



Regular Article

Interweaving globalisation and growth: A causal exploration across income levels

Irushi Sandanayaka^a, Danushi Rathnayake^a, Dinithi Athalage^a, Piyara Wijesuriya^a,
Ruwan Jayathilaka^{b,*}

^a SLIIT Business School, Sri Lanka Institute of Information Technology, New Kandy Road, Malabe, Sri Lanka

^b Department of Information Management, SLIIT Business School, Sri Lanka Institute of Information Technology, New Kandy Road, Malabe, Sri Lanka

ARTICLE INFO

JEL classification:

F63
F68
O10
O20

Keywords:

Economic growth
Globalisation
Economic globalisation
Social globalisation
Political globalisation

ABSTRACT

Economic growth is a crucial global macroeconomic goal and globalisation is widely regarded as a key driver of growth in today's interconnected world. However, previous studies have largely examined this relationship in a generalised manner, often without allocating equal focus to the multiple dimensions of globalisation. This study explores the causal relationship between economic growth and globalisation—encompassing its economic, social, and political dimensions—across 97 countries grouped by income level. The analysis spans 51 years (1971–2021) and employed the Panel Granger Causality Test. Unlike most existing studies, which primarily focus on global and country-level trends, the current findings disclose a bidirectional relationship between economic growth and globalisation in both high and low-income groups. The results also reveal a growth driven globalisation in the upper-middle-income group, and a globalisation-driven growth in the lower-middle income group. Accordingly, policy recommendations are formulated in alignment with the Sustainable Development Goals (SDGs) set by the United Nations and tailored to income specific contexts to assist stakeholders in drafting effective and personalised strategies. These include promoting sustainable production practices and technology transfers in low-income nations, enhancing policies to support international trade in the lower-middle-income group, investing in human capital development in upper-middle-income nations, and encouraging technological advancements in high-income nations. This study contributes to the empirical literature on the globalisation-growth nexus across income classifications, offering intricate and timely insights spanning a fifty-year timeframe.

1. Introduction

Globalisation, defined as the process of unifying economies, cultures, and governance systems through the metaphorical dissolution of national boundaries, shapes global networks in diverse forms, driven by social, economic, political, and environmental transformations (Ehigiamusoe, 2023; Olorogun, 2024). This holistic concept of global integration comprises three key sub-indices: economic, social, and political globalisation.

The economic dimension encompasses aspects related to international trade (trade in goods and services, tariffs, taxes, trade regulations, treaties, and agreements) and international finance (foreign direct investment, foreign debt, foreign reserves, and international investment

agreements). Social globalisation fosters interpersonal, informational, and cultural integration across continents through migration, tourism, technology-intensive exports, cultural trade, internet access, journalistic independence, and human rights promotion. Similarly, political globalisation is represented by mechanisms such as embassies, international treaties, and intergovernmental organisations that maintain political alliances among governments (Eidgenössische Technische Hochschule Zürich, 2024).

Economic growth, broadly described as the long-term expansion of an economy's productive capacity and measured through a nation's Gross Domestic Product (GDP), is a fundamental objective for all countries from both social and economic perspectives. The relationship between economic growth and globalisation, including their sub-

* Corresponding author. Department of Information Management, SLIIT Business School, Sri Lanka Institute of Information Technology, New Kandy Road, Malabe, Sri Lanka.

E-mail addresses: irushisandanayaka20@gmail.com (I. Sandanayaka), danushirathnayake01@gmail.com (D. Rathnayake), dinithiathalage02@gmail.com (D. Athalage), piyarawijesuriya@gmail.com (P. Wijesuriya), ruwan.j@slit.lk (R. Jayathilaka).

URL: <https://www.sliit.lk/faculty-of-business/staff/ruwan.j> (R. Jayathilaka).

<https://doi.org/10.1016/j.ssaho.2025.101399>

Received 21 December 2024; Received in revised form 27 February 2025; Accepted 28 February 2025

2590-2911/© 2025 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

dimensions, has been extensively explored in prior research, yielding varied and sometimes contradictory findings. Some studies have concluded that global integration fosters economic development (Chang & Lee, 2010; Hasan, 2019), while others have found that either the overall index of globalisation or its sub-dimensions exert no statistically significant effect on growth (Dreher, 2006; Gurgul & Lach, 2014). Additionally, empirical analyses have suggested that globalisation can hinder economic growth if not managed effectively (Stiglitz, 2003). However, in today's world, where economies are increasingly interconnected, understanding the globalisation-growth nexus is crucial for comprehending macroeconomic trends, addressing global challenges, adapting to economic shifts, and making informed policy decisions to drive inclusive growth.

This study covers a 51-year period from 1971 to 2021, selected based on data availability. This extended timeframe enables the examination of long-term trends, the evolutionary nature of globalisation and growth, and the influence of historical global events. The analysis spans 97 nations classified into four income groups by the World Bank. These income groups exhibit distinct socioeconomic structures, economic advancement potential, and varying capacities to respond to globalisation. As a result, the effects of global integration are often uneven across different sectors. By focusing on country income classifications, the study aims to understand how globalisation and its facets influence economic growth in each group, ultimately informing strategies tailored to different income levels to ensure a globalisation-inclusive path towards sustainable development. The study is structured around the following objectives.

1. To determine the causal direction between economic growth and globalisation for the country income groups.
2. To determine the causal direction between economic growth and economic globalisation for the country income groups.
3. To determine the causal direction between economic growth and social globalisation for the country income groups.
4. To determine the causal direction between economic growth and political globalisation for the country income groups.

The Konjunkturforschungsstelle (KOF) Globalisation Index (Dreher, 2006) developed and maintained by the KOF Swiss Economic Institute, is used to effectively analyse the globalisation-growth nexus. This index provides a comprehensive measure of global integration, encompassing economic, social, and political dimensions, making it well-suited for this study. The index is widely utilised in both early and recent literature (Abubakar, 2024; Ehigiamusoe, 2023; Law et al., 2015), enhancing the reliability of the results.

This study seeks to contribute to the existing body of literature in the following ways. Firstly, the study categorises countries into four income groups—high, upper-middle, lower-middle, and low-income as per the World Bank's annual classification, based on the Gross National Income (GNI) per capita recorded by an economy. During the year of the analysis (2024), economies which had recorded a GNI per capita of \$1135 or less in 2022 comprised the low-income group; those which had recorded a GNI per capita between \$1136 and \$4465 in 2022 comprised the lower-middle group; countries with a GNI per capita between \$4466 and \$13,845 in 2022 constituted the upper-middle income group; while nations recording a GNI per capita higher than \$13,845 in 2022 were considered as the high-income sect (World Bank Group, 2025). A significant gap exists in the literature regarding the globalisation-growth relationship in lower-middle and low-income countries. This study aims to bridge this gap by providing a comprehensive income-specific analysis.

Secondly, it was observed how prior studies have focused solely on overall and economic globalisation, often overlooking social and political dimensions. This research, therefore, examines the globalisation-growth nexus in the identified income groups by incorporating all three dimensions—economic, social, and political—ensuring a

multidimensional perspective.

Thirdly, study employs Panel Granger causality analysis to investigate the causal directions within the globalisation-growth relationship. While this methodology is widely used to identify directional relationships, it has been underutilised in the context of country income classifications. By analysing 97 countries over 51 years and considering multiple globalisation dimensions, this study applies the methodology in a novel way, generating a unique dataset and new findings.

Finally, by identifying the causal relationships between overall, economic, social, and political globalisation and income-specific economic growth, the study provides valuable insights for policymakers. By aligning with the United Nations' Sustainable Development Goals (SDGs), these findings can inform tailored policy actions for the income groups considered. Policy recommendations thus identified specifically cater to SDG 1: No Poverty, SDG 4: Quality Education, SDG 5: Gender Equality, SDG 7: Affordable and Clean Energy, SDG 8: Decent Work and Economic Growth, SDG 9: Industry, Innovation, and Infrastructure, SDG 10: Reduced Inequalities, SDG 12: Responsible Consumption and Production, SDG 13: Climate Action, SDG 14: Life Below Water, SDG 15: Life on Land, SDG 16: Peace, Justice and Strong Institutions, and SDG 17: Partnerships for the Goals.

This research aims to advance the understanding of globalisation's role in economic growth, contributing both theoretical and practical insights for policymakers, researchers, and international organisations.

2. Theoretical foundations and literature review

This section contextualises the foundational theories linking globalisation and economic growth, exploring their interrelationships across economic, social, and political dimensions within each country income group classification. A review of the existing literature provides the basis for this discussion.

2.1. Review of theoretical Foundations

The relationship between global integration and economic growth has been explained through a limited number of theoretical perspectives. Modernisation theory highlights how market practices, technological transfers, and diplomatic engagements, predominantly disseminated by Western nations, drive the transformation of traditional societies into modern economies, reducing disparities between nations (Rostow, 1991). This perspective implies that global integration—through economic (trade openness), social (technological exchange), and political (governance structures) channels—facilitates economic advancement and development.

Dependency theory, in contrast, emphasises the importance of external relationships in shaping a nation's growth and development. Unlike modernisation theory, it argues that disproportionate economic exchanges between developed and developing economies create dependence, with poorer nations relying on wealthier ones for growth (Maizels et al., 1998). This suggests that globalisation stimulates economic growth primarily in high-income countries, whereas its influence on low-income nations remains limited.

Neoliberalism theory advocating for fiscal discipline, trade liberalisation, and privatisation (Pigou, 1944), regards globalisation as a driver of economic efficiency and growth. However, its impact is viewed as context-specific, varying with national dynamics and capacities, and is often associated with rising economic and social inequalities between nations. Accordingly, the nexus between globalisation and economic growth is diverse and highly dependent on context.

2.2. Critical literature review

To identify relevant literature, renowned academic databases such as Science Direct, Springer Nature, Wiley Online, Taylor & Francis, and Google Scholar were searched using fundamental terms related to the

study. Titles and abstracts of research articles were reviewed, leading to the selection of 65 full-length papers for inclusion in this study. The literature search strategy is illustrated in Fig. 1.

