



Impacts of Macroeconomic Indicators, Corruption and Corporate Governance on Sustainable Development Goals: The Case of Southeast Asia

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Abstract

The main objective of this study is to investigate the impacts of macroeconomic indicators, corruption, and country-level corporate governance on the achievement of Sustainable Development Goals (SDGs). The SDGs are a set of global objectives agreed upon by all United Nations (UN) member states in 2015 as part of the UN's 2030 Agenda, which aims to create a better world. This study analyzed data from seven Southeast Asian countries (Cambodia, Malaysia, Indonesia, Singapore, Thailand, the Philippines, and Vietnam) and four additional Asian countries outside the region, namely Japan, South Korea, China, and India, covering the period from 2007 to 2019. Panel data techniques, such as feasible generalized least squares (FGLS) regressions, were employed to test the research hypotheses. The findings revealed that macroeconomic indicators, specifically the unemployment rate and inflation rate, negatively impacted SDG achievement, whereas country-level corporate governance positively influenced SDGs. Additionally, countries with lower corruption levels and more developed economies were found to have higher SDG scores. Furthermore, a comparison between the pre- and post-2015 UN adoption of SDGs showed that all sampled countries improved their SDG scores, particularly in meeting targets related to social inclusion, economic growth, and environmental protection. Finally, the results indicated that country-level corporate governance could moderately mitigate the negative effect of the inflation rate on SDG achievement. This paper contributes to the literature and practice by providing evidence that in Southeast Asian countries, the unemployment rate, inflation rate, corruption, and country-level corporate governance significantly influence SDG achievement. Moreover, country-level corporate governance can alleviate the adverse effect of at least one macroeconomic indicator on SDG achievement.

Introduction

Sustainable development was defined by the United Nations as “the development that meets the needs of the present without compromising the ability of future

generations to meet their own needs”. (United Nations Brundtland Commission, 1987) Thus, to confront with critical problems and challenges associated with sustainable development, the United Nations produced

a set of universal goals called the Sustainable Development Goals (SDGs) at the United Nations conference on sustainable development in Rio de Janeiro in 2012. Today, after the United Nations members officially adopted the SDGs in 2015 and the United Nations has declared the year of 2020 to 2030 as the decade of action to fulfill the SDGs, many countries around the world have started to pay attention and make effort to achieve the SDGs, especially, those in European countries like Sweden, Denmark, and Norway.

However, there are important factors that might either facilitate or hinder the success of sustainable development. For example, prior studies have pointed out that certain macroeconomic factors had a significant impact on economic growth, stock market, income inequality, or CO2 emissions. (Tabash et al., 2022; Fischer, 1993; Jareño & Negrut, 2016; Deyshappriya, 2017; Gazi et al., 2022) In addition, prior research concerning fraud and corruption, also indicated that fraud/corruption had a negative influence on bank stability and bank profitability (Asteriou et al., 2021), financial development (Song et al., 2021), and sustainable development (Abubakar & Mutalib, 2023; Hope, 2021; Hoinaru et al., 2020). Besides, previous studies investigated the association between corporate governance and sustainable development and concluded that corporate governance had a significant positive impact on sustainable development or the realization of the SDGs. (Abubakar & Mutalib, 2023; Guidara et al., 2021; Al Maqtari et al., 2020; Martinez-Ferrero & Garcia-Meca, 2020)

While there has been prior research on the impacts of fraud, corruption, and corporate governance on the SDGs, evidence of the relationship between macroeconomic indicators, fraud/corruption, and corporate governance on SDGs, particularly in Southeast Asian countries, is rare or nonexistent. Therefore, this study aims to examine the relationship between macroeconomic indicators, corruption, and corporate governance on SDG achievements and to investigate whether corporate governance, as a moderator, can mitigate the negative effects of macroeconomic indicators and corruption on SDG outcomes. The macroeconomic indicators selected for this study include two of the most closely monitored and widely used by economists and investors today: the unemployment rate and the inflation rate (The Conference Board Inc., 2023; Chen, 2020; European Commission, 2016). Fraud/corruption is measured using the Corruption Perceptions Index, while country-level corporate

governance is assessed using the simple average of six public governance indicators: voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, rule of law, and control of corruption.

The primary analyses in this study focused on seven Southeast Asian countries-Cambodia, Indonesia, Malaysia, Singapore, Thailand, Vietnam, and the Philippines-where data for all dependent, independent, and control variables were available from 2007 to 2019. Feasible Generalized Least Squares (FGLS) was employed, along with other necessary tests for regression analysis assumptions, including the Jarque-Bera test, the Hausman test, the Breusch-Pagan test, and White's test, to analyze the collected panel data. This paper contributes to both practitioners and policymakers by providing evidence that, in Southeast Asian countries, the unemployment rate, inflation rate, corruption, and country-level corporate governance significantly influence the achievement of SDGs and can mitigate the adverse effects of certain macroeconomic indicators. The remainder of this paper is organized as follows. First, we present the concept of Sustainable Development Goals (SDGs), fraud/corruption, macroeconomic indicators, and corporate governance. Second, we review prior literatures regarding sustainable/economic developments, fraud/corruption, and corporate governance, and introduce hypotheses development. Third, we describe the research methodology, as well as model specification. Fourth, we discuss the empirical results with additional analyses. Last, we outline the conclusions, contributions, limitations, and propose suggestions for future research.

Objectives

The objectives of this study are 1) to examine the impacts of macroeconomic indicators, corruption, and country-level corporate governance on the achievement of Sustainable Development Goals (SDGs), and 2) to explore whether country-level corporate governance has moderating effect on the relationship between macroeconomic indicators and SDGs, as well as between corruption and SDGs.

