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THE IMPACT OF FINANCIAL DEVELOPMENT AND THE INFORMAL ECONOMY ON SUSTAINABLE DEVELOPMENT IN ASEAN

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Abstract

This study examines the interplay among the ASEAN region's financial development, informal economy, and sustainable development. While financial development is expected to support economic growth, its relationship to sustainability remains ambiguous, particularly in economies with significant informal sectors. Using a panel dataset from 1991 to 2020 across 10 ASEAN countries, the study employs robust econometric techniques, including fixed effects, feasible general least squares methodology, and quantile regression, to assess the direct and indirect effects of financial development and informality on sustainability. Findings reveal that the informal economy positively contributes to sustainable development, likely by providing employment and economic opportunities. However, financial development, measured by a broad money supply and private sector credit, has a negative impact, suggesting that financial resources are not effectively allocated to sustainability-driven sectors. The interaction between financial development and informality further exacerbates sustainability challenges, indicating a misalignment between formal financial mechanisms and informal economic activities. These results highlight the need for policy strategies integrating informal sector dynamics into financial systems, ensuring financial growth translates into broader sustainable development outcomes. Strengthening financial inclusion and directing capital to sustainability-focused initiatives could help bridge the gap between formal finance and the informal economy in ASEAN nations.

Keywords: *sustainable development, ASEAN, informal economy, financial development*

I. INTRODUCTION

Today's global landscape is confronted with pressing social, environmental, and economic concerns. Reduction of poverty and income inequality, managing climate challenges, and the recent need to mitigate pandemic-related risk all form part of the need for massive financial resources and spending.[1]

[1] Simone Pizzi et al., "Voluntary Disclosure of Sustainable Development Goals in Mandatory Non-Financial Reports: The Moderating Role of Cultural Dimension," *Journal of International Finance and Management Accounting* 33, (2021): 83–106.

Along with other sustainability risks, the COVID-19 epidemic significantly harmed countries' economic activities by imposing financial limitations. The introduction of measures to curb the spread of the pandemic heightened uncertainties about production and economic outcomes. At the same time, the considerable lack of long-term financial strategies remains a critical concern.[2] Achieving sustainable development necessitates the mobilisation of financial resources as well as the transfer of superior technologies to less-developed countries. Therefore, the sustainable development agenda has prompted financial sector actors to change course and play an essential role in supplementing a country's efforts in channelling domestic finances by identifying novel solutions relevant to delivering the much-needed progress toward attaining meaningful, sustainable development.[3] Countries in the Association of Southeast Asian Nations (ASEAN) bloc have also taken some steps to reform their financial sectors since the late 1990s, primarily to tackle the Asian economic crisis and also to guarantee sustained economic growth. As shown in Figure 1, the gross domestic product of ASEAN countries at current prices dropped towards the late 1990s, with Indonesia showing the most significant decline. This signalled the Asian economic crisis, necessitating policies for financial reforms.

Due to the importance of utilising domestic resources efficiently for growth and economic development,[4] sustainable development goals (SDGs) emphasise that active contribution and participation of actors in the domestic financial sector is essential for creating broader social values.[5] Therefore, in its efforts to improve economic growth and alleviate poverty, which are critical in expediting SDG accomplishment, the private sector boosts the development of the financial sector. By contributing its resources, expertise, and experiences, the financial sector possesses strengths like responsiveness

[2] Najam Iqbal et al., "Asymmetry and Leverage with News Impact Curve Perspective in Australian Stock Returns' Volatility During COVID-19," *Journal of Risk and Financial Management* 14, no. 314 (2021).

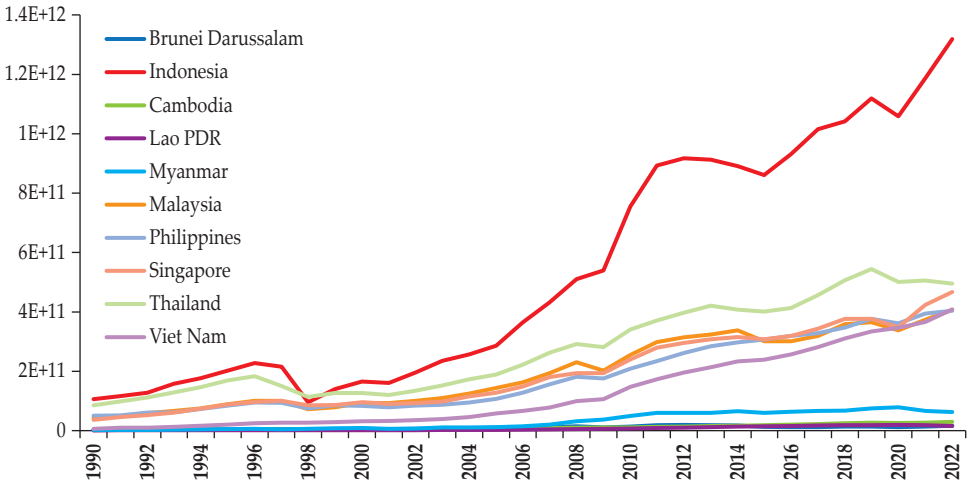
[3] Edward B. Barbier, and Joanne C. Burgess, "Climate and Development: The Role of the Sustainable Development Goals," *in* Anil Markandya & Dirk Rübbelke (eds.), *Climate and Development* (World Scientific, 2022): 67–90. https://doi.org/10.1142/9789811240553_0003.

[4] Gazi Salah Uddin et al., "Financial Development and Poverty Reduction Nexus: A Cointegration and Causality Analysis in Bangladesh," *Economic Modelling* 36, (2014): 405-412.

[5] Johannes W. H. Waal and Thomas Thijssens, "Corporate Involvement in Sustainable Development Goals: Exploring the Territory" *Journal of Cleaner Production* 252, (2020): 119625.

and technical innovation, which are vital to significantly benefitting the development process.[6]

Figure 1. ASEAN countries' GDP at current prices



Source: World Development Indicators

Viewed from another angle, the social and economic development in emerging and less-developed economies is widely impacted by the informal sector, placing the informal economy as a key subject in the development debate.[7] In many countries, there is evidence that small and medium-sized businesses form a substantial part of the informal economy, which usually refers to economic activity not subject to government regulations or taxation.[8] It is important for entrepreneurship, business, income, and employment since state agencies in developing nations frequently lack resources to support and

[6] Axel Marx, "Public-Private Partnerships for Sustainable Development: Exploring their Design and its Impact on Effectiveness," *Sustainability (Switzerland),* 11, no. 4 (2019): 1087; Theo Hacking, "The SDGs and the Sustainability Assessment of Private-Sector Projects: Theoretical Conceptualisation and Comparison with Current Practice using the Case Study of the Asian Development Bank," *Impact Assessment and Project Appraisal* 37, no. 1 (2019): 2-16; Fortune Ganda, "The Environmental Impacts of Financial Development in OECD Countries: A Panel GMM Approach," *Environmental Science and Pollution Research* 26, no. 7 (2019): 6758-6772.

[7] Rafael La Porta and Andrei Shleifer, "Informality and Development" *Journal of Economic Perspectives* 28, (2014): 109-126.

[8] Ogechi Adeola et al., "The Informal Economy: CSR and Sustainable Development", in O. Osuji, F. Ngwu, and D. Jamali (eds) *Corporate Social Responsibility in Developing and Emerging Markets: Institutions, Actors and Sustainable Development* (Cambridge University Press, 2019): 85–97. https://doi.org/10.1017/9781108579360.007

regulate commercial activity.[9] Designated as a subject area in the United Nations' SDGs, informal economic activity is a part of some highly critical obstacles to sustainable development in the twenty-first century. Because of its association with unfair competition, labour rights violations, low productivity, low income, and environmental degradation, the informal sector is linked to two vicious cycles, poverty and development, which usually plague most developing nations. These cycles cause degradation of the natural environment and depletion of resources and need to be tackled.[10] This provides a sound understanding of informal economic activities important in achieving sustainable development.