2.2.1. Global integration and economic growth in an overall global context

Global integration has transcended geographical boundaries, impacting economies regardless of their performance levels. Analyses conducted at a global level (Acheampong et al., 2021; Burhan et al., 2015; Lee et al., 2017) examine how globalisation influences economic growth across all income groups.

Empirical evidence suggests that globalisation serves as a catalyst for economic growth, particularly in economies with lower performance levels (Lee et al., 2017). Economic, social, and political globalisation collectively foster economic expansion, while economic restrictions, such as trade barriers, inhibit growth (Burhan et al., 2015). Globalisation has been shown to have a statistically significant impact on economic growth in Sub-Saharan Africa (Abubakar, 2024), though its influence follows a non-linear trajectory—positively affecting growth up to a threshold before diminishing (Zahonogo, 2018).

Economic globalisation is widely recognised as a driver of economic expansion (Coulbaly et al., 2018; Gurgul & Lach, 2014; Marques et al., 2017). Financial integration, a key component of economic globalisation, enhances growth by increasing financial development and foreign direct investment (Gaies et al., 2020; Gomes Neto & Veiga, 2013; Nguea et al., 2024; Ze et al., 2023), while debt accumulation negatively impacts

economic progress (Gaies et al., 2019).

Furthermore, financial sector development catalyses economic growth rates (Anwar & Cooray, 2012; Bekaert et al., 2011; Falahaty & Law, 2012; Kandil et al., 2015). Financial development, foreign direct investments, and exports, constituents of financial globalisation, were discerned to influence economic growth in the Sub-Saharan African region despite the country's income classification (Olorogun, 2024). The banking sector, which is a part of financial integration, tends to have a significant impact on the economic growth in BRICS and MINT nations (Muye & Muye, 2017). At the same time, it denotes economic growth in thriving and emerging economies (Ghosh, 2017).

Trade, another critical aspect of economic integration, positively influences economic growth (Dumrongritikul et al., 2019; Pea-Asounga et al., 2025). Trade and global integration are also key drivers of the transition to green technologies and sustainable economic development (Qamaruzzaman, 2025). Meanwhile, social globalisation promotes economic growth in emerging economies by fostering information exchange and technological innovation (Acheampong et al., 2021; Gurgul & Lach, 2014). The integration of artificial intelligence into economic activities, driven by social globalisation, has been linked to sustainable development (Wang, Zhang, & Li, 2024), thus moulding global economic landscapes. Furthermore, amplified degrees of trade globalisation and cutting-edge technologies were identified giving rise to environmental benefits, thus ensuring global eco-friendly economic prosperity (Wang, Li, & Li, 2024; 2025). Regarding Central and Eastern

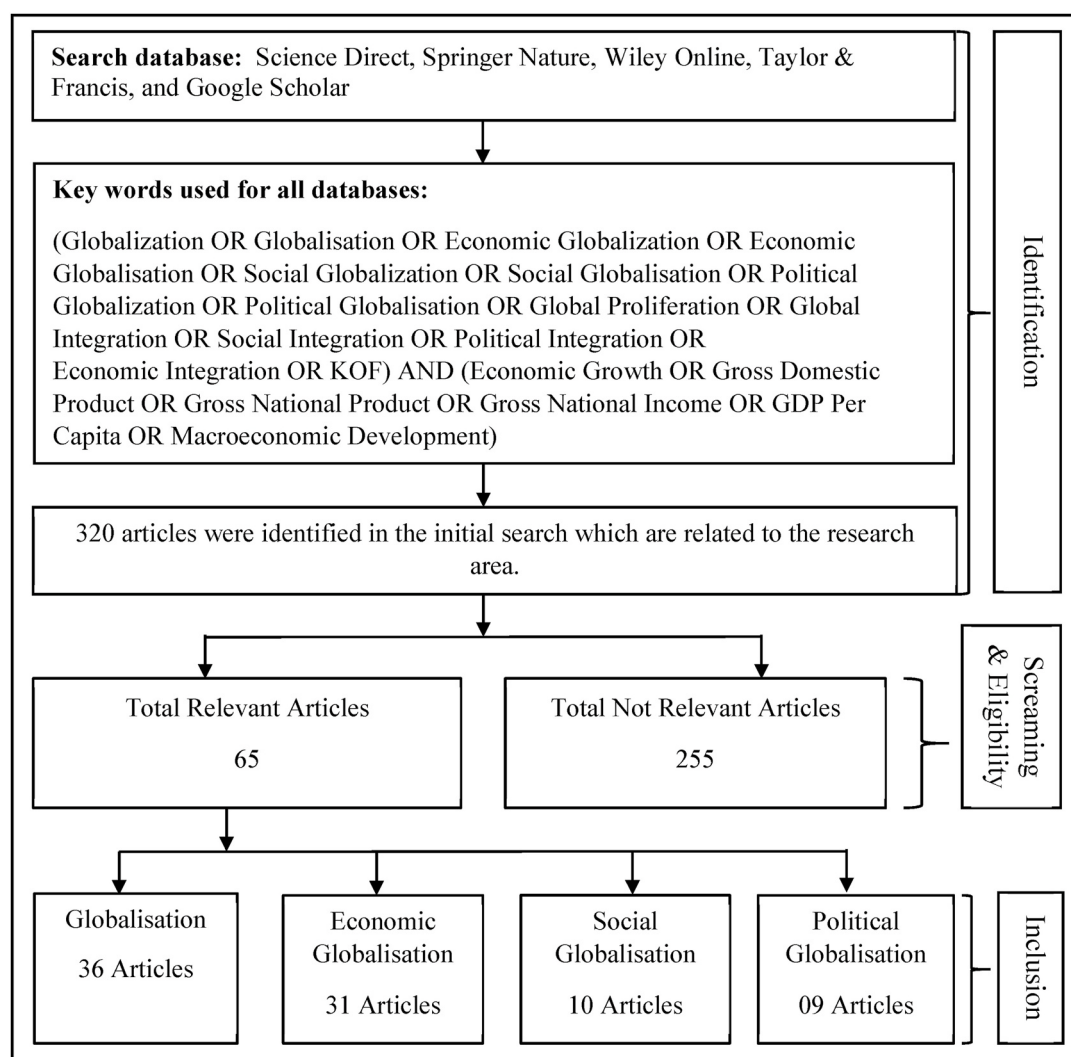


Fig. 1. Literature search strategy Source: Authors' illustration.

European nations, political globalisation exerts no statistically significant impact at a 5% significance level (Gurgul & Lach, 2014). However, in some selective East Asian countries belonging to the high and upper-middle income categories, a detrimental impact is shown by political integration on economic growth in short run. In contrast, a positive impact is shown in the long-term (Xie & Jin, 2023). Accordingly, most of the literature have established globalisation and its three sub-dimensions along with their respective building blocks, act as encouragers of economic growth in the global context.

In contradiction to this, the impact of globalisation is exerted on economic growth rates in economies with better performance levels (Lee et al., 2017). Moreover, economic and political globalisation hinders growth rates in emerging economies worldwide (Acheampong et al., 2021). With governmental corruption, financial factions of economic globalisation tend to demote economic growth at a global level (Kunieda et al., 2014). Thus, it can be deduced how the positive influence exercised by globalisation had taken a pessimistic turn subjected to the performance level and certain administrative circumstances in certain economies.

Counter to the ideas presented above, a bi-directional relationship between globalisation and economic growth was discovered in a study done on BRICS nations (Latif et al., 2018). In contrast, a bi-directional relationship between foreign direct investments, which is a constituent of economic globalisation and economic growth, was revealed in a study done at a global level (Iamsiraroj, 2016). Furthermore, bi-directional relationships between overall worldwide integration and economic expansion have been identified in Bangladesh, Egypt, Indonesia, Iran, South Korea, Mexico, Nigeria, and Philippines. In contrast, one-way causal flows were found in Pakistan and Turkey in a study done on N-11 countries (Fachrurrozi et al., 2022). Accordingly, while bidirectional causal flows about the overall and the economic aspects of globalisation have been identified in the global context, a significant gap in the literature exploring the two-way interrelations between economic growth and the social and political facets of international integration is highly observed.

2.2.2. Global integration and economic growth in the high-income category

Globalisation has played a significant role in shaping high-income economies, prompting multiple researchers to examine its impact (Carp, 2014; Elfaki & Ahmed, 2024; Meng et al., 2022). Studies generally indicate that globalisation has a positive influence on economic growth in high-income nations (Ahmad et al., 2021; Balsalobre-Lorente et al., 2021; Khan et al., 2023; Law et al., 2015; Nasreen et al., 2020; Yang et al., 2021). Economic globalisation, in particular, has been found to enhance financial sector development, foreign direct investment, and trade liberalisation, all of which contribute to economic expansion (Uddin & Azam Khan, 2023). Globalisation tends to present indirect impacts on economic expansion when studied with environmental variables like carbon emissions and renewable energy in the European Union (Girlovan et al., 2025). With an increment in the globalisation indices, the growth rates tend to get elevated in high-income economies (Elfaki & Ahmed, 2024), whereas, in the long term, economic globalisation exerts a positive impact on growth rates in high-income nations (Alariqi et al., 2023). Financial integration, which is a constituent of economic globalisation, tends to promote the growth of the financial system of high-income countries. Since the monetary system of a nation is a mandatory element found in the economy of a country; it can be concluded that there is a growth impact of financial globalisation on economic growth rates. Similarly, foreign direct investments which is a subcomponent of financial globalisation, were found to positively induce economic development in the G7 economies (high-income nations) both during the short and the long runs (Wani et al., 2024). Trade globalisation included within economic integration was observed facilitating eco-conscious economic growth in high-income nations much smoothly, in comparison to their global counterparts (Wang, Zhang, et al., 2024). Accordingly, the overall contribution exercised by the

comprehensive dimension of globalisation and its economic element on the economic development in high-income nations can be discerned as optimistic.