Literature Review

Sustainable Development Goals

The 2030 Agenda for Sustainable Development was adopted by all United Nations member states in 2015, and since then, attention to the Sustainable Development Goals (SDGs) has grown enormously, particularly over

the last five years. The SDGs represent a universal call to action for all countries to create a world without poverty and with reduced inequality; a world that fosters long-term economic growth and prosperity for all while protecting the planet; and a world where no one is left behind. To achieve these sustainable objectives by 2030, the United Nations General Assembly established 17 global goals in 2015, addressing the three main dimensions of sustainable development: social, economic, and environmental challenges. Specifically, the 17 goals include: (1) No Poverty, (2) Zero Hunger, (3) Good Health and Well-Being, (4) Quality Education, (5) Gender Equality, (6) Clean Water and Sanitation, (7) Affordable and Clean Energy, (8) Decent Work and Economic Growth, (9) Industry, Innovation, and Infrastructure, (10) Reduced Inequalities, (11) Sustainable Cities and Communities, (12) Responsible Consumption and Production, (13) Climate Action, (14) Life Below Water, (15) Life on Land, (16) Peace, Justice, and Strong Institutions, and (17) Partnerships for the Goals. In addition, to evaluate success or failure for each goal, 169 measurable targets and 248 indicators (with 231 unique indicators) were developed by the Inter-Agency and Expert Group on SDG Indicators (IAEG-SDGs) and were formally accepted at the 48th session of the United Nations Statistical Commission in 2017 (United Nations, 2023a).

It is clear that if a country aims to achieve these anticipated outcomes within the designated time frame, it must seek strong collaboration from both the public and private sectors. While public institutions bear the primary responsibility for social and economic development, as well as environmental protection, the private sector is also a key partner, playing a crucial role in promoting sustainability. The results from the KPMG Survey of Sustainability Reporting 2022 indicate that the SDGs have increasingly resonated with businesses worldwide. This conclusion is based on the finding that the global SDG reporting rate for the top 100 companies in each country studied increased from 39 percent in 2017 to 71 percent in 2022. Although the results also highlighted that the majority of companies reported on only specific SDGs, such as SDG 8, SDG 12, and SDG 13, nearly 10 percent reported on all 17 SDGs (KPMG International Limited, 2022).

The study by Rashed & Shah (2021) also emphasizes the vital role of the private sector in fulfilling the SDGs. For example, the private sector is connected to all 17 goals when companies comply with local

regulations and increase disclosure of relevant information. Additionally, when companies use energy and resources efficiently, minimize waste, generate employment, serve as a crucial source of technological innovation, embrace the circular economy, address workers' rights, and establish partnerships among stakeholders, they align their business practices with SDG 11, SDG 12, SDG 13, SDG 6, SDG 8, SDG 9, and SDG 17. Moreover, a study from Colombia on the relationship between the private sector and its contribution to the SDGs found that, based on sustainability reports using the Global Reporting Initiative (GRI) standards, the private sector in Colombia is already contributing to sustainable development. This includes improving water quality and increasing water-use efficiency (SDG 6), improving energy efficiency (SDG 7), achieving sustainable and environmentally sound management of chemicals and wastes (SDG 12), and halting deforestation while promoting sustainable forest management (SDG 15) (United Nations Development Programme, 2018).

With 169 targets and 248 indicators, it is clear that numerous factors can influence the achievement of the 17 Sustainable Development Goals (SDGs), whether collectively or individually. While the global success of the 2030 Agenda for Sustainable Development relies heavily on the ability of all countries to work together, the achievement of SDGs at the national level depends more on specific and detailed factors. Overall, factors affecting economic, social or environmental development include macroeconomic stability, unemployment, economic growth, levels of conflict and political stability, government support, infrastructure and physical capital, technology advancement, the availability and quality of natural resources, quality of human resources, entrepreneurial skills, levels of fraud and resource mismanagement, educational standards, saving rates, trade barriers, access to nutritious food, clean water, energy, basic healthcare and jobs, inequality, gender discrimination or social injustice, climate change, minimum wages, population growth, global health crises, and social-cultural differences (Action Against Hunger USA, 2023; World Vision Canada, 2022; Pettinger, 2021; Woodruff, 2019).

Macroeconomic Indicators

Macroeconomics plays a crucial role in national development by integrating various policies, resources, and technologies. This integration drives economic

growth, reduces poverty, promotes social equity, and supports sustainable development (The World Bank Group, 2023a). Given this, it is evident that global economic conditions and macroeconomic indicators are closely linked to the achievement of sustainable development goals. Since sustainable development fundamentally rests on three dimensions-social cohesion, economic efficiency, and environmental responsibility-it is reasonable to assert that unfavorable global or domestic economic conditions can hinder progress, particularly for vulnerable countries, in reaching the 2030 Sustainable Development Goals.

Macroeconomic indicators are essential tools used to assess, measure, and evaluate the overall state of current and future economic performance. These indicators are typically provided by governments, non-profit organizations such as the United Nations (UN), the World Bank, or the International Monetary Fund (IMF), as well as prestigious universities around the world (The World Bank Group, 2023b; Barone, 2023). Macroeconomic indicators can be categorized into three types: leading, coincident, and lagging indicators. Leading indicators, such as average weekly hours in manufacturing, new orders for manufactured goods, new housing permits, stock price indices, current account deficits (national savings levels), leading credit indices, and interest rate spreads, are used to predict near-term economic conditions, typically within the next three to six months. Coincident indicators, including personal income, retail sales, and average hours worked in manufacturing, change almost simultaneously with current economic conditions, providing a real-time snapshot of the economy. Lagging indicators, on the other hand, reflect economic changes after they have occurred. These indicators, such as gross domestic product (GDP), unemployment rates, inflation rates (consumer price index, CPI), interest rates, corporate profits, labor costs per unit of output, and currency strength and stability, are typically used to confirm trends identified by leading and coincident indicators. Among the most closely monitored and widely used macroeconomic indicators today by economists and investors are GDP growth, economic growth rate, unemployment rate, yield curve, inflation rate, and interest rates (The Conference Board Inc., 2023; Chen, 2020; European Commission, 2016).