Some attempts have been made to examine how the informal economy and financial development separately affect sustainable development. However, these investigations are sparse and fail to directly address the interactions between the informal economy and financial development. The studies have also not produced a robust empirical analysis to support their findings. These issues motivate the emergence of the present study.

II. LITERATURE REVIEW

II.A. The Informal Economy and Sustainable Development

The informal economy plays a crucial role in fostering economic growth by contributing to increased productivity, mainly because of the significant disparity between the informal and formal sectors in terms of the productivity of labour.[11] What sparked the growth of the 1970s and 1980s era discussions on the appropriate definition of informal economy, particularly, for statistical and policy purposes, is the fact that there was often no straightforward distinction between the informal sector and its formal counterpart.[12] The International Labour Organization (ILO) and Women in Informal Employment: Globalizing and Organizing (WIEGO) put forth a three-part definition for a more comprehensive understanding of economic informality. First, the informal sector entails all unregistered enterprises' activities regarding both employment and production. Second, regardless of whether occurring in informal or formal companies, informal employment entails all employment not covered by a

[9] Candace Martinez et al., "Economic Informality and the Venture Funding Impact of Migrant Remittances to Developing Countries" *Journal of Business Venturing* 30, (2015): 526–545.

[10] Peter Rogers et al., "In an Introduction to Sustainable Development" Routledge, London: Earthscan, Glen Education Foundation, Inc., (2008): 107-137.

[11] Codrina Rada, "Formal and Informal Sectors in China and India," *Economic Systems Research* 22, no. 2 (2010): 129–153.

[12] Kate Meagher, "Unlocking the Informal Economy: A Literature Review on Linkages Between Formal and Informal Economies in Developing Countries," *WIEGO Working Paper* no. 27 (2013).

given society's labour protection regulations. Finally, the informal economy encompasses the activities of workers and companies and the outputs they generate that are not covered by a society's legal and regulatory framework.

Economic informality is often linked to poverty, as a substantial part of informal sector jobs is characterised by low wages, irregularity, and lack of social benefits.[13] Notwithstanding, establishing a strong correlation between informality and poverty is challenging due to the blurred boundaries between the formal and informal sectors, resulting from interconnections between formal and informal enterprises.[14] Two contrasting viewpoints have emerged regarding the labour movement into the informal economy. According to Meagher, one group, adopting a rational, individualistic perspective, argues that individuals choose to exit the formal economy, despite its greater social protection and higher taxes, to maximise their income and flexibility. On the other hand, some contend that workers do not typically opt into the informal economy out of choice, and formal-sector employers benefit the most.[15]

La Porta and Shleifer noted that despite the recurrent notion that the presence of a considerable portion of an economy being associated with informality is a barrier to economic growth as well as investment and overall development, informal economy size has expanded in developing countries because of widespread unemployment and has shown consistent growth over time. According to Khuong et al.,[16] the informal economy accounts for half of Pakistan's overall GDP. Yelwa and Adam[17] found that the informal economy has a considerable beneficial impact on nominal GDP growth in Nigeria. Pham[18] discovered that factors such as trade-related globalisation, government policies, working-age population, and economic growth impact the informal sector in emerging economies. Yelwa et al.[19] stated that sustained economic growth requires controlled productivity and a growth-oriented informal sector.

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[13] ILO, "Women and Men in the Informal Economy: A Statistical Picture," *Geneva: ILO and WIEGO* (2013).

[14] Donald Brown, et al., "Urban Informality and Building a More Inclusive, Resilient and Green Economy," *IIED Working Paper* (December), International Institute for Environment and Development (2014).

[15] Valodia, I., and Devey, R. 2010. "Formal-Informal Economy Linkages: What Implications for Poverty in South Africa?" *Law, Democracy and Development* 14, 2010, 1-26; Miriam Altman, "Formal-Informal Economy Linkages," *Employment Growth and Development Initiative*, (2008).

[16] Nguyen Vinh Khuong et al., "Does Informal Economy Impede Economic Growth? Evidence From an Emerging Economy," *Journal of Sustainable Finance and Investment* 11, no. 2 (2021): 103–122. https://doi.org/10.1080/20430795.2020.1711501

[17] Mohammed Yelwa and Adam, A. J., "Informality and Economic Growth in Nigeria: 1980–2014," *Journal of Economics and Public Finance* 3, no. 3 (2017): 405.

[18] Thi Hong Hanh Pham, "Impacts of Globalization on the Informal Sector: Empirical Evidence from Developing Countries," *Economic Modelling* 62, (2017): 207–218.

[19] Mohammed Yelwa et al., "Informality, Inclusiveness and Economic Growth in Nigeria," *The International Journal of Management Science and Business Administration* 1, no. 10 (2015): 33–44.

Nonetheless, due to the lack of proper understanding of the relationship between inclusivity, growth, and informality, barriers to poverty alleviation and achievement of economic development were associated with widespread informality in their study. Elgin and Birinci[20] projected the association between long-term growth and informality to be an inverted U shape in that high-income nations have a positive association. In contrast, low-income countries have a negative association. Duarte's[21] studies on Spain established a one-way causal relationship flowing from informality to growth, while there appeared to be a zero long-run causal relationship for informality and growth in an alternative model.

Baklouti and Boujelbene[22] recognised the significant nexus of institutional quality with the shadow economy-economic growth relationship. According to their findings, strong institutional quality in countries allows a situation where more formality is associated with higher GDP per capita; in countries with poor institutional quality, on the other hand, the extent of informality does not affect increased GDP per capita. It was found that the relative consumption-output volatility had a beneficial influence on the extent of informality. This was demonstrated in the work of Horvath[23], which was conducted to develop a general equilibrium two-sector model framework of real business cycles for a small open economy in which the informal economy was measured poorly. Informality was found to expand along with a rise in interest rates while consumption, investment, and output fell due to such interest rate increases. By examining the influence of two big business training programmes in Peru, Barron[24] found better results for formalising small-scale enterprises. The improvement seen in that study was associated with accessibility to basic finance, transparent tax procedures, and the ability to review company models. Estevao et al.[25] identified various potential approaches for lowering informality in the African setting, including strengthening investor protections and the tax system, as well as increasing access to financing and market efficiency.

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[20] Ceyhun Elgin and Serdar Birinci, "Growth and Informality: A Comprehensive Panel Data Analysis I," *Journal of Applied Economics* XIX, no. 2 (2016): 271–292.

[21] Pablo Duarte, "The Relationship between GDP and the Size of the Informal Economy: Empirical Evidence for Spain," *Empirical Economics* 52, no. 4 (2017): 1409–1421.

[22] Nedra Baklouti and Younes Boujelbene, "A Simultaneous Equation Model of Economic Growth and Shadow Economy: Is there a Difference between the Developed and Developing Countries?" *Economic Change and Restructuring* 53, no. 1 (2020): 151–170.

[23] Jaroslav Horvath, "Business Cycles, Informal Economy, and Interest Rates in Emerging Countries," *Journal of Macroeconomics* 55, (2018): 96–116.

[24] Manuel Barron, "Business Training Programs and Microenterprise Formalization in Peru," *Cogent Economics & Finance* 8, no. 1 (2020): 1791546.

[25] Joao Estevao et al., "The Importance of the Business Environment for the Informal Economy: Evidence from the Doing Business Ranking," *Technological Forecasting & Social Change* 174, (2022): 121288.

Considering the ephemeral characteristics of informal sector companies, Akintimehin et al.[26] demonstrated that social capital highly influences business performance. It was indicated that entrepreneurs engaged in informal activities usually utilise existing resources from internal social capital while also developing external social capital, as they are both proven to be important for business success.

Regarding environmental issues, Bali Swain et al.[27] argued that the scale of informality is significant in evaluating environmental policies' efficacy. The informal sector was shown by Köksal et al.[28] as a long-term driver of ecological footprint levels when coupled with formal economies. There is a general notion that a larger size of an informal sector contributes immensely to damaging the environment because environmental regulations are usually avoided by businesses engaged in informal activities.[29] Elgin and Oztunali[30] illustrated an inverted U-shaped connection and found that small and large informal economies are related to lower pollution levels, whereas pollution is higher in an environment with medium-sized informal economies. Biswas et al. discovered that an informal economy positively and marginally influences air pollution levels. It was further found that the detrimental influence of pollution due to rising informality might be mitigated by combating corruption, which has generally been linked to the rise of informal economic activities in developing nations.