However, on the contrary, concerning economies in the high - income category, there is a negative impact of economic integration on economic growth rates in the short run (Alariqi et al., 2023). Similarly, economic globalisation demotes economic growth in crisis, uncertainties and imbalances (Carp, 2014). Therefore, the effect of economic globalisation on the economic growth in this segment of countries can be understood to be taking a negative approach subjective to the economic duration considered and the unfavourable circumstances countered.

Studies conducted to examine the two - way direction relationships between globalisation and economic growth have generated findings supporting the argument of globalisation acting as a promoter of economic growth in high - income nations (Usman et al., 2022). Moreover, overall globalisation, along with economic and social integrations tends to have a significant impact on economic growth (Chang & Lee, 2010). Furthermore, a study that investigated the multidirectional causal implications of globalisation and economic growth revealed findings on a significant impact exerted by globalisation on private investments, which can indirectly stimulate economic growth rates in high - income economies (Abid & Alotaibi, 2020). However, limited research has investigated the link between political integration and economic growth in this income group.

2.2.3. Global integration and economic growth in the upper middle-income category

Some studies have investigated the impact of globalisation on economic growth in upper-middle-income nations (Guan et al., 2020; Radulović & Kostić, 2024), resulting in diverse findings to support policy makers. While the consolidated globalisation index was discerned to have a positive contribution to the economic growth of upper-middle-income nations (Khan et al., 2023; Uddin & Azam Khan, 2023), the three dimensions of globalisation (economic, social and political) were also identified to have a positive overall impact on the same (Chang et al., 2013). An increment in the overall globalisation index leads to an elevation in financial development which is a constituent of economic growth rates (Guan et al., 2020). An optimistic impact of economic and political integrations is exerted on growth rates in the short term. Similarly, social integration promotes growth rates in the long run with regards to the upper-middle-income economies (Radulović & Kostić, 2024). The political aspect of globalisation tends to have a detrimental impact on economic development in the long term in upper middle-income countries (Radulović & Kostić, 2024). Hence, the dynamics in the long and short terms differ with regard to the effect exerted by the three dimensions of globalisation on economic expansion.

A significant influence of global integration on economic growth was discovered by many studies investigating the impact of globalisation on a multitude of other macroeconomic and environmental variables (Akadiri et al., 2019; Dhingra, 2023; Juan et al., 2021; Wu et al., 2022). Economic integration was observed expediting the rate of economic proliferation in South America; an upper-middle income nation (Tillaguango et al., 2024). Furthermore, a significant effect of the social dimension of globalisation and financial development, which is a constituent of economic integration, is shown on the economic growth rates of Malaysia (Raihan et al., 2024). Similarly, financial globalisation was also found to alleviate macroeconomic deviations while promoting the efficiency of capital management in Kazakhstan; another nation of the upper-middle income sect (Beisenbayeva et al., 2024). Trade liberalisation included within the economic facet of integration was also found facilitating economic development in China through means of financial, labour force and technological advancement (Wen & Zhou, 2025). Artificial intelligence, a technological dimension comprised in the informational globalisation of the social dimension was found to enhance effectiveness of China's primary sector industries (Wang, Sun,

& Li, 2025). However, an absence of a significant influence of social and economic integrations on economic growth rates was discovered in a study surrounding upper - middle-income economies in the short and long term, respectively (Radulović & Kostić, 2024). Accordingly, globalisation and its subdimensions depict fluctuations in the significance of the impact that they exert on economic growth with variations in time.

Some studies were conducted to investigate the causal relationship between globalisation and economic growth in upper-middle-income economies (Cengiz & Manga, 2023; Sunde, 2017). A positive causal impact of economic globalisation on employment in industries, a constituent of economic growth, discovered from a study which investigate the bi-directional relationship in upper-middle-income countries (Cengiz & Manga, 2023). Furthermore, by investigating causal relationships in South Africa, it was found that there is a bi-directional causal relationship between exports, which is a faction of trade globalisation falling under economic integration and economic growth (Sunde, 2017). However, a hindrance in studies which purely examined the bi-directional causal relationships between globalisation, its sub-dimensions and economic growth was discovered about the upper-middle income nations.

2.2.4. Global integration and economic growth in lower middle-income category

Global integration has transcended into economies and has influenced the expansion and development of it. The impact of globalisation on economic growth rates in lower - middle-income economies has been studied by many researchers (Shahbaz et al., 2018; Tariq et al., 2023). Globalisation indices act as catalysts for economic growth and expansion, exerting an optimistic impact on the growth rates in economies belonging to the lower middle-income category (Glennice Fosah et al., 2023; Shahbaz et al., 2016; Uddin & Azam Khan, 2023). Hence, an increase in overall globalisation drags the economic growth rates to higher levels.

On the contrary, a negative impact of economic globalisation exerted on economic development was identified in both the short and long run (Baidoo et al., 2023), whereas, a detrimental impact of all dimensions of globalisation (economic, social and political) is exerted on the effect which, is a constituent of economic growth pertaining to the lower middle-income nations (Shahbaz et al., 2018). Accordingly, it can be deduced about, a significant impact of globalisation and its sub-dimensions are exerted on economic growth rates in lower-middle income countries, with its nature of influence diversified by the period and the impact received by the different aspects of economic growth.

Furthermore, a significant impact of global integration on economic growth was also identified and revealed in findings about a study conducted evaluating multiple variables (Tariq et al., 2023). Inverse to the above argument, economic growth tends to have an impact on globalisation. The growth rates act as a stimulator for global integration (Nathaniel et al., 2024). Moreover, findings of a study that evaluated the bi-directional relationship between economic growth and economic globalisation reveal that there is a one-way causal effect of economic growth on economic integration (Baidoo et al., 2023). However, there is yet a significant literature gap in studies that have identified the impact of economic growth on globalisation in the lower-middle-income economies.

2.2.5. Global integration and economic growth in the low-income category

With global integration proving itself as a phenomenon capable of transfiguring economic domains, its influence on the economic proliferation of the low-income sector endeavouring to harmonise with the other nations domineering growth has become a focal concern. While the overall dimension of global integration was identified to influence the economic proliferation in low-income nations positively (Ehigiamusoe, 2023; Uddin & Azam Khan, 2023). The nexus between the three subindices of globalisation with economic growth had been previously studied about the low-income group of world nations to

reveal pessimistic effects exerted from the economic and social dimensions and optimistic effects from the political dimension on economic growth (Rao & Vadlamannati, 2011). Being a sect of nations with insufficient infrastructural capabilities, it was also identified how these economies should endeavour in amplifying their levels of trade integration, to accomplish green economic growth (Wang, Zhang, et al., 2024). Empirical evidence from Nigeria related to trade globalisation identifies exports as positively influencing and imports exerting a contradicting influence on its growth dynamics (Gimba et al., 2025). Furthermore, the economic dimension of globalisation and economic growth was proved to have a bi-directional causal relationship, while social and political dimensions exert a positive unidirectional impact on economic growth (Ehigiamusoe, 2023). However, the scarcity of past studies centred on the nexus between globalisation and economic about low-income countries hint at how underexplored the scenario is.

Accordingly, the above literature review can be evaluated outline to the following variations in the growth-globalisation dynamics in each income-specific context. It can be noted as to this nexus specific to high-income groups have taken a positive form, with integration and growth rates encouraging each other. This positive influence of globalisation on growth is mirrored by upper-middle income nations, except for the mixed causalities extended by the political facet of globalisation. In contrast, in the lower-middle income group the globalisation-growth nexus pertaining to the subdimensions of globalisation has taken a negative form. Unlike upper-middle income nations who have mirrored the globalisation-growth link of their high-income counterparts, the dynamic has shifted in the low-income sect when compared with their lower-middle counterparts to show mixed influences from the dimensions of globalisation.

2.3. Observed gap in literature

The 65 past studies discussed in the literature review have been published between the years 2010 and 2014. Demonstrated in Fig. 2 are the yearly count of published research articles discussing the nexus between economic growth and globalisation in relation to the specific income context. It is observable as to how the least number of articles had been published regarding the lower-middle and low-income classifications during the 14 years, signifying how underexplored these categories are when compared to the other income categories. Hence, as established in the rationale, it is the aim of the study to contribute to the bridging of the gap by focusing on all income groups to result in the income-specific nature of the globalisation-growth nexus in a holistic manner.

A comprehensive summary of the reviewed studies, including methodologies, data sources, and findings, is presented in S1 Appendix.

3. Data and methodology

This section provides a comprehensive overview of the research approach adopted in this study, detailing the data sources and statistical methodology used for analysis.