Fraud and Corruption

Fraud is defined as the intentional distortion of

facts or deliberate deception to gain unlawful advantage or deprive others of financial benefits or legal rights (Collins Dictionary, 2023). According to established models that explain fraudulent behavior, such as the fraud triangle (Wells, 2011), fraud diamond (Wolfe & Hermanson, 2004), and fraud pentagon (Crowe, 2011), numerous factors can trigger the occurrence of fraud. These factors include (1) pressure, or motivation to commit fraud due to financial stress, anxiety, or addiction; (2) opportunity, or the ability to commit fraud without being detected, often due to weaknesses in internal controls; (3) rationalization, or personal justification of fraudulent actions; (4) competence, or the characteristics, abilities, or skills required to conduct fraud; and (5) arrogance, or a sense of superiority that leads individuals to believe they are above rules and regulations.

Fraud is generally categorized into three main types: (1) asset misappropriation, which involves the theft or misuse of company assets; (2) fraudulent statements, which involve the manipulation of financial information through overstating, understating, or omitting details, leading to misleading financial statements; and (3) corruption, which involves the abuse of entrusted power for illicit benefits or personal gain (Transparency International, 2023).

Despite numerous efforts to eradicate, reduce, and prevent fraud, it remains a persistent issue. The effects of fraud are particularly severe during economic downturns when pressure on individuals and entities, opportunities for fraud, and rationalizations are at their highest due to the chaos and uncertainty of crises. Studies by PricewaterhouseCoopers International Ltd. (2022) and the Association of Certified Fraud Examiners, Inc. & Grant Thornton LLP (2021) provide insights into fraud trends during and after the coronavirus pandemic. The findings indicated that more than 50 percent of organizations experienced fraud, and due to the disruptive changes during the pandemic, fraud escalated. The types of fraud that warrant particular attention at this time include cyber fraud, social engineering fraud, identity crime, unemployment fraud, and payment fraud.

Over the years, all forms of fraud have continued to evolve, yet their destructive consequences remain unchanged. Fraud consistently has substantial social and psychological impacts on individuals, businesses, and society. It undermines sustainable development goals both directly and indirectly by depleting global GDP, causing the loss of natural resources, increasing global

poverty and inequality, destroying trust and social harmony, and triggering economic and political instability (United Nations, 2023b). Addressing the global fraud epidemic remains a critical focus for all countries, and effectively combating fraud is more crucial than ever to achieve the 17 Sustainable Development Goals by 2030.

Corporate Governance

Governance is a crucial factor influencing the success of the Sustainable Development Goals (SDGs). As noted by the World Bank (1992) and Madon (2009), governance has long been recognized as a necessary complement to sound economic policies, with good governance being essential for achieving equitable and sustainable development. The Organization for Economic Co-operation and Development (2023a) also acknowledges that governance is critical for development, with societies possessing more effective and accountable governing bodies typically outperforming those with weaker governance in key areas such as economic growth and human development. Governance refers to the set of rules, practices, and processes used to govern or oversee the control and direction of a country or organization (Merriam-Webster, 2023). Corporate governance (CG) specifically pertains to the structures, processes, and mechanisms employed to manage, direct, and control an organization. It primarily focuses on balancing the interests of various stakeholders, including shareholders, the board of directors, management, employees, government agencies, and society.

Corporate governance offers numerous benefits. It helps build trust, transparency, and accountability, which are vital for fostering business integrity, financial stability, and long-term success. Good corporate governance provides a clear view of business direction and integrity, and it helps establish appropriate rules and controls that align interests and build confidence among stakeholders. Additionally, it encourages ethical behavior, reduces conflicts of interest, enables better strategic planning and decision-making, facilitates capital raising, attracts talented individuals to the firm, and improves employee retention. Furthermore, it reduces the potential for fraud and mitigates other business risks, such as operational, financial, cybersecurity, compliance, and reputational risks (Organization for Economic Co-operation and Development, 2023b; Chen, 2023; Indeed UK Operations Ltd., 2022).

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Hypotheses Development

It is undeniable that change is inevitable, and it is a constant force in life. Change affects everyone, and this is certainly true for global and national economic situations, which experience cycles of prosperity and adversity. Economic conditions fluctuate over time, following the four stages of economic cycles: expansion (where activity is growing and approaching a peak), peak (where growth reaches its maximum point), contraction (where activity slows and declines), and trough (where activity bottoms out before rising again) (Rodini, 2023).

In recent years, countries worldwide have faced significant economic fluctuations due to various events, such as (1) the ongoing Russia-Ukraine war, which has caused tensions in energy markets and food supply chains, driving the cost of living to unprecedented levels globally (European Central Bank, 2023), and (2) the coronavirus pandemic, which, despite being on a downward trend for over 12 months, remains a global threat with new surges in cases and deaths due to emerging variants (United Nations, 2023c).

Given that every country's economy perpetually cycles through periods of expansion, peak, contraction, and trough, it is crucial to study and identify macroeconomic indicators that significantly impact global or national development, either throughout the entire cycle or at specific periods. Several studies have investigated the effects of macroeconomic indicators on various subjects, such as economic growth, stock markets, income inequality, and CO2 emissions. For instance, in the context of economic growth, Tabash et al. (2022) found

that government debt, donations, government expenditures, and the unemployment rate negatively affected economic growth, whereas credit facilities, inflation, and total investments had positive impacts. Fischer (1993) also noted that high inflation and large budget deficits hindered growth. Regarding the stock market, Jareño & Negrut (2016) explored the relationships between key macroeconomic indicators and the stock market, revealing associations with gross domestic product (GDP), the industrial production index, unemployment rate, and long-term interest rates. Additionally, Deyshappriya (2017) examined the relationship between macroeconomic indicators and income inequality in Asian countries, finding that GDP had a parabolic relationship with inequality. In contrast, official development assistance (ODA), education, and labor force participation negatively correlated with inequality, while inflation, political risk, terms of trade, and unemployment had positive correlations. Finally, Gazi et al. (2022) demonstrated that macroeconomic indicators such as GDP and energy use were positively and significantly associated with CO2 emissions in oil-producing countries.