Bali Swain et al. also recommend reducing corruption to improve the informal economy's marginal impact on environmental degradation. This study found that the informal sector positively affects local pollution but does not substantially impact global emissions such as CO_2. According to the report, the informal sectors in developing nations emit less since they generally utilise less energy due to reliance on labour-intensive production methods. In investigating the causal link between CO_2 emissions and economic growth in Tunisia, Abid[31] discovered that informal sector activities cause environmental deterioration, hence proposed reducing the size of the informal sector.

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[26] Olamide Oluwabusola Akintimehin et al., "Social Capital and its Effect on Business Performance in the Nigeria Informal Sector," *Heliyon* 5 (2019): e02024.

[27] Ranjula Bali Swain et al., "Regulation, Governance and the Role of the Informal Sector in influencing Environmental Quality?" *Ecological Economics* 173 (2020): 106649.

[28] Cihat Köksal et al., "The Role of Shadow Economies in Ecological Footprint Quality: Empirical Evidence from Turkey," *Environmental Science and Pollution Research* 27, no. 12 (2020): 13457–13466.

[29] Amit Biswas et al., "Pollution, Shadow Economy and Corruption: Theory and Evidence," *Ecological Economics* 75 (2012): 114–125.

[30] Ceyhun Elgin and Oguz Oztunali, "Pollution and Informal Economy," *Economic Systems* 38, no. 3 (2014): 333–349.

[31] Mehdi Abid, "The Close Relationship Between Informal Economic Growth and Carbon Emissions in Tunisia Since 1980: The (Ir)relevance of Structural Breaks," *Sustainable Cities and Society* 15, (2015): 11–21.

Huynh[32] predicted that tax collection and tax law enforcement would exacerbate the problem of environmental degradation. In a study by Chaudhuri,[33] informality of business in relation to tax enforcement was found to be an inverted-U shape, mainly due to the deregulation and scale effects of having a carbon-emitting informal manufacturing company subcontracted by the formal sector. These findings confirmed tax collection and tax law enforcement as important policy instruments for reducing carbon emissions but raised the risk of increasing informal economic activities. The formal sector's indirect taxes may lead to a rise in emissions with a trade-off for social welfare. Consequently, there is a need for adequate fiscal policy to facilitate the transition to cleaner economies. Bento et al.[34] introduced an optimal tax model capable of reflecting the informal-formal substitutions in an economy, demonstrating that the presence of informality may improve the efficiency of having tighter taxes on environmental externalities. Their findings revealed that emerging economies are preferable places to implement energy taxes since they could collect taxes more efficiently and reduce environmental externalities. Chaudhuri and Mukhopadhyay suggested an indirect technique for pollution control.[35] As a result, higher taxes should be levied on formal businesses utilising outputs from the informal economy as intermediate inputs because economic units in the informal sector cannot afford the payment of pollution taxes nor the installation of pollution abatement equipment to mitigate their polluting activities.

Regarding social issues, even though the informal sector has been estimated to be responsible for nearly half of developing countries' employment and economic activity,[36] the benefits of such employment in eradicating poverty through which sustainable development can be improved are highly debated.[37] Workers in the informal sector are forced to work in lower-wage employment with little job security in cities because they lack the socioeconomic resources to hold out for higher-paying official sector jobs indefinitely. Therefore, informal employees are frequently subjected to difficult and precarious working

[32] Cong Minh Huynh, "Shadow Economy and Air Pollution in Developing Asia: What is the Role of Fiscal Policy?" *Environmental Economics and Policy Studies* 22, no. 3 (2020): 357–381. https://doi.org/10.1007/s10018-019-00260-8SULTANAET AL.449

[33] Sarbajit Chaudhuri, "Pollution and Welfare in the Presence of Informal Sector: Is there any Trade-Off?" *Economic Studies* 43, no. 1 (2005): 21–42.

[34] Antonio Bento et al., "Environmental Policy in the Presence of an Informal Sector," *Journal of Environmental Economics and Management* 90 (2018): 61–77.

[35] Sarbajit Chaudhuri and Ujjaini Mukhopadhyay, "Pollution and Informal Sector: A Theoretical Analysis," *Journal of Economic Integration* 21, no, 2 (2006): 363–378.

[36] Martha Alter Chen, "The Informal Economy: Definitions, Theories and Policies," *Women in Informal Employment Globalizing and Organizing,* Working Paper no 1 (2012).

[37] Sumila Gulyani and Debabrata Talukdar, "Inside Informality: The Links between Poverty, Microenterprises, and Living Conditions in Nairobi's Slums," *World Development* 38, No. 12 (2010): 1710–1726.

circumstances in informal enterprises that lack health benefits or employment security.[38] Gangopadhyay and Shankar[39] investigated and discussed the prevalence of monopsonistic exploitation and working poverty in South Asia's urban informal sectors. An index of destitution for less-developed countries' working poor was constructed by Gangopadhyay et al.,[40] explaining several economic and social variables that contribute to increasing destitution among poor informal workers. It was revealed that profit considerations overshadow hardship and poverty. Croitoru and Sarraf[41] discovered that the profitability of informal brick kiln enterprises in Bangladesh becomes negative when the accompanying health consequences and some societal pollution costs are factored in. Gutiérrez-Romero[42] identified past levels of inequality as a key element in understanding the size of an informal sector over time. Dell'Anno[43] found a negative link between low levels of inequality and informality across countries, whereas high levels of inequality boost informality.

Yelwa et al. discovered that socioeconomic characteristics in the informal sector can favourably impact the economy. Villanueve et al.[44] conducted face-to-face interviews with entrepreneurs in Mexico City to study the possibility of informal firms demonstrating social responsibility. The study revealed that informal firms would engage in some implicit social responsibility action despite the harsh and vulnerable conditions. The connection between sustainable development and informal social responsibilities was drawn out by Uzo and Shittu[45] by researching the mechanisms surrounding the practice of social responsibilities in Nigeria's informal sector.

According to Ruzek,[46], the informal sector can help balance equity, the environment, the economy, and the intragenerational future. Özgür, Elgin,

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[38] James Macgregor et al., "Informal Economy: Primer for Development Professionals on the Importance of the Informal Economy in Developing Countries," *IIED* (2012).

[39] Partha Gangopadhyay and Sriram Shankar, "Labour (Im)mobility and Monopsonistic Exploitation of Workers in the Urban Informal Sector: Lessons from a Field Study," *Urban Studies* 53, no. 5 (2016): 1042–1060. https://doi.org/10.1177/0042098015571056

[40] Partha Gangopadhyay et al., "Working Poverty, Social Exclusion and Destitution: An Empirical Study," *Economic Modelling* 37, (2014): 241–250.

[41] Lelia Croitoru and Maria Sarraf, "Benefits and Costs of the Informal Sector: The Case of Brick Kilns in Bangladesh," *Journal of Environmental Protection* 03, no. 06 (2012): 476–484.

[42] Roxana Gutiérrez-Romero, "Inequality, Persistence of the Informal Economy, and Club Convergence," *World Development* 139, (2021): 105211.

[43] Roberto Dell'Anno, "Inequality, Informality, and Credit Market Imperfections," *Macroeconomic Dynamics* 22, no. 5 (2018): 1184–1206.

[44] Cristian Villanueve et al., "Social Responsibility among Informal Enterprises: Evidence from Mexico," *Journal of Development Entrepreneurship* 25, No. 3 (2020): 2050021.

[45] Uchenna Uzo and Olamide Shittu, "Corporate Social Responsibility in Developing and Emerging Markets," In *Institutions, Actors and Sustainable Development*, Cambridge University Press, 2019, 191–205.