3.1. Data

This study utilises a dataset spanning the period from 1971 to 2021 for 97 countries. The selection of the time period and the number of countries included in the study is based on the availability and accessibility of data for all variables over a common time duration. Countries with missing values for any of the considered variables were excluded from the analysis. As presented in Table 1, data on globalisation (economic, social, and political) were sourced from the KOF Swiss Economic Institute, while economic growth data were obtained from the World Bank. GDP per capita (current US\$) is used as the measure of economic growth, as it serves as a key macroeconomic indicator reflecting a nation's economic performance. The KOF Globalisation Indices, which

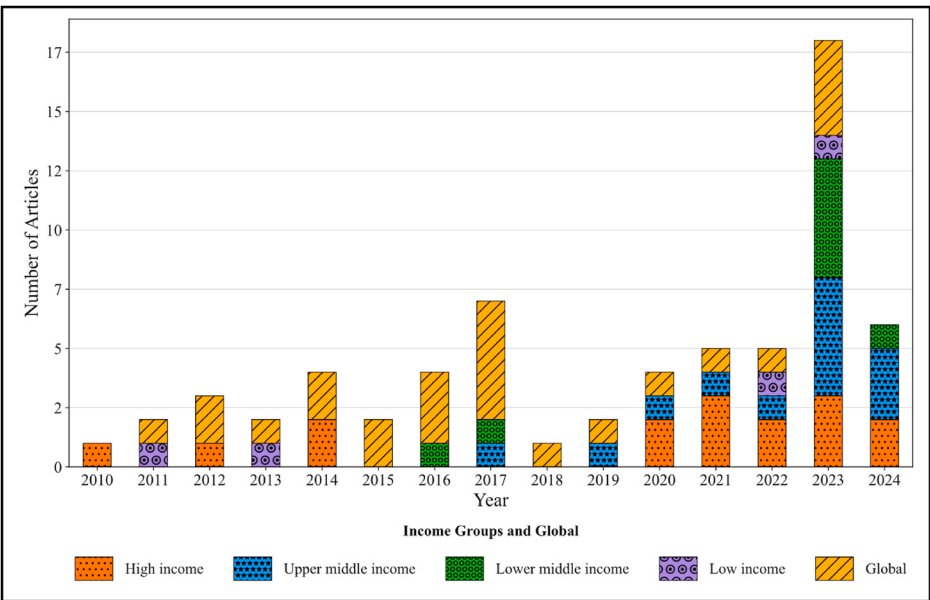


Fig. 2. Year-by-year article count and the covered contexts.

Table 1
Variables' data sources.

Variable	Acronym	Unit of Measure	Source
Economic Growth	GDP	GDP Per Capita (Current US\$)	World Bank (2022) https://data.worldbank.org/indicator/NY.GDP.PCAP.CD
Globalisation	GLO	KOFGI (1–100)	KOF Swiss Economic Institute (2022) https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html
Economic Globalisation	EGLO	KOFecGI (1–100)	KOF Swiss Economic Institute (2022) https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html
Social Globalisation	SGLO	KOFSoGI (1–100)	KOF Swiss Economic Institute (2022) https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html
Political Globalisation	PGLO	KOFPoGI (1–100)	KOF Swiss Economic Institute (2022) https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html

Source: Authors' compilation.

comprehensively capture the economic, social, and political dimensions of globalisation, were employed due to their robustness in incorporating a weighted combination of relevant factors.

3.2. Methodology

This study evaluates the causal relationships between globalisation and economic growth using the Panel Granger Causality test (Granger, 1969), widely applied in similar research contexts (Cengiz & Manga, 2023; Elfaki & Ahmed, 2024; Nathaniel et al., 2024; Shahbaz et al., 2018; Xie & Jin, 2023). The method is also extensively used in other disciplines such as engineering, physics (Kornilov et al., 2020; Yao et al., 2016), biology and medicine (Bassani et al., 2012; Furqan & Siyal, 2016), tourism (Wijesekara et al., 2022), telecommunications (Dutta, 2001; Pradhan et al., 2016; Pradhan et al., 2014), climate science

(Dissanayake et al., 2023; Jiang et al., 2015; Triacca, 2001), and political science (Cai et al., 2023; Groshek, 2011). The Panel Granger Causality test examines the causal relationships between the panel variables with a high level of accuracy, enhancing the predictability of variable interactions (Jayawardhana et al., 2024). The test requires the fulfilment of two key preconditions: stationarity and stability of the time series data.

Levin-Lin-Chu unit root test

To test for stationarity, the Levin-Lin-Chu (LLC) unit root test (Levin et al., 2002) was used. Among various unit root tests, LLC was chosen due to its suitability for assessing unit roots across multiple entities (panel data) over an extended period. It has been widely deployed in social sciences research, including studies in macroeconomics (Falahaty & Law, 2012; Kandil et al., 2015).

$$\Delta y_{i,t} = \theta_{0i} + \rho y_{i,t-1} + \sum_{j=1}^{p_i} \theta_{1i} \Delta y_{i,t-j} + \varepsilon_{i,t} \tag{1}$$

Equation (1) delineates the equation utilised for LLC unit root test. Accordingly, the intercept of the equation is symbolised by θ_{0i} while ρ and p_i depict the auto-regressive coefficient and the order of the lags respectively. $\varepsilon_{i,t}$ denotes the error term of the test. The null and alternative hypotheses constructed for the determination of stationarity in the panel, Null Hypothesis: The panel consist of unit roots (non-stationary)

$$H_0 : \rho = 0$$

Alternative Hypothesis: The panel does not contain unit roots (stationary)

$$H_1 : \rho < 0$$

At the acceptance of the null hypothesis at 1% significance level, some variables are differenced which is denoted by the letter “D” in front of the variable acronym, varying with the income categories and the same test was carried out until the null hypothesis was rejected at 1% significance level.

Panel Vector Autoregression model

The Panel Vector Autoregression model (PVAR) was employed to assess dataset stability and determine the optimal lag length for the analysis. PVAR integrates the Vector Autoregression (VAR) model with

panel data, treating all variables as endogenous at a panel level (Love & Zicchino, 2006). This model is extensively used in econometrics, particularly in macroeconomic studies (Falahaty & Law, 2012; Kandil et al., 2015).

$$W_{it} = \gamma_0 + \gamma_1 W_{i,t-1} + f_i + \varepsilon_{it} \quad (2)$$

Equation (2) denotes the PVAR equation used to determine the stability of the variables in this study. The vector consisting of the endogenous variables is depicted by W and f denotes the fixed effect variable. i and t symbolize the income group specific nations and the years respectively. The optimal lag length to be utilised for the Panel Granger Causality analysis have been determined by selecting the minimum lag number from the lag selection criteria Moment selection Bayesian Information Criterion (MBIC) (Akaike, 1983; Rissanen, 1978; Schwarz, 1978), Moment selection Akaike Information Criterion (MAIC) (Akaike, 1969), and the Moment selection and Hannan and Quinn Information Criterion (MQIC) (Hannan & Quinn, 1979). Furthermore, a robustness check was conducted using alternative lag lengths to validate the results.

Panel Granger Causality Test

Upon ensuring stationarity and stability, Equation (3) was used to assess Granger causal relationships.

$$GLO_{i,t} = \sum_{k=1}^{\rho} \beta_i GLO_{i,t-k} + \sum_{k=0}^{\rho} \theta_k GDP_{i,t-k} + \varepsilon_{i,t} \quad (3)$$

GLO and GDP act as the dependent and independent variables,

respectively. The i symbolises the income categories (low, lower-middle, upper-middle and high) and t represents the period in years from 1971 to 2021. The frequency of lags and number of lags are depicted by k and ρ respectively. The regression coefficient of the equation is shown by β and θ represents the constant values of regression where the frequency of lags may differ from 1 to N (population size). ε demonstrates the magnitude of the error. The causal progressions between the globalisation, its sub-dimensions and economic growth were analysed in order to experiment the research objectives of unveiling the direction of causality between the globalisation indices and economic growth.

Panel Granger Causality test was deployed in this study to accurately evaluate the impact of the variables on each other. This approach is highly favoured by researchers in exploring bidirectional causal flows between variables of a time series dataset owing to its capability in providing accurate forecasts for the response variable (Jayawardhana et al., 2024). The nexus between economic growth and globalisation dynamics; trade openness, technological transfers and governance structures proxied for economic, social and political dimensions respectively under the Modernisation theory, could be accurately evaluated using this methodology to identify supporting or contrasting findings to the theory. Furthermore, this methodology precisely investigates the causal flows between globalisation and economic growth across income groups to evaluate the dynamics between income categories satisfying the Dependency theory. In the context of Neoliberalism theory, the impact of socio-economic aspects of globalisation on economic growth and vice versa could be efficiently evaluated using the Panel Granger Causality test. The steps followed by the study in the data

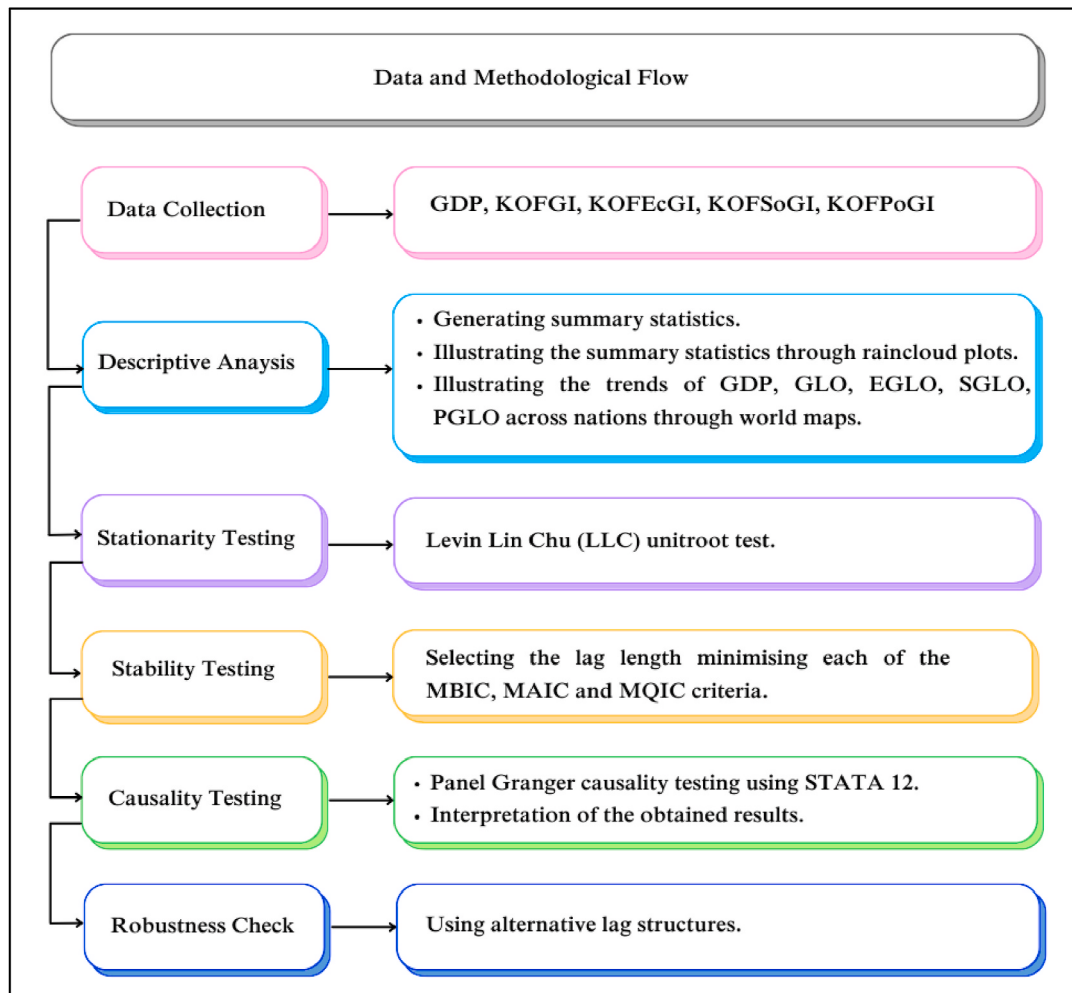


Fig. 3. Data methodology flow diagram.

analysis is portrayed in Fig. 3.