Overall, although previous studies yield inconclusive results for some indicators, it is evident that many macroeconomic indicators substantially impact the economy, society, and the environment. Consistent with these prior studies, we posit that macroeconomic indicators will significantly influence the success of the 17 Sustainable Development Goals (SDGs). Specifically, given the ongoing Russia-Ukraine conflict and the lingering effects of the COVID-19 pandemic, which continue to cause economic difficulties and a cost-of-living crisis globally, we predict that the unemployment rate and inflation rate will notably affect the achievement of the SDGs.

H₁: Macroeconomic indicators are associated with the SDGs achievements.

H_{1a}: Unemployment rate is associated with the SDGs achievements.

H_{1b}: Inflation rate is associated with the SDGs achievements.

Fraud and corruption have long been subjects of interest for researchers worldwide. For example, Asteriou et al. (2021) examined the effects of various factors, including corruption, on bank stability and profitability in Eurozone countries from 2005 to 2018. Their study concluded that corruption negatively impacted both bank stability and profitability. Similarly, Song et al. (2021) investigated the relationship between financial

development and corruption in both developed and developing countries, finding that corruption adversely affected financial development.

In recent years, with the growing emphasis on sustainability, there has been a noticeable increase in research focusing on the impact of corruption on sustainable development. Studies have consistently shown that corruption is a significant factor influencing the achievement of sustainable development (Abubakar & Mutalib, 2023; Hope, 2021; Hoinaru et al., 2020). In line with these findings, we propose that corruption will have a substantial impact on the success of the 17 Sustainable Development Goals (SDGs).

H₂: Corruption is negatively associated with the SDGs achievements.

In recent years, researchers worldwide have continuously explored the impact of corporate governance on various aspects, such as firm financial performance (Ruangprapun & Chotitumtara, 2022; Rizwan & Chughtai, 2022), Environmental, Social, and Governance (ESG) disclosure/performance (Bhatia & Marwaha, 2022; Menicucci & Paolucci, 2022; Halid et al., 2022), foreign direct investment (Tong et al., 2022; Agyemang et al., 2019), foreign portfolio investment (Agyei et al., 2022), entrepreneurial conditions (Al Maqtari et al., 2020), earnings management (Ruangprapun & Chotitumtara, 2022; Abdou et al., 2020), tax evasion (Benkraiem et al., 2021), and various forms of fraud (Rostami & Rezaei, 2022; Girau et al., 2022; Kassem, 2022). Overall, these studies indicate that corporate governance, whether at the country level or firm level, significantly positively influences favorable outcomes such as firm performance, ESG disclosure, and foreign direct investment, while exerting a significant negative impact on undesirable practices like earnings management, tax evasion, and fraud. Furthermore, other research highlights the benefits of corporate governance, suggesting that it is a valuable factor positively impacting the achievement of the Sustainable Development Goals (SDGs). Specifically, country-level corporate governance, such as the strength of auditing and reporting standards, or firm-level corporate governance, such as the robustness of internal governance, positively influences sustainable development and the realization of the SDGs. This influence may occur through effects on entrepreneurial framework conditions or sustainability disclosure (Abubakar & Mutalib, 2023; Guidara et al., 2021; Al Maqtari et al., 2020; Martinez-Ferrero & Garcia-Meca, 2020).

Given that this study focuses on the SDGs, and the SDG index is an aggregate performance measure of each country's progress in achieving the 17 goals, we determined that country-level corporate governance would be more appropriate than firm-level governance for our analysis. Therefore, consistent with prior studies, we posit that country-level corporate governance will positively impact the success of the 17 Sustainable Development Goals.

H₃: Country-level corporate governance is positively associated with the SDGs achievements.

Evidence of the moderating effect of both country- and firm-level corporate governance is supported by previous research. For instance, Abubakar & Mutalib (2023) examined the relationship between corruption and SDGs using country-level corporate governance as a moderator. Their findings indicated that country-level corporate governance positively moderated the relationship between corruption and sustainable development. Similarly, the study by Omankhanlen et al. (2021) highlighted that certain types of corporate governance could mitigate the relationship between macroeconomic factors and financial malpractices in Nigerian banks. Based on these prior studies, we posit that country-level corporate governance will moderate the association between macroeconomic indicators and the success of the 17 Sustainable Development Goals. Additionally, we hypothesize that country-level corporate governance will positively moderate the relationship between fraud/corruption and the achievement of the 17 Sustainable Development Goals.

H₄: Country-level corporate governance moderates the association between macroeconomic indicators and the SDGs achievements.

H_{4a}: Country-level corporate governance moderates the association between unemployment rate and the SDGs achievements.

H_{4b}: Country-level corporate governance moderates the association between inflation rate and the SDGs achievements.

H₅: Country-level corporate governance moderates the association between corruption and the SDGs achievements.

Conceptual Framework

The conceptual framework for this research is presented in Figure 1 below.