[46] William Ruzek, "The Informal Economy as a Catalyst for Sustainability," *Sustainability (Switzerland),* 7, no. 1 (2015): 23–34.

and Elveren[47] discovered a negative correlation between informal sector size and sustainable development metrics. Özgür, Elgin, and Elveren generally portrayed informal business activities as a fundamental integral part of sustainable development and established a strong correlation between socioeconomic indicators and informal sector size. In a study by Sultana, Rahman, and Khanam,[48], the informal sector plays an overall detrimental role in developing countries' quest to achieve sustainable development, employing an indicator of the working poor as the proxy for informality. Recognising workforce and informality as significant parts of the global economy, Chen[49] suggested evaluating social and economic policies based on their impacts on informal economic activities and their integral components. A high association of economic development levels and the quality of institutions with informal economic activities was demonstrated in the study by Pratap and Quintin,[50] highlighting a more modern perception of informality, which focuses on self-financed, unskilled labour-intensive small-scale activities and capable of recognising the implications of having a pro-growth policy and supporting large informality levels. Rai, Brown, and Ruwanpura[51] argued that addressing the impact of informality on economic growth and decent work should receive greater attention to fulfil its potential.

II.B. Financial Development and Sustainable Development

Financial development crucially forms a foundation for achieving sustainable economic growth. The financial sector's economic growth and development role has steadily increased globally. Various studies have shown a positive correlation between economic growth and environmental degradation, particularly in developing countries.[52] The South Asian region experiences common environmental issues, like wind erosion and water depletion, with approximately 90 million hectares of land being impacted by rising water salinity, hampering agricultural activities. Pakistan, in particular, faces significant land

[47] Gokcer Özgür et al., "Is Informality a Barrier to Sustainable Development?" *Sustainable Development* 29, no. 1 (2021): 45-65.

[48] Nahid Sultana et al., "The Effect of the Informal Sector on Sustainable Development: Evidence from Developing Countries," *Business Strategy & Development* 5, no. 4 (2022): 437-451.

[49] Martha Alter Chen, "The Informal Economy: Recent Trends, Future Directions," *New Solutions: A Journal of Environmental and Occupational Health Policy* 26, no. 2 (2016): 155-172.

[50] Sangeeta Pratap and Erwan Quintin, "The Informal Sector in Developing Countries: Output, Assets and Employment," *WIDER Research paper* no. 2006/130, (2006).

[51] Shirin Rai et al., "SDG 8: Decent work and Economic Growth–A Gendered Analysis," *World Development* 113, (2019): 368-380.

[52] Andrew Scott et al., "Research and Evidence on Green Growth," *Report by the Overseas Development Institute for Evidence on Demand*, (2013).

degradation due to desertification-induced erosion.[53] South Asian countries also face frequent rising sea levels, flooding, carbon emissions, escalating temperatures, droughts, and increases in water salinity.[54] These environmental impacts have severe repercussions on the environment and national economy.[55] To address these environmental threats, sustainable economic development has become imperative, emphasising the importance of preventing environmental degradation and fostering green economic growth.

Moreover, in most countries, economic development has significant adverse effects on the natural environment. There is a pressing need to address these undesirable ecological consequences through measures such as fostering social inclusion, enforcing environmental protection, promoting macroeconomic growth, and encouraging low carbon emissions. These aspects collectively embody the green growth concept as embodied in the SDG framework, where the achievement of green growth is interconnected with many SDGs.

Numerous studies have investigated the relationship between financial development, economic growth, and environmental performance. Yang[56] also identified a reverse causal relationship between the advancements in the equity of markets and economic progress in high-income countries. In a study of sixteen low-income nations, Bist[57] explored how social sustainability relates to economic growth and financial development. The results showed that social progress positively affects economic growth and financial development. Considering 12 years for 42 developing economies, Masoud and Hardaker[58] similarly assessed how social progress relates to financial development. The outcome revealed that social progress is positively connected to financial development. Additionally, Donelli and Chiriatti[59] focused on the BRICS countries (Brazil, Russia, India, China, and South Africa). At the same time,

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[53] Tanjina Hasnat et al., "Major Environmental Issues and Problems of South Asia, Particularly Bangladesh," *Handbook of Environmental Materials Management,* (2018): 1e40.

[54] Saleemul Huq and Jessica Ayers, "Climate Change Impacts and Responses in Bangladesh," Brussels, Belgium: Policy Department Economy and Science, European Parliament, (2008).

[55] Hannah Reid et al., "Up in Smoke? Asia and the Pacific," *Fifth Report of the Working Group on Climate Change and Development*, (2007): London: New Economics Foundation.

[56] Fan Yang, "The Impact of Financial Development on Economic Growth in Middle-Income Countries," *Journal of International Financial Markets, Institutions and Money* 59, (2019): 74–89. https://doi.org/10.1016/j.intfin.2018.11.008.

[57] Jagadish Prasad Bist, "Financial Development and Economic Growth: Evidence from a Panel of 16 African and Non-African Low-Income Countries," *Cogent Economics & Finance* 6, No. 1 (2018): 1449780.

[58] Najeb Masoud and Glenn Hardaker, "The Impact of Financial Development on Economic Growth," *Studies in Economics and Finance* 29, no. 3 (2012): 148e173.

[59] Federico Donelli and Alessia Chiriatti, "Turkish Civilian Capacity in Post-conflict Scenarios: The Cases of Bosnia and Herzegovina and Kosovo," *Journal of Global Analysis* 7, no. 1 (2017).

Bayar[60] discovered that the development of the financial sector positively affects economic growth in developing economies.

From the review of the literature, it is clear that few studies have investigated the impact of the informal economy on sustainable development, as well as the impact of financial development on sustainable development. Moreover, no existing study has examined the indirect effect of the interaction of both the informal economy and economic development on sustainable development. Furthermore, robust empirical analysis is essential, given the vital role both the informal economy and financial development play in achieving sustainable development. Therefore, the emergence of this study examines both the direct and indirect impacts of the informal economy and financial development on sustainable development in the ASEAN region.

III. METHODS

III.A. Data

This study employs a panel dataset encompassing 10 ASEAN nations, which include Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam, from 1991 to 2020. It concentrates on ASEAN countries where, alongside other developing nations, concerns for sustainable economic development abound, and cross-nation variance in informal economic activities and financial sector policy is striking. The study's annual statistics were obtained from the World Bank's World Development Indicators (WDI) database. Table 1 contains the variable definitions.

III.B. Model

The following regression model is specified to achieve the aims of this study.

$$SD_{it} = \alpha_0 + \alpha_1 IE_{it} + \alpha_2 FD_{it} + \alpha_3 GDPP_{it} + \alpha_4 FDI_{it} + \alpha_5 NR_{it} + \alpha_6 TO_{it} + \epsilon_{it} \quad (1)$$

$$SD_{it} = \alpha_0 + \alpha_1 IE_{it} + \alpha_2 FD_{it} + \alpha_3 GDPP_{it} + \alpha_4 FDI_{it} + \alpha_5 NR_{it} + \alpha_6 TO_{it} + \alpha_7 (IE * FD)_{it} + \epsilon_{it} \quad (2)$$

Where SD is sustainable economic development, it is the dependent variable. The explanatory variables are informal economy (IE), financial development (FD), income per capita (GDPP), foreign direct investment (FDI),

[60] Yilmaz Bayar, "Financial Development and Economic Growth in Emerging Asian Countries," *Asian Social Science* 10, no. 9 (2014): 8e17.

natural resource endowment (NR) and trade openness (TO). ϵ Represents the disturbance term.

Following the works of Barbier Burgess and Guney,[61] this study measures sustainable development with adjusted net savings as the ratio of gross national income (GNI) (excluding emissions damage). Informal economy (IE) is measured following the estimation of Medina and Schneider,[62] which was arrived at through the MIMIC method. Following Yang, financial development is measured by broad money supply as a share of GDP (FD1), but for robustness purposes, domestic credit available to the private sector as a share of GDP (FD2) is also used to measure financial development.