4. Results

This section presents the findings derived from the descriptive analysis and the Panel Granger causality analyses conducted on the variables.

4.1. Descriptive analysis

Fig. 4 summarises the statistical distribution of the variables presented in S3 Appendix using raincloud plots. This hybrid visualisation combines a split violin plot (the cloud), a box plot (embedded within the cloud), and a strip plot (the rain).

The half-violin plots generated vary in shape and spread across the variables considered (GDP, GLO, EGLO, SGLO, and PGLO) and the respective income group classifications. In low-income countries, GLO demonstrates a greater distribution towards the left, indicating that most nations in this category rank lower on the globalisation index. A similar pattern is observed for SGLO and PGLO, whereas EGLO exhibits a more evenly distributed spread.

In lower-middle-income countries, the distributions of GLO and PGLO appear fairly dispersed across the scale, while EGLO and SGLO values are concentrated towards the right (higher values) and the left (lower values), respectively.

In upper-middle-income countries, GLO and PGLO exhibit broader distributions at both the right and left extremes. Meanwhile, EGLO

peaks at higher values, whereas SGLO tends towards the lower end.

In high-income nations, the distribution of all variables shows greater density towards the right, indicating higher GLO, EGLO, SGLO, and PGLO values. While GDP values in low, lower-middle, and upper-middle-income groups are concentrated around lower values, the distribution for high-income nations is more widespread.

Similar patterns are reflected in the strip plots, which further illustrate the variations in variable distributions across income classifications. The box plots associated with the cloud plots for GDP values across all income groups suggest that the distribution is positively skewed. In high-income countries, GLO follows a normal distribution, whereas in all other income groups, it is right-skewed.

Similarly, SGLO is right skewed across all income groups. EGLO, on the other hand, appears to be normally distributed across all categories except for lower-middle-income countries, where it is left-skewed. In contrast, PGLO is negatively skewed in high-income countries but exhibits positive skewness in low-income countries.

The GDP values recorded by the countries in this study for the years 1971 and 2021 are visually represented in Fig. 5A and B, as part of Fig. 5. While all nations have experienced significant economic growth, as reflected in GDP, the countries that have shown the least growth over this period are marked on the maps below.

Accordingly, while Rwanda and Mali, which had performed the worst in this context within the low-income group in 1971, were replaced by the Syrian Arab Republic and the Central African Republic in 2021, Burundi remained in this category across both years. In the lower-middle-income group, Zambia and Pakistan entered this segment

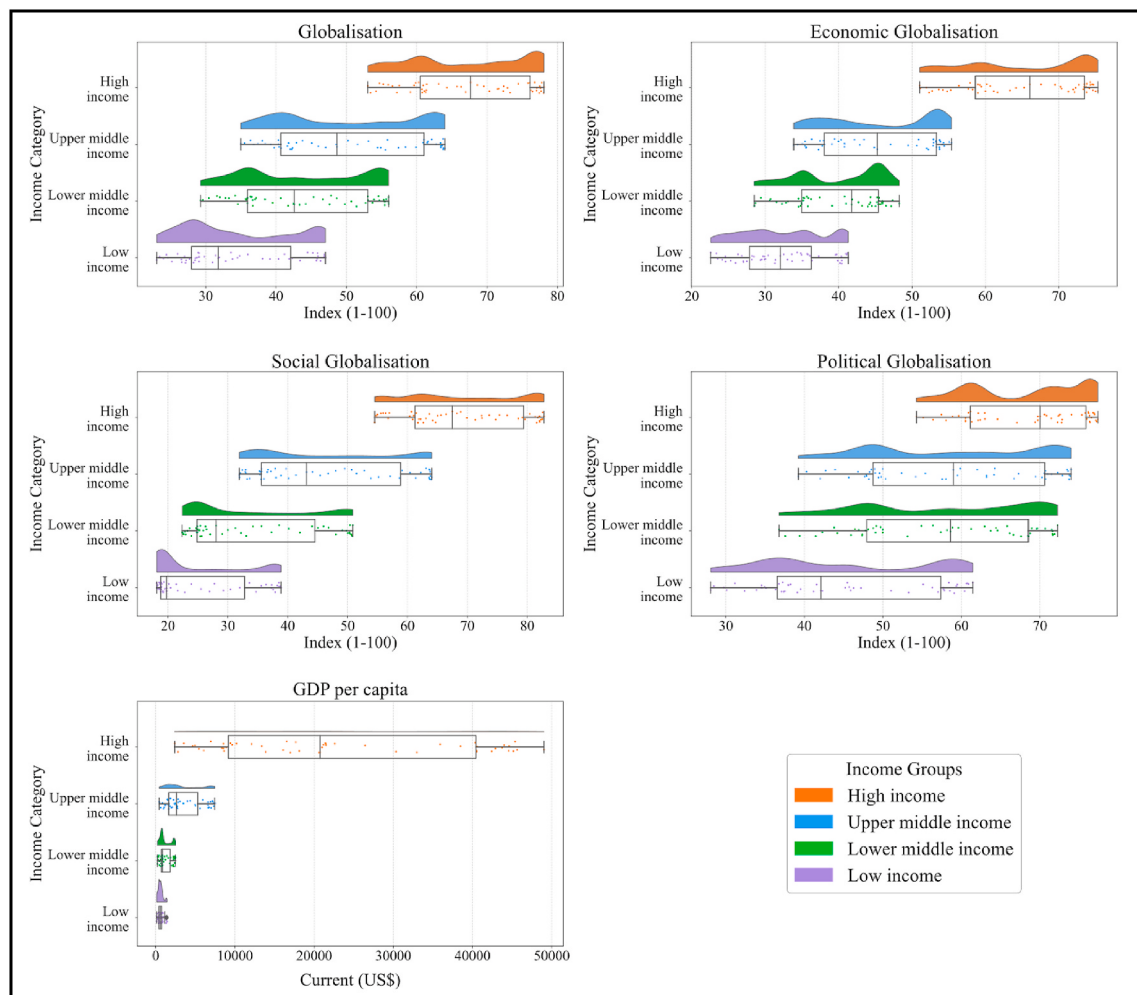


Fig. 4. Raincloud plots visualising the distribution patterns of globalisation and economic growth variables across the income groups.