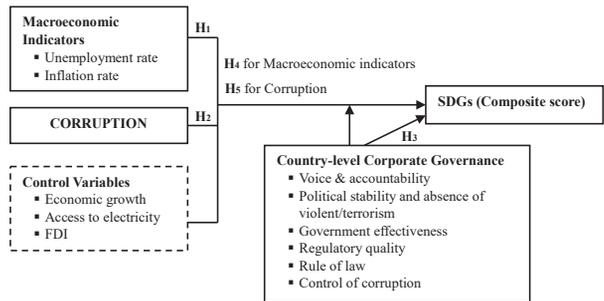


Figure 1 A conceptual framework of SDGs achievements, macroeconomic indicators, fraud/corruption, and country-level corporate governance

Research Methodology

1. Population and Samples

Initially, this research aimed to examine the relationships between SDGs achievements, macroeconomic indicators, corruption, and country-level corporate governance in both developed and developing countries in Southeast Asia. However, due to limited data availability from some Southeast Asian countries, we ultimately obtained complete data from only seven countries in this region. Furthermore, since Singapore is the only developed country in Southeast Asia, we expanded the scope of the research by including four additional Asian countries: Japan, South Korea, China, and India. Japan and South Korea are considered developed countries, while China and India are BRICS nations with significant economic influence. The International Monetary Fund (2023) classifies seven Asian countries as advanced economies: Australia, Hong Kong, Japan, South Korea, New Zealand, Singapore, and Taiwan. However, due to the unavailability of data for Hong Kong and Taiwan, and the exclusion of Australia and New Zealand—both considered part of Oceania rather than Asia—we focused on the remaining countries. To balance the sample between developed and developing countries, we included China and India, which are emerging economies with strong growth and rank as the second and fifth largest economies in the world, respectively.

Ultimately, the panel data used in this study were collected from 11 Asian countries: seven from the Association of Southeast Asian Nations (ASEAN)—Cambodia, Malaysia, Indonesia, Singapore, Thailand, the Philippines, and Vietnam—three from East Asia—China, Japan, and South Korea—and one from South Asia—India. The sampling period covered 13 years, from 2007 to 2019, resulting in a total of 143 country-year observations.

2. Collection of Data

Data were obtained from various sources and each variable was measured as shown in Table 1.

other control variables, following Omankhanlen et al. (2021) and Abubakar & Mutalib (2023), were collected from IMF world outlook database, World Bank, world development indicators, or global competitiveness

Table 1 Definition and measurement of variables

Variables	Measurement/Description	Source of data	Reference
Dependent variable Sustainability Development Goals (SDGs)	SDG Score/Index: an assessment of each country's overall performance on the 17 SDGs, giving equal weight to each Goal (ranging from 0 to 100)	United Nations Development Programme (UNDP)	Abubakar & Mutalib (2023); Al Maqtari et al. (2020); Martinez-Ferrero & Garcia-Meca (2020)
Independent variables Macroeconomic Indicators			
▪ Unemployment (U)	The total number of unemployed people as a percentage of the total labor force	World Bank	Abubakar & Mutalib (2023); Agyei et al. (2022); Omankhanlen et al. (2021)
▪ Inflation (CPI)	Annual percentage of consumer prices	Transparency International	
CORRUPTION	Corruption Perceptions Index (ranging 0 to 10; 0 highly corrupt and 10 very clean)		
Moderating variable Country-level CG			
Public Governance (PG_WGI)	Simple average of the six public governance indicators	Author's computation from World Bank: Worldwide Governance Indicators (WGI)	Abubakar & Mutalib (2023); Agyei et al. (2022); Benkraiem et al. (2021); Al Maqtari et al. (2020); Agyemang et al. (2019);
6 public governance indicators	Perceptions of the extent to which a country's citizens can vote in selecting their government, have freedom of expression, a free media and freedom of association (ranging from -2.5 to 2.5)		
▪ Voice & accountability			
▪ Political stability and absence of violence/terrorism	Perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism (ranging from -2.5 to 2.5)		
▪ Government effectiveness	Perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies (ranging from -2.5 to 2.5)		
▪ Regulatory quality	Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development (Percentile rank ranging from 0 (lowest rank) to 100 (highest rank))		
▪ Rule of law	Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence (ranging from -2.5 to 2.5)		
▪ Control of corruption	Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests (ranging from -2.5 to 2.5)		
Control Variables			
▪ Economic growth (GROWTH)	Annual percentage growth rate of GDP	World Bank	Abubakar & Mutalib (2023)
▪ Foreign Direct Investment (FDI)	Foreign direct investment divided by GDP		
▪ Access to Electricity (ELEC)	Percentage of population with access to electricity		

Following Abubakar & Mutalib (2023), Al Maqtari et al. (2020) and Martinez-Ferrero & Garcia-Meca (2020), SDGs achievements were measured using SDG index, an assessment of each country's overall performance on the 17 SDGs, giving equal weight to each goal with each score ranging from 0 to 100, and the data were obtained from United Nations Development Programme (UNDP). Next, macroeconomic indicators, namely unemployment rate and inflation rate, as well as

report. In terms of fraud/corruption, like the studies of Abubakar & Mutalib (2023), Agyei et al. (2022) and Omankhanlen et al. (2021), we measured fraud/corruption by using Corruption Perceptions Index obtained from World Bank indicators and Transparency International. Finally, following prior studies such as Abubakar & Mutalib (2023), Agyei et al. (2022), Benkraiem et al. (2021), Al Maqtari et al. (2020), and Agyemang et al. (2019), we decided to measure

country-level corporate governance by using simple average of the six public governance indicators obtained from the raw data of the six indicators of the World Bank’s Worldwide Governance Indicators (WGI) and then we computed the average score.

3. Data Analysis

The following regression models were used to test H₁ to H₅, respectively. Model 1 was used to test the direct (unconditional) impacts of macroeconomic indicators (H₁) which were unemployment rate (U) and inflation rate (CPI) and corruption (H₂) (CORRUPTION) on SDGs achievements. Next, model 2 was used to test the direct (unconditional) effects of country-level corporate governance (H₃) (PG_WGI) on SDGs achievements. Finally, model 3 was used to test the moderating effects of country-level corporate governance on the relationship between macroeconomic indicators and SDGs achievements (U*PG_WGI and CPI*PG_WGI), and the association between corruption and SDGs achievements (CORRUPTION_G*PG_WGI). In this regression (model 3), to lessen multicollinearity problem, corruption was transformed to be a grouping (categorical) variable as CORRUPTION_G.