Table 1.
Variable Description

Variable Name	Acronym	Description	Supporting literature
Sustainable Development	SD	Adjusted net savings, excluding emission damage (% of GNI)	Barbier and Burgess; Guney
Informal Economy	IE	Multiple indicators Multiple Causes (MIMIC) method (% of GDP)	Medina and Schneider
Financial Development	FD	Broad money supply (% of GDP) and domestic credit to private sector (% GDP)	Yang; Wang, Xiao, and Lu[63]
Income per capita	GDPP	GDP per capita (constant 2010 US$)	Nepal et al.[64]
Foreign Direct Investment	FDI	Foreign direct investment, net inflows (BoP, current US$)	Din et al.[65]
Natural resource abundance	NR	Total natural resources rents (% of GDP)	Dogan, Altinoz, and Tzeremes[66]
Trade Openness	TO	Trade (% of GDP)	Zahonogo[67]

[61] Taner Güney, "Renewable Energy, Non-Renewable Energy and Sustainable Development," *International Journal of Sustainable Development and World Ecology* 26, (2019): 389–397. https://doi.org/10.1080/13504509.2019.1595214.

[62] Leandro Medina and Friedrich Schneider, "Shadow Economies Around the World: What did We Learn Over the Last 20 Years?" *IMF Working Paper* 18/17, (2018): International Monetary Fund, Washington, DC.

[63] Qing Wang et al., "Does Economic Policy Uncertainty affect CO2 Emissions? Empirical Evidence from the United States," *Sustainability* 12, (2020): 9108. https://doi.org/10.3390/su12219108.

[64] Rabindra Nepal et al., "Energy Security, Economic Growth and Environmental Sustainability in India: Does FDI and Trade Openness play a Role?" *Journal of Environmental Management* 281, (2021): 111886 https://doi.org/10.1016/j.jenvman.2020.111886.

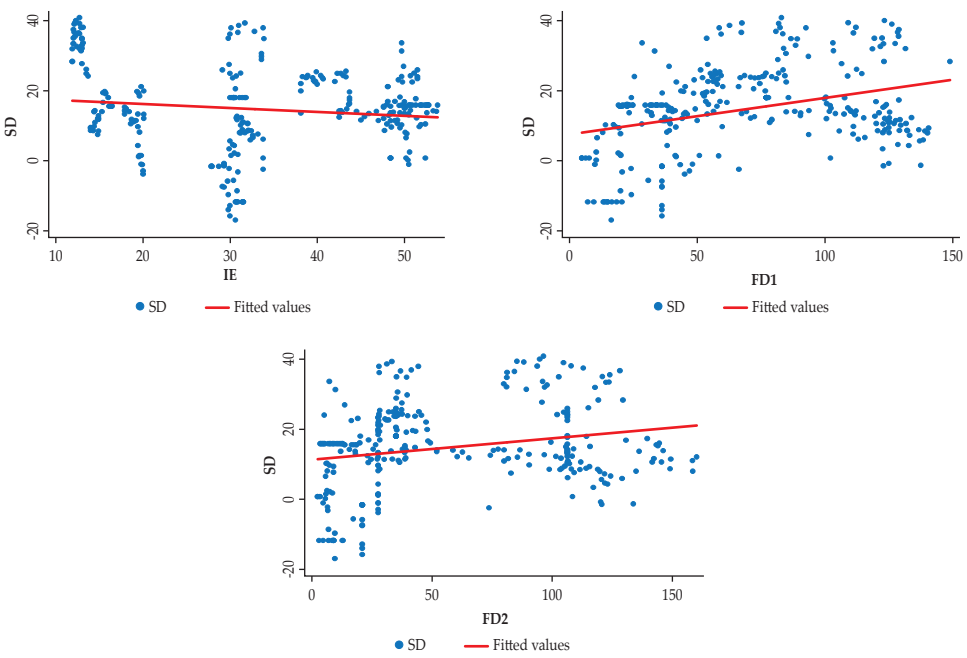
[65] Shahab Ud Din et al., "Nexus Between Sustainable Development, Adjusted Net Saving, Economic Growth, and Financial Development in South Asian Emerging Economies," *Journal of Knowledge Economics* (2021): 1–14. https://doi.org/10.1007/s13132-021-00818-6.

[66] Eyup Dogan et al., "The Analysis of 'Financial Resource Curse' Hypothesis for Developed Countries: Evidence from Asymmetric Effects with Quantile Regression," *Resource Policy* 68 (2020): 101773. https://doi.org/10.1016/j.resourpol.2020.101773.

[67] Pam Zahonogo, "Trade and Economic Growth in Developing Countries: Evidence from Sub-Saharan Africa," *Journal of African Trade*, 3, (2016): 41–56. https://doi.org/10.1016/j.joat.2017.02.001.

A preliminary graph in Figure 2 below shows the scatter plot of the relationship between sustainable development and each of the informal economy (IE), broad money supply (FD1) and domestic credit to the private sector (FD2). This preliminary view revealed that SD is negatively correlated with IE, suggesting that higher levels of SD are associated with lower IE and vice versa. The correlation between SD and FD1 was shown in the figure to be positive, while the correlation between SD and FD2 was shown in the figure to be negative.

Figure 2. Scatter relationship between SD and IE, FD1 and FD2 respectively.



III.C. Method of Analysis

A description of the variables was carried out using summary statistics. The statistics mainly show each variable's mean, standard deviation, minimum and maximum values. The pairwise correlation was also used to determine the relationship among variables and verify that the relationships are not very strong among explanatory variables, which might lead to multicollinearity problems. First- and second-generation unit root tests were conducted to examine the time series properties of the panel data. The first-generation test follows the Levin, Lin, and Chu[68] procedure, while the second-generation test follows the

[68] Andrew Levin et al., "Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties," *Journal of Econometrics* 108, (2002): 1–24. https://doi.org/10.1016/S0304-4076(01)00098-7

Pesaran[69] procedure. The second-generation test is robust in the presence of cross-sectional dependence. Westerlund and Egerton's[70] cointegration test was also employed to check for the long-run equilibrating relationships among the model variables.

We employed fixed effects (FE), feasible GLS (FGLS), and quantile regression methods for empirical robustness analysis. FE can eliminate the heterogeneity across the panel members that are time-invariant.[71] The Hausman test was employed to aid the choice of FE over its random effect counterpart. FGLS allows for a more flexible covariance structure of the errors and offers heteroskedasticity and/or cross-sectional correlation-robust estimation across units and autocorrelation within units.[72] Quantile regression was employed, following Goswami, Roy, and Giri[73] and Buchinsky[74] to examine the impacts at different quantiles.

Generally, problems related to cross-sectional and serial correlations and heteroskedasticity are significant issues in panel regression models. Two main techniques stand out in dealing with these issues. However, one of these techniques is to employ the ordinary least squares (OLS) regression with a robust estimate of standard errors that can resist serial correlation and heteroskedasticity problems.[75] Other classes of robust standard errors were also used, such as clustered standard errors,[76] and robust standard errors in the context of unknown clusters.[77] According to Bai, Choi, and Liao, the second option is to utilise the generalised least squares estimator (GLS), which explicitly accounts for heteroskedasticity and serial and cross-sectional correlations. Moreover, it is established that the GLS provides more efficient estimates than the OLS. For this reason, the feasible GLS method was adopted for use in this study.

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[69] Hashem M. Pesaran, "A Pair-wise Approach to Testing for Output and Growth Convergence," *Journal of Econometrics* 138, (2007): 312–355.

[70] Joakim Westerlund and David Edgerton, "Simple Tests for Cointegration in Dependent Panels with Structural Breaks," *Oxford Bulletin of Economics and Statistics* 70, (2007): 665-704.

[71] Sardar Islam et al., "Making Long-Term Economic Growth More Sustainable: Evaluating the Costs and Benefits," *Ecological Economics* 47, (2003): 149–166. https://doi.org/10.1016/S0921-8009(03)00162-9.