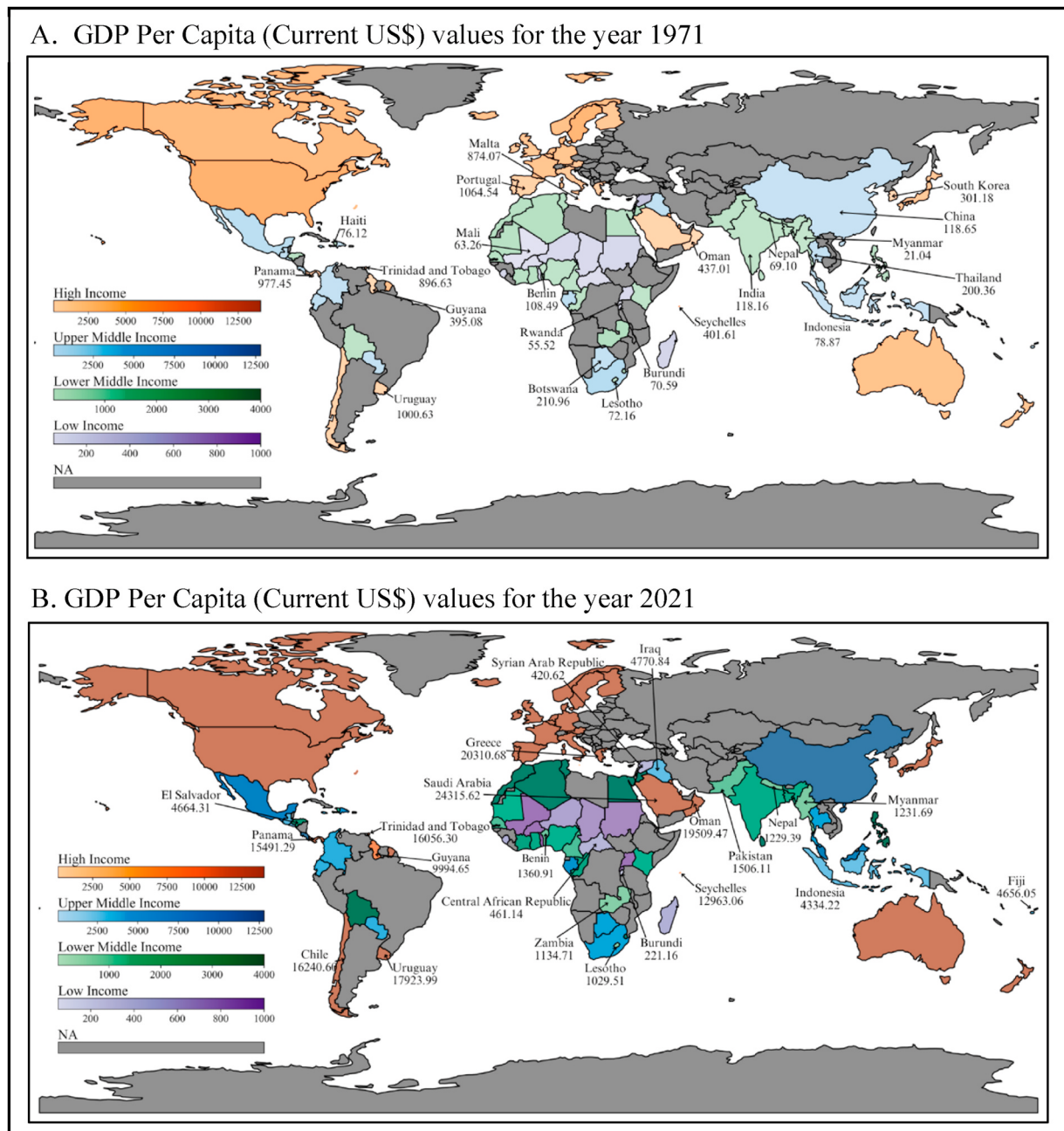


Fig. 5. A comparative visualisation of economic growth trends across global nations.

in 2021, replacing Haiti and India, while the remaining four countries remained unchanged within this quartile.

By 2021, China, Thailand, and Botswana had significantly improved their economic growth rates, moving out of the lowest quartile within the upper-middle-income group, whereas Indonesia maintained its position in this category across both years. Among high-income nations, Chile, Greece, and Saudi Arabia replaced South Korea, Malta, and Portugal in the lowest quartile by the final year of analysis, while the other high-income countries remained unchanged in this least-performing segment across both years. The transformation trends experienced by nations in the low-, lower-middle-, upper-middle-, and high-income groups between 1971 and 2021, the starting and ending years of the 51-year study period, are illustrated in Figs. 6–9 for GLO, EGLO, SGLO, and PGLO.

Following the analysis, it was observed that all nations exhibited growth momentum; however, those with the least progress over the two

years have been highlighted in each map.

While Burundi and Niger remained among the low-income countries that recorded the lowest GLO growth in both years, Niger was replaced by the Central African Republic in this category in 2021. In the lower-middle-income group, Eswatini, Lesotho, and Cameroon were identified as the nations with the least growth in GLO in 2021. Meanwhile, Bangladesh, Benin, and Mauritania, which were in this category in 1971, improved their positions, while Nepal, Haiti, and Myanmar remained unchanged. Among high-income countries, seven nations remained in the lowest GLO growth category. However, Bermuda and Hong Kong entered this category in 2021, replacing South Korea and Qatar, which had been in this segment in 1971. In contrast, the upper-middle-income group underwent a complete transformation, with an entirely new set of nations in this category in 2021, compared to those in 1971.

When analysing economic globalisation, the lowest performance in 1971 was recorded by Nepal, Niger, India, Bangladesh, and Sudan. By

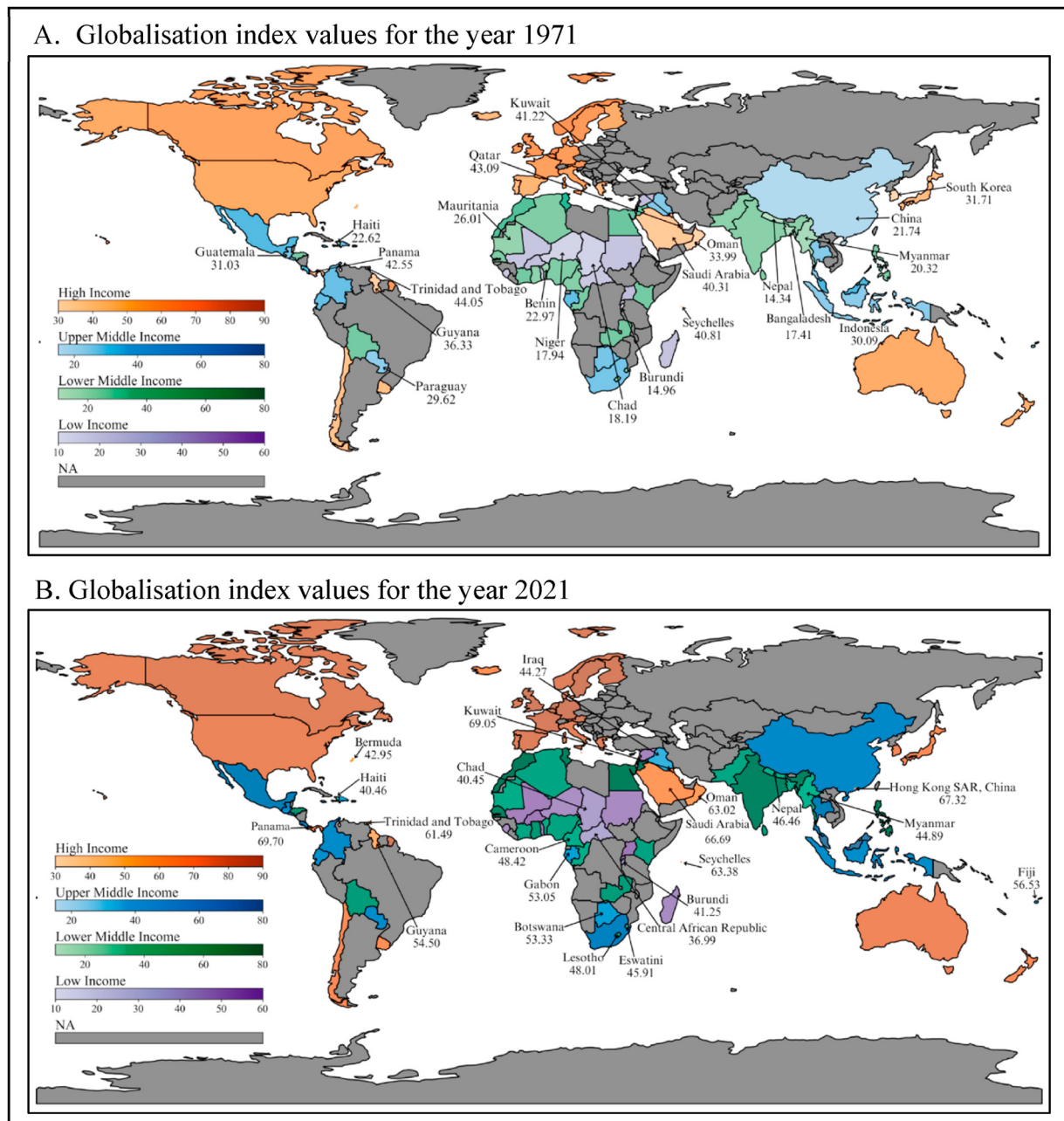


Fig. 6. A comparative visualisation of globalisation trends across global nations.

2021, Nepal and Bangladesh remained in this category, while Niger, India, and Sudan were replaced by Chad, the Central African Republic, and Haiti. In both years, the nations in this lowest-performing category belonged exclusively to the low- and lower-middle-income groups.

With reference to social globalisation, the lowest-performing nations in 1971 were Myanmar, Burundi, China, Nepal, and Chad, in that order. However, by 2021, the Central African Republic, Sudan, and Niger had replaced China and Nepal in this category, while Chad and Burundi remained among the lowest-ranked nations. By 2021, all the nations in this lowest-performing category fell within the low-income group, whereas China, due to its exponential development, had transitioned to the upper-middle-income category.

In the context of political globalisation, the lowest performing nations in 1971 were Bermuda, Seychelles, Oman, Qatar, and Botswana. By 2021, this category included Bermuda, Hong Kong, Lesotho, Seychelles, and Eswatini, replacing Oman, Qatar, and Botswana.

However, it remains evident that high-income nations such as Bermuda, Hong Kong, and Seychelles continue to rank lower in terms of political integration.

4.2. Panel Granger Causality analysis

Before conducting the Panel Granger causality analysis, the prerequisites of stationarity and stability were assessed. The LLC unit root test was applied to verify the stationarity of the variables (GDP, GLO, EGLO, SGLO, and PGLO). The test results, presented in S4 Appendix, confirmed the rejection of the null hypothesis (existence of unit roots) and supported the alternative hypothesis (stationarity) at the 1% significance level.