$$SDG_{it} = \beta_0 + \beta_1 U_{it} + \beta_2 CPI_{it} + \beta_3 CORRUPTION_{it} + \beta_4 GROWTH_{it} + \beta_5 FDI_{it} + \beta_6 ELEC_{it} + \beta_7 DDEVELOPED + \beta_8 D2015 + e_{it} \quad (1)$$

$$SDG_{it} = \beta_0 + \beta_1 U_{it} + \beta_2 CPI_{it} + \beta_3 PG_WGI_{it} + \beta_4 GROWTH_{it} + \beta_5 FDI_{it} + \beta_6 ELEC_{it} + \beta_7 DDEVELOPED + \beta_8 D2015 + e_{it} \quad (2)$$

$$SDG_{it} = \beta_0 + \beta_1 U_{it} + \beta_2 CPI_{it} + \beta_3 CORRUPTION_G_{it} + \beta_4 PG_WGI_{it} + \beta_5 U*PG_WGI_{it} + \beta_6 CPI*PG_WGI_{it} + \beta_7 CORRUPTION_G*PG_WGI_{it} + \beta_8 GROWTH_{it} + \beta_9 FDI_{it} + \beta_{10} ELEC_{it} + \beta_{11} DDEVELOPED + \beta_{12} D2015 + e_{it} \quad (3)$$

Where: U*PG_WGI and CPI*PG_WGI are the interactions of macroeconomic indicators and country-level corporate governance, while CORRUPTION_G*PG_WGI is the interaction of corruption and country-level corporate governance. β₀ is the constant term. β₁₋₁₂ are parameters to be estimated. e_{it} is the error term, and i,t stands for country i at year t. Other main variables are defined in Table 1. Descriptive statistics such as Mean, Standard Deviation (SD) and Max-Min, as well as panel data techniques such as the feasible generalized least squares (FGLS) regressions were used to provide necessary information and to test all research hypotheses.

Results

The descriptive statistics of the variables, as shown in Table 2, provide a summary of the basic characteristics of the research data. The mean SDG score is 66.94, while the mean unemployment rate and inflation

rate are 3.45 and 3.60, respectively. These figures suggest that both the economy and the progress towards SDGs were satisfactory among the sampled countries during the period from 2007 to 2019. The average values of corruption and country-level corporate governance are 4.46 and 0.08, respectively, indicating a moderate level of transparency and corporate governance structures.

For the inferential analysis, several tests were conducted to examine key assumptions for the regression analysis used in this study. First, the Jarque-Bera test was applied to assess the normality of residuals. If the Jarque-Bera test statistic (JB) is greater than the critical value and the p-value is less than 0.05, the data do not come from a normal distribution. At a significance level of 0.05, the critical value in a chi-squared distribution with two degrees of freedom is 5.99. The Jarque-Bera test results in Table 3 show that the data in all models are normally distributed. Second, the variance inflation factor (VIF) was calculated to measure the strength of the correlation between the independent variables in each regression model. The VIF values in Table 4 indicate no severe multicollinearity, as all variables have VIF values below 5 in all models, except for corruption (CORRUPTION_G) and country-level corporate governance (PG_WGI), which have VIF values below 10 in Model 3 (James et al., 2021). Additionally, the Hausman test was employed to determine whether the random effects model is more appropriate than the fixed effects model. The null hypothesis is that the preferred model is random effects. The results presented in Table 5 show that all models reject the null hypothesis at the significance level of 0.05, indicating that the preferred model is fixed effects.

Table 2 Descriptive Statistics

Variable	No. of obs.	Mean	SD	Min.	Max.
SDG	143	66.94189	6.80779	52.39	78.8
U	143	3.44537	2.08932	0.14	8.536
CPI	143	3.59977	3.82412	-1.35283	24.09685
CORRUPTION	143	4.46084	1.98849	1.8	9.3
CORRUPTION_G	143	2.29371	0.83777	1	4
PG_WGI	143	0.08314	0.75664	-0.87539	1.62619
GROWTH	143	5.10637	2.87953	-5.69323	14.51975
FDI	143	-0.0215	0.04338	-0.15482	0.04431
ELEC	143	92.35099	15.7286	20.2	100
DDEVELOPED	143	0.45454	0.49967	0	1
D2015	143	0.38461	0.48821	0	1

Notes: CORRUPTION (0 = highly corrupt, 10 = very clean); CORRUPTION_G (1 if CORRUPTION = 0-2.5, 2 if CORRUPTION = 2.6-5.0, 3 if CORRUPTION = 5.1-7.5 and 4 if CORRUPTION = 7.6-10); DDEVELOPED (0 = a developing country, 1 = a developed country); D2015 (0 = a year before 2015, 1 = a year of 2015 and after)

Source: Computed by the authors

Table 3 Jarque-Bera Test

Model	No. of obs.	Skewness	Kurtosis	JB	p-value	χ^2
1	143	0.32827	3.34600	3.28159	0.19328	5.99146
2	143	0.31981	3.31383	3.02448	0.22041	5.99146
3	143	0.25920	3.45881	2.85558	0.23983	5.99146

Source: Computed by the authors

Table 4 Multicollinearity Test

Variable	Model 1 VIF	1/VIF	Model 2 VIF	1/VIF	Model 3 VIF	1/VIF
U	1.94	0.514159	1.95	0.513380	1.95	0.513374
CPI	1.54	0.650040	1.51	0.661682	1.53	0.654077
CORRUPTION	2.88	0.347362				
CORRUPTION_G					9.93	0.100734
PG_WGI			2.73	0.366737	8.91	0.112261
GROWTH	1.63	0.614948	1.76	0.568728	1.76	0.568726
FDI	2.05	0.488694	1.97	0.507357	2.11	0.475046
ELEC	1.97	0.506990	1.84	0.542958	2.51	0.397774
DDEVELOPED	2.59	0.386700	2.45	0.408015	2.57	0.388858
D2015	1.24	0.807217	1.22	0.821402	1.33	0.754196
Mean VIF	1.98		1.93		3.62	

Notes: To avoid the problem of severe multicollinearity, CORRUPTION_G was used instead of CORRUPTION in regression model 3.

