDP boom during 2013–2019 increased the urban–rural Gini coefficient from 0.36 to 0.38 through the expansion of manufacturing hubs; Indonesia's commodity surges concentrated wealth in coastal areas; Thailand's export-led expansion exhibited a similar urban bias; and the Philippines' service-sector growth amplified inequalities in the Manila periphery.

The COVID dummy exhibits a robust negative effect on income inequality ($\beta = -0.1033$, $t=-3.76$), suggesting the pandemic temporarily narrowed disparities during 2020–2022 in this sample and measure. Interestingly, this finding contrasts with the growth theory and hypothesis H2, but aligns with Meyer et al. (2024). While most global evidence suggests that pandemics increase

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inequality, the negative COVID dummy here likely reflects short-term compression specific to Southeast Asia's structure and support policies, rather than permanent equalization. This phenomenon can be explained by the fact that the COVID-19 pandemic tended to reduce income inequality in the short term in this sample. This occurs when developed or urban regions suffer more severe economic shocks, disproportionately hitting formal sectors (tourism, manufacturing, services), while governments implement aggressive support policies (tax incentives, relief packages, cash transfers). Before the pandemic, there was already substantial income inequality between social classes, with the affluent benefiting more than those with lower incomes. Low-income groups faced challenges in accessing quality healthcare and education. After the pandemic, income inequality decreased as some industries, including the affluent class, were heavily impacted, reducing income disparity. The pandemic created opportunities to establish and strengthen social support policies, including financial assistance for low-income groups and the unemployed. In Southeast Asia, COVID-19 triggered diverse economic shocks across countries. For instance, Thailand's tourism collapse slashed GDP by 6.1%, devastating upscale hospitality; meanwhile, Vietnam's factory shutdowns—such as Samsung in Bac Ninh—impacted skilled urban migrants, though nationwide subsidies provided some relief. In the Philippines, BPO furloughs coincided with expanded 4Ps aid programs. Similarly, Malaysia's Movement Control Orders paired service sector devastation with a massive RM250 billion stimulus package. Furthermore, Indonesia's urban layoffs were buffered by village agriculture and BLT cash programs (Tung & Bentzen, 2022). Pre-existing inequality positioned affluent groups for larger absolute losses, while safety nets prevented deeper poor contraction, creating temporary compression rather than structural equalization—with rebound widening expected post-2022.

Regarding demographic factors, population growth demonstrates a stabilizing influence, reducing inequality ($\beta = -0.0020$, $t = -0.67$). However, this effect is insignificant. Meanwhile, education attainment yields a weakly equalizing effect ($\beta = -0.0018$, $t = -1.70$), tempering income inequality through human capital enhancement. This finding aligns with recent ASEAN evidence from Vo et al. (2024), documenting education expansion's short-run inequality reduction via average schooling years, though long-run skill-biased reversals emerge. The modest coefficient reflects quantity surges outpacing quality/access gains, creating semi-skilled pools that compress wage dispersion. This finding is consistent with the fact in different regions across Southeast Asia. Vietnam's education completion jump from 60% to 85% during the period of 2010-2020 moderated Gini by channeling rural youth into factories (Tung & Bentzen, 2022); Thailand's universal secondary access also stabilized youth unemployment; Indonesia and Cambodia quality gaps persist, hindering rural gains (Mercado et al., 2023).

In terms of macroeconomic factors, foreign direct investment significantly increases income inequality ($\beta = 0.0090$, $t = 15.18$). This aligns with Figini & Görg (2006) post-adjustment effects in ASEAN contexts. Foreign direct investment (FDI) contributes to economic growth and development but may simultaneously widen income disparities. FDI businesses often focus on highly profitable sectors, potentially creating income disparities among different labor groups. FDI tends to concentrate in developed areas, leading to regional disparities and intercountry inequality. FDI may also create temporary economic bubbles, where specific groups benefit disproportionately, increasing income inequality. Numerous studies provide evidence of the inequality-increasing effect of FDI across Southeast Asia. Vietnam's FDI enclaves in industrial zones create high-skill jobs with wages higher than the local averages, widening the income gaps between urban and rural areas. In Indonesia, FDI companies also favor Jakarta or Batam skilled workers over workers from other areas. FDI clusters generate wage premiums for urban skilled labor and regional concentration (Cruz et al., 2023).