Accordingly, GDP had to be differenced once to achieve stationarity across all income categories. While the lower-middle and high-income groups attained stationarity at the first level, the low-income and

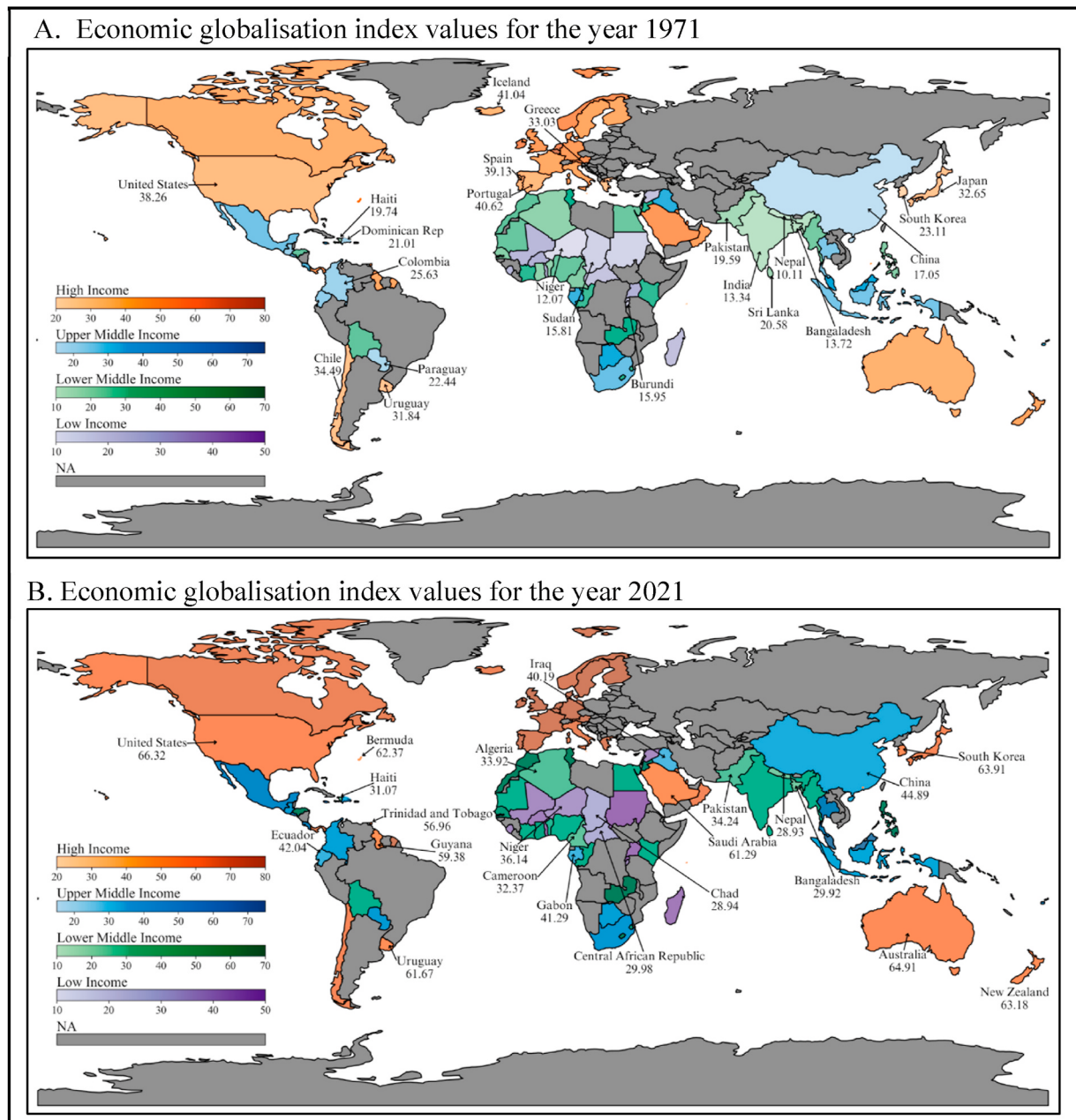


Fig. 7. A comparative visualisation of economic globalisation trends across global nations. Source: Authors' illustration.

upper-middle-income groups required first-order differencing in the case of overall globalisation (GLO). In the context of its sub-dimensions, all income groups except low-income nations attained stationarity at the first level for economic globalisation (EGLO) and political globalisation (PGLO). Meanwhile, all income classifications except the high-income group had to be differenced once for social globalisation (SGLO) to achieve stationarity.

Subsequently, the lag intervals for each variable within each income classification were determined using the PVAR model. The optimal lag length was identified by minimising the MBIC, MAIC, and MQIC selection criteria. The Roots of the Companion Matrix diagrams, presented in S5 Appendix, confirmed that the stability condition was met, with all eigenvalues lying within the unit circle.

Once the conditions of stationarity and stability were satisfied, the Panel Granger causality test was conducted, and the outcomes are illustrated in Fig. 10. The results indicate that overall globalisation has a bidirectional causal relationship with economic growth in high- and

low-income groups, whereas globalisation unidirectionally influences economic growth in lower-middle-income countries, while the opposite causal relationship is observed in upper-middle-income countries.

Furthermore, social globalisation and economic growth were found to exhibit a bidirectional relationship in high- and low-income categories, whereas economic globalisation and economic growth demonstrated a two-way causality in lower-middle-income groups. However, in high-income nations, economic globalisation exerts a unidirectional impact on economic growth, while in low-income nations, economic growth significantly influences economic globalisation.

In the case of political globalisation, a one-way causal flow towards economic growth was observed in high-, low-, and lower-middle-income groups. However, no causal relationship was found between political globalisation and economic growth in upper-middle-income nations. Similarly, social globalisation was found to have no significant relationship with economic growth in lower-middle-income groups.

A more detailed version of the Panel Granger causality findings is

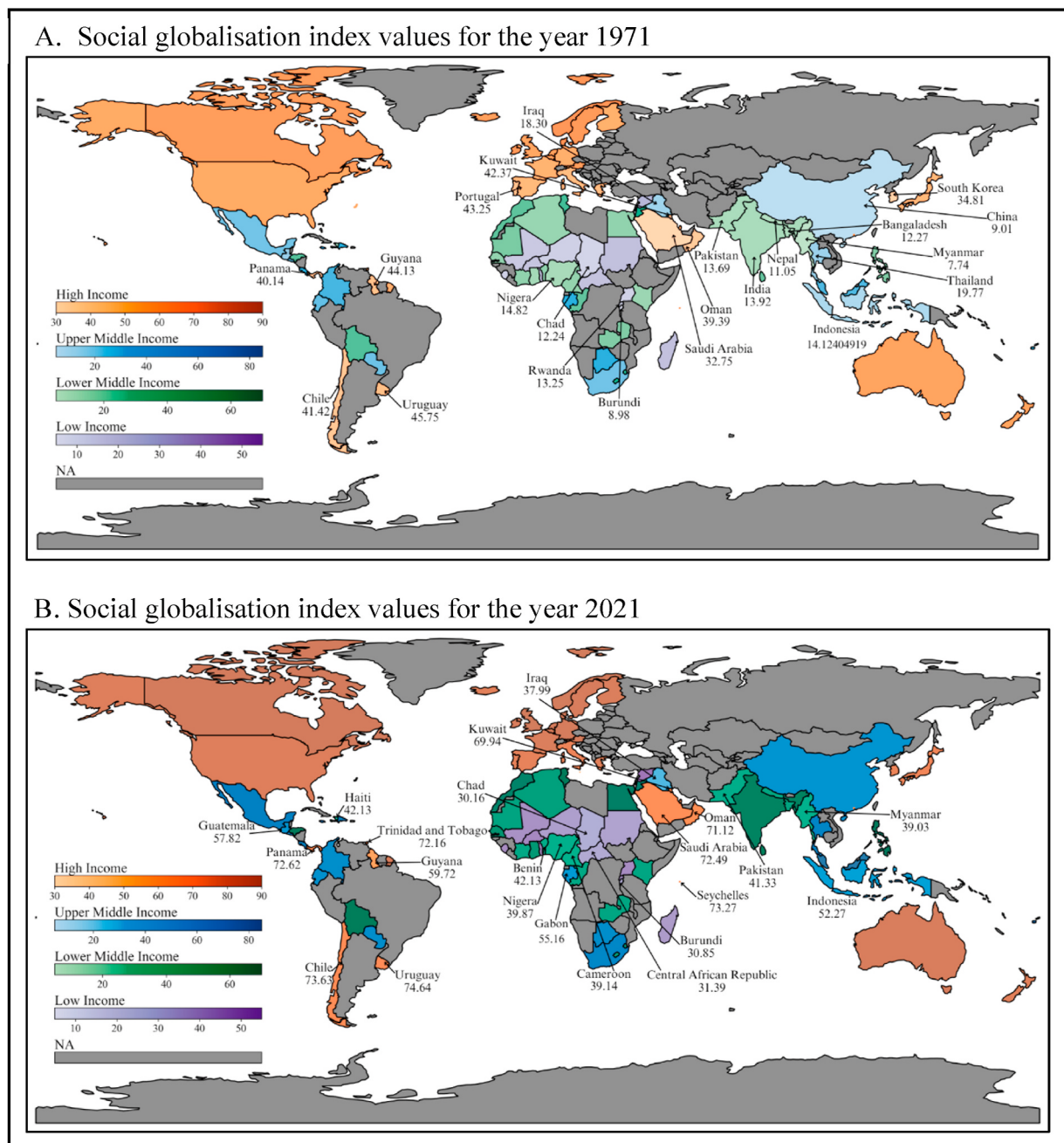


Fig. 8. A comparative visualisation of social globalisation trends across global nations.

presented in S6 Appendix.

Subsequently, a robustness check on the Panel Granger Causality findings was conducted. In this process, alternative lag lengths were tested in addition to the optimal lag lengths. The results, presented in S7 Appendix, indicate that the majority of the findings remained consistent, thereby confirming the reliability of the results across different specifications.

5. Discussion

This section comprehensively discusses the findings obtained with reference to each income group.