[72] Biorn Erik, "A Tutorial for Panel Data Analysis with Stata," University of Oslo, Oslo, Norway. January 04, (2010), Econ 5103 – Advanced econometrics – Panel data. https://www.uio.no/studier/emner/sv/oekonomi/ECON5103/v10/undervisningsmateriale/ECON5103_V10_STATA_01.pdf.

[73] Anju Goswami et al., "Does HDIs Level Sustainable During 1999/2018 Across Cross-Nations? An Application of Bootstrap Quantile Regression Approach," *Sustainable Operations and Computers* 2, (2021): 127–138. https://doi.org/10.1016/j.susoc.2021.06.001.

[74] Moshe Buchinsky, "Recent Advances in Quantile Regression Models: A Practical Guideline for Empirical Research," *Journal of Human Resources* (1998): 88–126. https://doi.org/10.2307/146316.

[75] Halbert White, "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity," *Econometrica 48*, no. 4 (1980): 817–838.

[76] Jeffrey Wooldridge, "Econometric Analysis of Cross Section and Panel Data," The MIT Press, 2010).

[77] Jushan Bai et al., "Standard Errors for Panel Data Models with Unknown Clusters," *Journal of Econometrics,* (2020): 1–15.

Quantile regression was used to support the feasibility of the GLS method. In traditional linear regression, the concept of estimating different means to explain grouped data is abandoned for the idea that the parameters of a linear model can be calculated for all these means with the assumption that the means fall on a line or some linear surface. Least squares estimation is a valuable method for estimating conditional mean models. According to Goswami, Roy, and Giri, quantile regression is equally helpful for estimating models for conditional quantile functions.[78] Specifically, the quartiles method was employed. It divides the population into four equal parts and estimates three coefficients for each parameter to capture the 25th, 50th, and 75th quantile estimates to show the relationships at these different levels.

IV. RESULTS

From the summary statistics of variables, sustainable development (SD), which is adjusted net savings' share of gross national income (GNI), had a mean of 14.73 percent; informal economy's share of GDP (IE) had a mean of 33.0 percent; broad money supply (FD1) had a mean of 69.01 percent; and domestic credit to private sector's share of GDP (FD2) had a mean of55.94 percent. This means that considerable financial resources are available to the region's private sector. If effectively utilised, they are expected to translate to more sustainable development by making cleaner energy alternatives available to engender capacity to mitigate climate change.[79] Furthermore, GDP per capita (GDPP) was shown to have a mean of US$9,737.8, suggesting that the countries in this region are upper-middle income nations, on average. Trade openness (TO) had a mean of 119.02 percent; natural resource rents' share of GDP (NR) had a mean of 7.833 percent; and foreign direct investment's share of GDP (FDI) had a mean of 5.29 percent.

Our pairwise correlation in Table 3 below shows that sustainable development is significantly and negatively correlated with the informal economy. Still, it is significantly and positively correlated with financial development (both in terms of money supply and available credit to the private sector) and other variables like GDP per capita, trade openness and FDI. More importantly, our correlation results revealed a weak relationship among the explanatory variables (except in the case of broad money supply and domestic credit to the private sector, which was not included in a single model). They all

[78] Goswami et al., "Does HDIs Level Sustainable, 127-138.

[79] Ajit Pratap Singh and Kunal Dhadse, "Economic Evaluation of Crop Production in the Ganges Region Under Climate Change: A Sustainable Policy Framework," *Journal of Cleaner Production* 278, (2021): 123413 https://doi.org/10.1016/j.jclepro.2020.123413.

showed correlation coefficients lower than the threshold of 0.8, which poses no multicollinearity concerns for the panel data.

To make an appropriate decision on the procedures to test for unit root and cointegration in the data, a section dependence test was conducted, and the results are presented in Table 4. This is to verify if the countries are cross-sectionally independent regarding the variables employed. With the test's null hypothesis being "cross-section independence", the significant statistics revealed for the informal economy (IE), broad money supply (FD1), domestic credit to the private sector (FD2), natural log of GDP per capita (GDPP), trade openness (TO), natural resource rent (NR), and foreign direct investment (FDI) suggest that the null hypothesis is rejected. The countries are cross-sectionally dependent in terms of these variables. On the other hand, the statistics reported for sustainable development (SD) are insignificant, suggesting that the countries are not cross-sectionally dependent on this variable. These results warrant unit consideration for the second-generation unit root test, which can address cross-sectional dependence issues.

Table 2.
Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
SD	14.73	12.14	-16.95	40.88
IE	33.00	13.68	11.9	53.8
FD1	69.01	39.20	4.894	148.9
FD2	55.94	44.49	2.371	160.1
GDPP	9737.8	14893.7	189.2	61386.2
TO	119.02	89.60	11.85	437.3
NR	7.833	8.007	0.0001	37.40
FDI	5.290	5.500	-2.757	29.76

Source: Authors' Computations using Stata 14.

Table 3.
Pairwise Correlation

Variable	SD	IE	FD1	FD2	lnGDPP	TO	NR	FDI
SD	1.0							
IE	-0.127**	1.0						
FD1	0.337***	-0.218***	1.0					
FD2	0.223***	-0.164***	0.935***	1.0				
lnGDPP	0.612***	-0.445***	0.447***	0.311***	1.0			
TO	0.430***	-0.505***	0.64***	0.624***	0.707***	1.0		
NR	-0.020***	0.026	-0.140**	-0.286***	0.196***	-0.272***	1.0	
FDI	0.347***	-0.341***	0.293***	0.280***	0.607***	0.699***	-0.187***	1.0

Source: Authors' Computations using Stata 14.

From our results of unit root test in Table 5, the first-generation test from the Levin-Lin-Chu procedure largely agrees with the second-generation test generated from the Pesaran procedures. Most of the variables are I(1), i.e. they are only stationary at their first-differenced series. Although, other variables such as natural log of GDP per capita, natural resource rents and FDI are stationary at the level series, making them I(0) series. From our cointegration test results, three out of four statistics are found to be significant, suggesting that the test's null hypothesis of no cointegration is rejected and a conclusion is reached that the variables employed are cointegrated and exhibit a long-term relationship.

Based on the fixed effects, feasible GLS, and Quantile regression, we obtained the results presented in Table 7. These methods were employed for robustness purposes and their results are largely in agreement. The results are for the direct effect of informal economy and financial development on sustainable development. Informal economy was reported with significant positive coefficients in most of the results. Its coefficients range from 0.134 to 0.340, suggesting that an increase in the share of informal economy in total GDP would yield an increase in adjusted net savings as ratio of gross national income (and by implication, increases sustainable development) by between 0.134 and 0.340 percent points. As for broad money supply (FD1), the results revealed that its coefficients are negative and statistically significant, having values ranging between -0.0616 and -0.167. This suggests that a percent point increase in broad money supply as ratio of GDP will cause a decline in adjusted net savings as a ratio of gross national income (and thus, on sustainable development) by approximately between 0.06 and 0.2 percent points. Similar results were generated for domestic credit to the private sector as a ratio of GDP, whose coefficients were seen to be negative and statistically significant with values ranging between -0.0642 and -0.138. This indicates that a rise in domestic credit to private sector as ratio of GDP will cause a decline in adjusted net savings' share of gross national income (and hence, on sustainable development) by approximately between 0.06 and 0.14 percent points.

Looking at the results from the viewpoints of the included control variables, the log transformation of GDP produced positive significant coefficients for the different methods used. Its positive coefficients range between 4.959 and 7.656, suggesting that a single percentage point increase in GDP will yield a rise in adjusted net savings' share of gross national income (and sustainable development) by approximately between 4.96 and 7.66 percent points. Trade openness as a ratio of GDP is largely shown in the results to produce insignificant positive coefficients, but at a point on the 75th quantile, its positive coefficient of 0.0237 was seen to be statistically significant. This is shows that there is

some evidence that trade openness affects adjusted net savings significantly. By implication, a percent point increase in the share of trade in GDP will cause a rise in adjusted net savings' share of gross national income by about 0.0237 percent points. Natural resource rents produced negative coefficients that are statistically significant. The significant negative coefficients have values ranging between -0.173 and -0.537. This means that a percent point rise in the natural resource rents will yield a decline in adjusted net savings' share of gross national income, and hence, on sustainable development by approximately between 0.2 and 0.5 percentage points. Foreign direct investment was seen in the results to largely yield positive coefficients that are statistically significant. These significant coefficient values range between 0.105 and 0.543. This indicates that a single percentage point increase in the share of foreign direct investment in GDP will yield an increase in adjusted net savings' share of gross national income by approximately between 0.1 and 0.5 percentage points.