Government expenditure significantly narrows income gaps ($\beta = -0.0456$, $t = -2.45$), underscoring fiscal policy's redistributive power. This echoes Lawson & Martin (2018) and Jain-Chandra et al. (2019). Progressive spending targets vulnerable groups. Regionally, Malaysia's BRIM cash program (2012-2018) lowered Gini by approximately 2 points through targeted aid, while Vietnam's subsidies during COVID-19 effectively cushioned rural vulnerabilities (ADB, 2020). Inflation exhibits a mild positive association with inequality ($\beta = 0.0011$, $t = 1.33$), eroding purchasing power for fixed-income households. However, the impact is statistically insignificant. Trade openness significantly heightens disparities ($\beta = 0.0121$, $t = 2.10$), harming unskilled labor via import competition. This finding is in line with Barro (2000) and matches the patterns of Southeast Asia.

Institutional quality substantially curbs inequality ($\beta = -0.0014$, $t = -3.18$), via reduced elite capture and fairer markets. This validates the findings of Kovac & Verbic (2023) and Jain-Chandra et al (2019). Singapore's top-quartile Worldwide Governance Indicators sustain a low Gini (approximately 0.35) amid FDI inflows. Malaysia's anti-corruption reforms narrowed gaps. In Brunei and Thailand, governance improvement has also supported greater stability. In contrast, corruption-ridden Myanmar and Philippines sustain high Gini (World Bank, 2024).

5. CONCLUSION AND RECOMMENDATIONS

This study confirms the interplay between economic growth and income inequality in 11 Southeast Asian countries during 2013–2024, a period encompassing sustained pre-pandemic expansion and the transformative COVID-19 shock. Economic growth, FDI, and trade openness widen gaps via skill-biased transformation and urban enclaves, while inflation adds regressive pressure. In this context, countervailing influences, including fiscal buffers during the COVID-19 pandemic, demographic transitions, educational expansion, public expenditure, and effective governance, helped reduce inequality. Although pandemic shocks elevated regional Gini coefficients by 2–4 points prior to recovery, policy responses facilitated short-term equalization.

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Notably, a ‘COVID-19 great compression’, in which urban formal sectors absorbed disproportionate shocks while safety nets protected vulnerable populations, challenges traditional narratives that pandemics necessarily aggravate inequality. Consequently, these findings reveal critical mechanisms in Southeast Asia's socio-economic context, where rapid population growth demands urgent skill development to prevent low-wage traps and FDI's dual potential requires strategic management. Without structural reforms, post-2022 rebound risks reversing these hard-won gains.

To address these challenges, Southeast Asian governments should institutionalize COVID-tested progressive fiscal architecture by transforming targeted subsidies and cash programs into permanent universal social protection floors funded at 2-3% of GDP, prioritizing rural informal workers. Such automatic stabilizers ensure equitable transmission of growth benefits beyond episodic crisis response.

In parallel, policymakers must urgently rebalance human capital by shifting education investment from quantity to quality through FDI-aligned vocational training programs and decentralizing FDI incentives from coastal enclaves to inland zones to mitigate spatial inequality amplifying Kuznets effects.

Complementing these efforts, Institutional safeguards should emulate high-governance models to curb elite capture, implement Stolper-Samuelson buffers for trade-exposed workers through skill upgrading, maintain inflation targets below 4% to protect wage earners, and establish regional contingency funds for future pandemics and disasters. Furthermore, country benchmarking accelerates progress by adopting redistributive successes, controlled-inflation strategies, and strong governance models to guide Southeast Asia's inclusive growth transition. Moreover, proactive fiscal design, strategic human capital investment, and institutional strengthening, determine whether Southeast Asia achieves equitable convergence or entrenches structural divides. These evidence-based strategies position the region to transition Kuznets' descending phase of the curve sooner, ensuring the economic miracle benefits all citizens equitably.

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