Source: Computed by the authors

Table 5 Hausman Test

Model	χ^2	p-value	Preferred Model
1	25.07	0.0003	Fixed Effects
2	21.63	0.0014	Fixed Effects
3	108.11	<0.0001	Fixed Effects

Source: Computed by the authors

Table 6 Results of Variance Heterogeneity Test and Serial Correlation Test

Test	Model 1		Model 2		Model 3	
	χ^2	p-value	χ^2	p-value	χ^2	p-value
Breusch-Pagan test	0.36	0.5458	0.47	0.4941	0.40	0.5254
White's test	85.69	0.0001	87.59	<0.0001	130.41	0.0005
Wald test	85.31	<0.0001	46.03	<0.0001	38.91	0.0001
	F-statistic	p-value	F-statistic	p-value	F-statistic	p-value
Wooldridge test	24.348	0.0006	23.107	0.0007	22.542	0.0008

Source: Computed by the authors

The Breusch-Pagan and White's tests were used to assess whether the variance of the errors in each model was constant. While the Breusch-Pagan test indicated homogeneity of variance, the White's test suggested otherwise. Consequently, the Wald test for heteroskedasticity in the fixed effects regression model was performed, and the Wooldridge test was applied to investigate serial correlation. Both heteroskedasticity and autocorrelation were detected in all models with p-values less than 0.05, as shown in Table 6.

When heteroskedasticity and autocorrelation are present, heteroskedasticity and autocorrelation consistent (HAC) robust standard errors can be used to correct the standard error estimates. To compare the fixed effects and random effects specifications with robust standard

errors, the Sargan-Hansen test of overidentifying restrictions was conducted, which reconfirmed the preference for the fixed effects model. The Breusch-Pagan Lagrange multiplier (LM) test was then used to examine cross-sectional independence, particularly relevant for panel data with a large time dimension (T) and a small cross-sectional dimension (N). The results, shown in Table 7, support the presence of cross-sectional dependence, as the null hypothesis was rejected in all models at a significance level of 0.05. In addition to heteroskedasticity and autocorrelation, the models also exhibited cross-sectional dependence, and the HAC procedure does not provide efficient coefficient estimates in this context. For data with large T and small N, or when $T > N$, performing feasible generalized least squares (FGLS) regression is a more appropriate method, as it provides more reliable coefficient estimates.

Table 7 Breusch-Pagan LM Test of Independence

Model	χ^2	p-value	Results
1	135.400	<0.0001	Cross-Sectional Dependence
2	140.235	<0.0001	Cross-Sectional Dependence
3	120.045	<0.0001	Cross-Sectional Dependence

Source: Computed by the authors

Table 8 Results of FGLS Regression

Variable	Model 1	Model 2	Model 3
Constant	49.66753* (0.7656718)	53.42289* (0.9344491)	54.56503* (1.137132)
U	-1.376675* (0.0550163)	-1.238709* (0.0632483)	-1.369853* (0.0740544)
CPI	-0.0308067* (0.0061019)	-0.0210423* (0.0085553)	-0.0607962* (0.0183542)
CORRUPTION	0.9245236* (0.0938514)		
CORRUPTION_G			0.2802859 (0.180755)
PG_WGI		2.892211* (0.2815053)	3.766944* (0.6668529)
GROWTH	-0.0857756* (0.0075458)	-0.0756995* (0.0109879)	-0.0829438* (0.0137591)
FDI	17.4664* (2.154128)	14.20481* (2.036649)	14.74749* (2.435581)
ELEC	0.1863939* (0.0085427)	0.1848475* (0.0102189)	0.1715677* (0.0118098)
U*PG_WGI			-0.1621732 (0.1051263)
CPI*PG_WGI (0.0334902)			-0.0601968***
CORRUPTION_G*PG_WGI			-0.191451 (0.1943264)
DDEVELOPED	3.0711231* (0.2869466)	2.226033* (0.3711395)	2.479576* (0.3791103)
D2015	0.9601741* (0.0828023)	0.9108027* (0.1162302)	1.007134* (0.1632745)
Wald χ^2	3761.05	3042.96	2094.47
p-value	<0.0001	<0.0001	<0.0001

Notes: *, **, and *** denote significance at the 1%, 5%, and 10% level, respectively. The standard errors are shown in parentheses.

Source: Computed by the authors

According to the FGLS regression results presented in Table 8, Models 1 and 2 demonstrate the direct effects of macroeconomic indicators, corruption, and country-level corporate governance on SDG achievements, while Model 3 examines the interaction effects of country-level corporate governance. Overall, the results indicate that the unemployment rate (U) and inflation rate (CPI) negatively impact SDG achievements, whereas country-level corporate governance (PG_WGI) positively influences SDGs, all at a 0.01 significance level. As expected, corruption adversely affects SDGs, since a higher corruption perception index, which signifies greater transparency and less corruption, positively impacts SDG outcomes. This suggests that transparency in the public sector and governance enhances SDG achievements. In Model 3, the results reveal that country-level corporate governance negatively moderates the relationships between the independent variables and SDGs. However, only the interaction effect between country-level corporate governance and the inflation rate on SDGs is statistically significant at the 0.1 level. This implies that higher levels of country-level corporate governance mitigate the negative impact of inflation on SDGs, suggesting that effective governance can somewhat reduce the adverse effects of inflation on SDG outcomes.

Regarding control variables, the results across all models show that foreign direct investment and access to electricity have significant positive effects on SDGs. Interestingly, the growth rate exhibits a significant negative effect on SDGs in all models, though the economic impacts are small. Additionally, the findings for dummy variables indicate that being a developed country and the post-2015 UN adoption of SDGs positively influence SDG outcomes at a 0.01 significance level. Although FGLS regression is not inherently a fixed effects estimator, it indirectly accounts for fixed effects related to panel (country) and time (year) variables when the panel dataset is declared. Furthermore, our models include two explicit dummy variables addressing country and year effects. Therefore, the FGLS regression results are satisfactory for our analysis.