The results of the indirect effect of informal economy through financial development are presented in Table 8. The results reveal that, even though, the informal economy largely positively affects sustainable development and financial development largely negatively affects sustainable development, their interactions largely had a negative impact on sustainable development. Although, the FE results showed evidence of a positive effect from their interactions through domestic credit to the private sector, other results from the FGLS and quantile regressions showed that their interactions are negatively related to sustainable development. Therefore, we can argue that an increase in broad money supply as ratio of GDP (FD1) will yield a decline in adjusted net savings while a percent point increase in domestic credit to private sector can lead to an increase in adjusted net savings' share of gross national income. By implication, through the informal economy, the broad money supply still largely has negative consequences for sustainable development while domestic credit to the private sector can still have some positive influence on sustainable development.

The impacts of other variables remain unchanged. The informal economy (FE) without interaction with financial development still yielded significant positive coefficients in most of the results, suggesting that informal economy is consistently vital to achieving sustainable development. Financial development measured by broad money supply levels still resulted in significant negative coefficients. Similarly, financial development measured by domestic credit to private sector still yielded significant negative coefficients. There is still sufficient evidence to establish that an increase in GDP per capita helps to improve the achievement of sustainable development goals, with significant positive coefficients almost throughout the different methods used. Trade

openness is now seen to be insignificant but still maintains, to some extent, its positive coefficients. Natural resource rents consistently yielded significant negative coefficients throughout the results, confirming the early view of the resource-curse hypothesis that increase in resource allotment is usually an obstacle to economic development. The results still showed foreign direct investment to have significant positive influence on sustainable development, given its consistent positive coefficients under most of the methods used.

V. DISCUSSION OF FINDINGS

In line with Sultana et al., for developing countries, evidence emerged from these results that an informal economy largely promotes sustainable development. The outcome, however, mirrors those of Islam[80] for South Asian countries, and Khuong et al. for emerging economies. This outcome implies that the informal economy has become an integral part of the overall economy by providing jobs for unskilled individuals. helping them escape unemployment and, in turn, poverty and consequently boosting the achievement of sustainable development. Through this, unskilled individuals are also helped to start their own small businesses in order to improve their economic well-being. It may also imply that the informal economy has served as a complementary sector to the formal sector in the ASEAN region, in which the former supplies cheap labour to the latter to execute labour-intensive productive activities through sub-contracts. Surprisingly, both financial development indicators show negative relationship with sustainable development. This is contrary to the evidence found in most studies that investigated the financial development-growth nexus.[81] Although, the negative impact seems surprising, it corroborates some earlier findings that the financial sector can yield negative influence on sustainable through its detrimental impact on the education sector and human capital.[82] This may imply that the funding of the economy through the financial sector has not been channelled to vital sustainable-induced sectors in the ASEAN region, such as the education sector, and this has created gaps

[80] Asif Islam, "The Burden of Water Shortages on Informal Firms," *Land Economics* 95, no. 1 (2019): 91-107.

[81] Ahmed Hunjra et al., "Role of Financial Development for Sustainable Economic Development in Low Middle Income Countries," *Finance Research Letters* 47, (2022): 102793; Minh Ha Nguyen et al., "Does Financial Development Matter for Economic Growth in the Emerging Markets?" *Borsa Istanbul Review* 22, no. 4 (2022): 688–698.

[82] Rashmi Umesh Arora, "Financial Inclusion and Human Capital in Developing Asia: The Australian Connection," *Third World* 33 (2012): 177–197; Hamed Adeli Nik et al., "The Relationship between Financial Development Indicators and Human Capital in Iran," *Management Science Letters* 3, (2013): 1261–1272.

in the actual and potential capital needed to achieve sustainable growth and development.

Furthermore, there is strong evidence for the positive effect of increasing income per capita on sustainable development. It is conceivable that achieving sustainable development is almost entirely realized within the`3w context of a growing income and rising economic wellbeing. Therefore, a prerequisite to sustainable development is first, the improvement in income levels. This finding corroborates those of earlier studies on the influence of income level and growth on sustainable development.[83] Trade openness was also revealed to promote sustainable development, most especially, at the highest levels of total trade. This implies that ASEAN countries have largely been involved in sustainable international trade thereby improving their chances of achieving sustainable development. Some of the strategies for sustainable trade that these countries might have engaged in include the export of commodities which they have in relative abundance and the import of renewable energy technologies to help them attain sustainable energy consumption. For example, Indonesia has large nickel reserves, one of the vital raw materials employed in the production of electric vehicle (EV) batteries, accounting for about 25 percent of total global nickel reserves, and making the country to engage in import of technologies in the production EV batteries. This move is one of the plausible strategies through which international trade can positively contribute to sustainable development. The resource-curse hypothesis was backed by the results, given that strong evidence exists of the negative influence of natural resource rents on sustainable development. This is justified by the fact that most countries tend to renege in their development and sustainable growth path when there is enormous rents to the natural resources they are endowed with. There is equally strong evidence for the promoting effect of foreign direct investment on sustainable development in the ASEAN region. Once again, this is true when this direct capital infusions are channelled to sustainable economic activities, like the foreign investment in the production of cleaner alternative energy sources in Singapore, Indonesia, Malaysia, and Thailand.

As for the indirect effect of informal economy and financial development on sustainable development presented in Table 8, the interaction terms of informal economy (IE) and financial development (FD) were included in the equation to examine if both reinforce one another to promote sustainable development (SD). It was evident from the results that the interactions of informal economy and financial development largely produce detrimental effect

[83] Funda H. Sezgin et al., "Impact of Financial Development and Remittances on Educational Attainment within the Context of Sustainable Development: A Panel Evidence from Emerging Markets," *Sustainability* 15, no. 16 (2023): 12322. https://doi.org/10.3390/su151612322

on sustainable development (SD) in the countries of the ASEAN region. This may imply that the workings of the financial sector of these countries, mostly operating formally and not consistent with informal economic activities, which are usually hidden and not covered by formal arrangements.

Table 4.
Cross Section Dependence Test

Variable	CD test	p-value
SD	-0.626	0.532
IE	20.11***	0.000
FD1	14.34***	0.000
FD2	20.04***	0.000
lnGDPP	22.24***	0.000
TO	5.607***	0.000
NR	10.56***	0.000
FDI	2.368**	0.018

Source: Authors' Computations using Stata 14.

Table 5.
Unit Root Test

	First Generation test - LLC				Second Generation test - Pesaran (2007)			
	Level		First Difference		Level		First Difference	
Variable	stat	p-value	stat	p-value	stat	p-value	stat	p-value
sd	-1.100	0.135	-7.018***	0.000	-1.791	0.459	-3.54***	0.000
ie	1.036	0.849	-8.152***	0.000	-1.996	0.221	-3.471***	0.000
fd1	5.248	1.00	-3.45***	0.000	-1.371	0.898	-3.234***	0.000
fd2	3.712	0.999	-2.336***	0.009	-1.685	0.597	-2.526***	0.006
lngdpp	-3.019***	0.001	-1.452*	0.073	-2.453**	0.012	-2.36**	0.025
to	-0.884	0.188	-6.46***	0.000	-1.33	0.920	-3.297***	0.000
nr	-1.665**	0.048	-9.581***	0.000	-2.451**	0.012	-4.16***	0.000
fdi	-3.288***	0.000	-9.473***	0.000	-2.449**	0.012	-4.448***	0.000

Source: Authors' Computations using Stata 14.

Table 6.
Cointegration Test

Statistic	Value	P-value
Gt	-1.636	0.023
Ga	-4.421	0.333
Pt	-5.257	0.001
Pa	-4.268	0.000

Source: Authors' Computations using Stata 14.