The research findings largely confirm our hypotheses: macroeconomic indicators, specifically the unemployment rate and inflation rate, are associated with SDG outcomes; corruption is negatively associated with SDGs; and country-level corporate governance is positively associated with SDGs. Additionally, country-level corporate governance marginally

Table 9 Summary of Hypothesis Testing Results

Hypothesis	Relationship	Proposed Relationship	Results
H _{1a}	Unemployment rate (U) is related with SDGs.	-	Accepted
H _{1b}	Inflation rate (CPI) is related with SDGs.	-	Accepted
H ₂	Corruption is related with SDGs.	Negative	Accepted
H ₃	Country-level corporate governance (PG_WGI) is related with SDGs.	Positive	Accepted
H _{4a}	Unemployment rate (U) is related with SDGs.	Moderated by PG_WGI	Rejected
H _{4b}	Inflation rate (CPI) is related with SDGs.	Moderated by PG_WGI	Marginally Accepted
H ₅	Corruption is related with SDGs.	Moderated by PG_WGI	Rejected

Source: Research findings

moderates the relationship between the inflation rate and SDGs but does not moderate the relationships between the unemployment rate and SDGs or between corruption and SDGs, as presented in Table 9.

Discussion

The primary objective of this study is to examine the effects of macroeconomic indicators, corruption, and country-level corporate governance on the achievement of the Sustainable Development Goals (SDGs)-a set of global objectives adopted by all United Nations (UN) member states in 2015 as part of the UN's 2030 Agenda. These goals aim to end poverty, reduce inequality, protect the planet, and ensure access to healthcare, education, justice, and prosperity for all people worldwide. This study analyzed data from seven Southeast Asian countries and four additional Asian countries outside the region, namely Japan, South Korea, China, and India, covering the period from 2007 to 2019.

The findings reveal that macroeconomic indicators, specifically the unemployment rate and inflation rate, along with corruption, negatively impact the achievement of SDGs. These conclusions align with prior research, such as Tabash et al. (2022), who found that high unemployment negatively affects economic growth during economic downturns; Fischer (1993), who indicated that high inflation significantly reduces economic growth; and studies by Abubakar & Mutalib (2023), Hope (2021), and Hoinaru et al. (2020), which identified corruption as a key barrier to sustainable development. Conversely, our study shows that country-level corporate governance positively influences SDG achievement, supporting the findings of Abubakar

& Mutalib (2023), Guidara et al. (2021), Al Maqtari et al. (2020), and Martinez-Ferrero & Garcia-Meca (2020), who concluded that both country-level and firm-level corporate governance positively affect sustainable development or at least the realization of the SDGs.

Moreover, the results indicate that country-level corporate governance can partially mitigate the negative effects of the inflation rate on SDGs but cannot alleviate the adverse impacts of the unemployment rate and corruption on SDGs achievement. These findings are consistent with Omankhanlen et al. (2021), who also concluded that certain types of corporate governance could reduce the negative effects of macroeconomic factors on financial malpractices. However, our results differ from those of Abubakar & Mutalib (2023), who suggested that country-level corporate governance could moderate the relationship between corruption and sustainable development.

When comparing developed and developing countries, as well as pre- and post-2015 UN adoption of the SDGs, the results show that developed countries such as Singapore, Japan, South Korea, China, and India generally scored higher on SDG achievement than developing countries in Southeast Asia. Since 2015, overall, all sample countries have improved their SDG scores, aligning with the SDG targets.

Suggestion

Based on these results, we recommend that Southeast Asian countries recognize the challenges in meeting the 2030 sustainable development targets during current economic difficulties. Factors such as the unemployment rate, inflation rate, and corruption are significant obstacles to achieving these goals. To partially address these challenges, governments and policymakers should increase public awareness and involvement in sustainable development, promote and improve good corporate governance, and enforce anti-bribery and corruption policies more effectively and rigorously.

This paper contributes to both practitioners and policymakers by providing evidence that, in Southeast Asian countries, the unemployment rate, inflation rate, and corruption significantly hinder SDG achievement, whereas country-level corporate governance positively influences SDG success and can mitigate the adverse effects of some macroeconomic indicators. In summary, to promote sustainable development in Southeast Asia,

practitioners and policymakers should closely monitor the unemployment rate, inflation rate, and corruption, and strive to maintain these macroeconomic indicators at appropriate levels. Additionally, they should enhance country-level corporate governance to ensure the effectiveness of good corporate governance practices.

However, this study has some limitations. First, the analysis did not include all Southeast Asian countries due to the unavailability of panel data from Brunei, Cambodia, East Timor, and Laos. Second, this study classified China and India as developed countries because they are key members of the BRICS group, and despite being emerging economies, they rank among the world's top five largest economies in 2023, with China in 2nd place (GDP of \$17.7 trillion) and India in 5th place (GDP of \$3.2 trillion) (Wisevoter, 2023). Third, this research focused only on the composite SDG score, not on each of the 17 global goals. Fourth, due to the multicollinearity problem between corruption and country-level corporate governance in Model 3, we addressed the issue by transforming the corruption variable from continuous to categorical data. This may have contributed to the insignificant direct effect of corruption on SDGs and the insignificant moderating effect of country-level corporate governance on the relationship between corruption and SDGs in this study.

These limitations suggest that future studies should further investigate the impacts of macroeconomic indicators, corruption, and corporate governance, along with their interactions, on each of the 17 SDGs. Additionally, future research might consider using countries from other regions as samples, extending the study period, exploring alternative measures for corruption or country-level corporate governance, or including other factors that may significantly impact SDG achievement in the research models.

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