Table 7.
Regression Results – Direct Effect

	FE		FGLS		Quantile Regression					
					25th quantile		50th quantile		75th quantile	
Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
IE	-1.087	-1.108*	0.123	0.134*	0.280***	0.340***	0.0700	0.114	0.197***	0.186***
	(0.619)	(0.583)	(0.0764)	(0.0760)	(0.0950)	(0.0949)	(0.0784)	(0.0753)	(0.0472)	(0.0356)
FD1	-0.0672*	-	-0.0616***	-	-0.0765*	-	-0.0866**	-	-0.167***	-
	(0.0323)		(0.0184)		(0.0420)		(0.0347)		(0.0209)	
FD2	-	-0.0459	-	-0.0642***	-	-0.0858**	-	-0.0840***	-	-0.138***
		(0.0396)		(0.0164)		(0.0347)		(0.0275)		(0.0130)
lnGDPP	-1.721	-2.325	5.467***	5.670***	7.345***	7.656***	5.798***	6.005***	6.075***	4.959***
	(2.927)	(2.842)	(1.054)	(1.047)	(1.316)	(1.231)	(1.087)	(0.977)	(0.654)	(0.461)
TO	0.0344	0.0231	0.00358	0.00394	0.0208	0.0322	-0.00868	-0.00254	0.0144	0.0237**
	(0.0308)	(0.0356)	(0.0111)	(0.0109)	(0.0260)	(0.0263)	(0.0215)	(0.0209)	(0.0129)	(0.00988)
NR	-0.537**	-0.517**	-0.216***	-0.228***	-0.401**	-0.495***	-0.231*	-0.279**	-0.173**	-0.238***
	(0.172)	(0.166)	(0.0752)	(0.0745)	(0.158)	(0.162)	(0.131)	(0.129)	(0.0786)	(0.0607)
FDI	0.0760	0.0646	0.108**	0.105**	0.199	0.0539	0.543**	0.438*	0.360**	0.314***
	(0.181)	(0.189)	(0.0502)	(0.0493)	(0.281)	(0.281)	(0.232)	(0.224)	(0.140)	(0.106)
Constant	68.93	73.72*	-29.11***	-31.68***	-55.71***	-60.63***	-28.30***	-32.39***	-23.50***	-19.63***
	(40.95)	(39.03)	(8.590)	(8.626)	(9.678)	(9.415)	(7.993)	(7.476)	(4.809)	(3.530)
Observations	300	300	300	300	300	300	300	300	300	300
R-squared	0.132	0.117	-	-	-	-	-	-	-	-
Pseudo R-sq	-	-	-	-	0.210	0.230	0.169	0.189	0.313	0.341
F-stat	8.40***	12.04***	-	-	-	-	-	-	-	-
Chi2 stat	-	-	54.9***	59.99***	-	-	-	-	-	-
Hausman test	19.71***	19.15***								

Source: Authors' Computations using Stata 14.
Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 8.
Regression Results – Indirect Effect

	FE		FGLS		Quantile Regression					
					25th quantile		50th quantile		75th quantile	
VARIABLES	1	2	3	4	5	6	7	8	9	10
IE	-0.762	-0.563	0.150	0.0786	0.736***	0.636***	0.416***	0.379***	0.405***	0.215***
	(0.497)	(0.490)	(0.106)	(0.101)	(0.156)	(0.130)	(0.156)	(0.122)	(0.0798)	(0.0597)
FD1	-0.156**	-	-0.0522	-	0.162*	-	0.0390	-	-0.0533	-
	(0.0600)		(0.0376)		(0.0852)		(0.0853)		(0.0436)	
FD2	-	-0.175**	-	-0.092**	-	0.132	-	0.0233	-	-0.104***
		(0.0565)		(0.0395)		(0.0838)		(0.0793)		(0.0386)
lnGDPP	-0.165	0.212	5.576***	5.498***	8.740***	8.771***	6.658***	6.954***	6.952***	5.166***
	(2.803)	(2.599)	(1.049)	(1.075)	(1.192)	(1.107)	(1.193)	(1.047)	(0.610)	(0.510)
TO	0.0283	0.0151	0.00272	0.00616	-0.0182	-0.0109	-0.0223	-0.0161	-0.00494	0.0171
	(0.0275)	(0.0335)	(0.0114)	(0.0113)	(0.0251)	(0.0256)	(0.0251)	(0.0243)	(0.0128)	(0.0118)
NR	-0.457**	-0.424**	-0.218***	-0.231***	-0.526***	-0.585***	-0.260*	-0.366***	-0.259***	-0.252***
	(0.182)	(0.163)	(0.0750)	(0.0747)	(0.143)	(0.143)	(0.143)	(0.136)	(0.0732)	(0.0660)
FDI	0.0175	0.0102	0.110**	0.105**	0.0644	0.0109	0.402	0.294	0.255**	0.313***
	(0.184)	(0.185)	(0.0503)	(0.0493)	(0.250)	(0.248)	(0.250)	(0.235)	(0.128)	(0.114)
IE*FD1	0.00328	-	-0.00032	-	-0.0058***	-	-0.00346	-	-0.0038***	-
	(0.0025)		(0.001)		(0.00211)		(0.00211)		(0.00108)	
IE*FD2	-	0.00431*	-	0.000833	-	-0.00505***	-	-0.00299	-	-0.00084
		(0.00201)		(0.00105)		(0.00194)		(0.00184)		(0.000895)
Constant	44.99	35.31	-30.72***	-28.67***	-79.05***	-75.98***	-45.56***	-46.79***	-34.16***	-21.92***
	(38.64)	(35.75)	(9.081)	(9.434)	(10.26)	(9.471)	(10.28)	(8.957)	(5.256)	(4.363)
Observations	300	300	300	300	300	300	300	300	300	300
R-squared	0.160	0.158	-	-	-	-	-	-	-	-
Pseudo R-sq	-	-	-	-	0.239	0.254	0.178	0.195	0.331	0.342
F-stat	13.19***	8.82***	-	-	-	-	-	-	-	-
Chi2 stat	-	-	57.63***	59.46***	-	-	-	-	-	-
Hausman test	58.36***	22.8***								

Source: Authors' Computations using Stata 14.
Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

VI. CONCLUDING REMARKS

To address the main problems facing developing countries, sustainable development has been offered as a universal solution. In a bid to encourage sustainable consumption and production, an SDG was assigned to promoting work and sustainable growth through lending supports to labour-intensive sectors and small enterprises. This places the informal sector an important centre stage in issues surrounding sustainability. The financial sector has also been saddled with the responsibilities of providing sustainable finance to help increase investment in cleaner energy alternatives, in order to reduce the negative externalities associated with pollution from existing energy sources widely used in most developing countries. These issues form the bedrock of the motivations for this study, which aims to examine both the direct and indirect impact of informal economy and financial development on sustainable development in countries of the ASEAN bloc. Employing panel data for the 10 countries of this bloc, the study provided evidence for a promoting effect of informal economy and sustainable development and a detrimental effect of financial development on sustainable development. On the other hand, the indirect effects through their interaction produced a negative outcome.

The findings have profound implications. Firstly, the informal economy can serve as a vital tool for promoting sustainable development. Informal economic activities have been part of the contributors to the development process in these countries and many other developing countries in general. Moreover, through the use of subcontracts, by which the labour-intensive stage of formal sector's production is mostly handled by the informal sector, hence, at a given level of government regulation, the informal sector is somehow complementary to the formal business sector. Therefore, any attempt to reduce or increase the informal economic activities has an implication for the formal sector. As a result, integrating informal economic activity into the formal sector can be a viable technique for regulating the informal ones. Secondly, the financial sector in these countries are mainly operating on a formal basis and thus, their facilities are not accessible to informal sector, making it difficult for financial development to complement the informal sector in promoting sustainable development. It is, therefore, pertinent to develop ways through which the financial sector can support the activities of the informal sector through vital financial facilities for them to both bolster sustainable development in the ASEAN bloc.

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