5.1. Global integration and economic growth in the high-income category

In the context of bidirectional causal relationship between social

globalisation and economic growth, higher levels of economic expansion have been identified as a catalyst for improving living standards (cultural globalisation). At the same time, these enhanced livelihood patterns can, in turn, influence the structure and performance of economic units (Balsalobre-Lorente et al., 2021). Nations in the high-income category are more likely to benefit from digitalisation and technological advancements, which serve as two key drivers of economic expansion (Meng et al., 2022). In the context of economic globalisation, which has been found to exert a unidirectional impact on economic growth, financial integration—a key component of economic globalisation—plays a vital role in eliminating externalities associated with economic growth. Furthermore, rapid industrialisation across high-income nations, particularly in Europe, has been found to enhance production capacity, thereby expanding economies (Cengiz & Manga, 2023). However, it is essential to mitigate the adverse impacts of industrialisation through sustainable policymaking within high-income

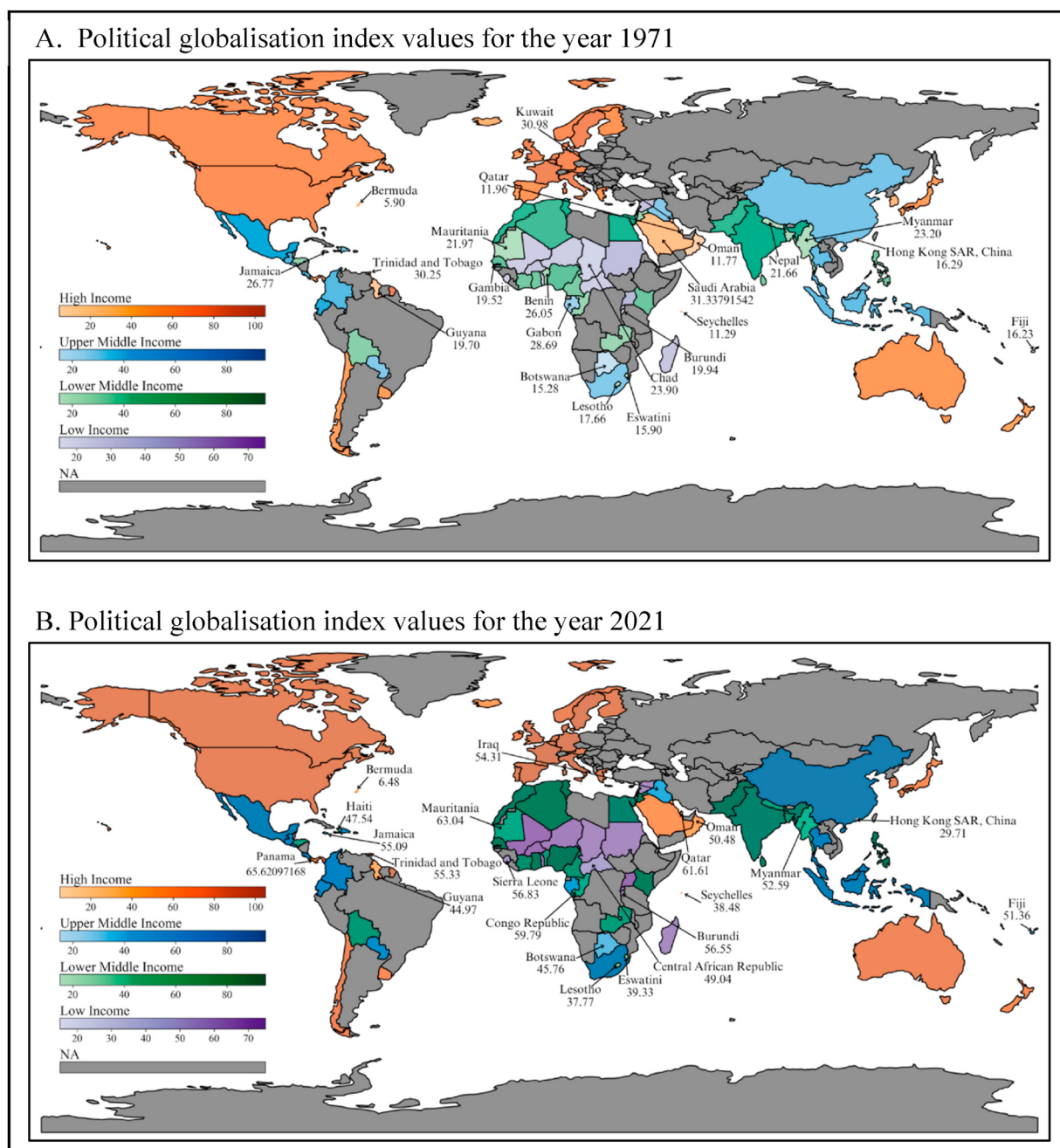


Fig. 9. A comparative visualisation of political globalisation trends across global nations.

economies. Regarding political integration, which was found to Granger-cause economic growth, existing empirical studies highlight the significant disintegration caused by Britain's exit from the European Union, which has influenced multiple economic sectors (de Lucio et al., 2024). Conversely, new entrants to the European Union tend to experience rapid economic expansion (Gurgul & Lach, 2014). Therefore, it is crucial to maximise the benefits of political globalisation by formulating effective policies that promote sustainable governance and political integration.

Compared to existing literature, the findings of this study present contradictions, particularly regarding the bidirectional causal relationship between globalisation and economic growth. Previous studies have primarily indicated unidirectional impacts, where globalisation influences economic growth but not vice versa (Chang & Lee, 2010; Usman et al., 2022). The differences observed in this study may be

attributed to variations in methodology, the time period considered, and the selection of countries included in the analysis.

5.2. Global integration and economic growth in the lower middle-income category

Globalisation has been widely recognised as a key driver of economic expansion in lower-middle-income nations (Ali & Imai, 2015; Awad, 2024; Glennice Fosah et al., 2023; Villaverde & Maza, 2011). The findings of this study align with the existing literature, reaffirming the unidirectional impact of globalisation on economic growth. In the context of political globalisation influencing economic growth, the political representation of lower-middle-income nations, which serves as a proxy for political integration, plays a crucial role in shaping public trust and loyalty. These factors, in turn, contribute to economic expansion

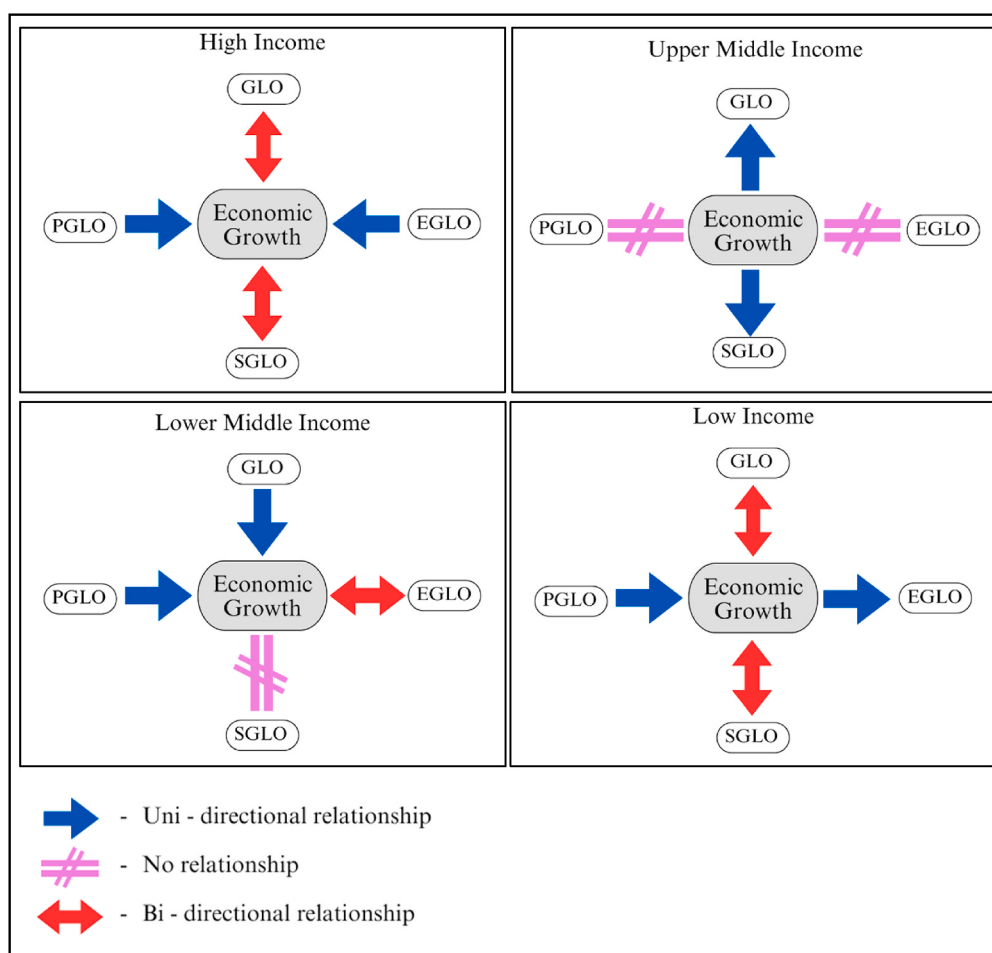


Fig. 10. Summary of the Panel Granger causality test.

(Kukreja, 2024). Rising economic growth rates have been found to accelerate financial market development and increase demand for financial products in India, a key nation in the lower-middle-income category (Shahbaz et al., 2018). Additionally, aspects of economic globalisation, such as cross-border trade and investment, have been identified as significant contributors to economic prosperity (Glennice Fosah et al., 2023). These factors collectively support the bidirectional causal relationship between economic growth and economic integration in lower-middle-income nations. The findings highlight the need for targeted policy measures tailored specifically to lower-middle-income countries, with the ultimate objective of facilitating their transition to a higher-income category.

5.3. Global integration and economic growth in the upper middle-income category

The results have revealed causal relationships suggesting that economic advancement in upper-middle-income nations serves as a catalyst for global integration. These findings are likely driven by country-specific dynamics, as these nations are often regarded as the 'major engines of global growth' (World Bank Group, 2024). Upper-middle-income nations are typically characterised by higher levels of education, high-wage earners, and prominent roles in global economic and political structures, in contrast to their low-income counterparts. Additionally, these nations share similar cultural ideologies, which strengthens their social networks and allows them to be recognised as global leaders in culture (Siegrist, 2001). Despite their active participation in global economic and political affairs, this study

has not found statistically significant causal links between economic growth and global economic or political integration. One possible explanation is the distribution of voting power in international institutions such as the World Bank, which is heavily concentrated in high-income nations (The World Bank Group, 2025). Furthermore, competition from other global economic players may impose obstacles for upper-middle-income countries when engaging in international economic activities.

A comparison of these findings with existing literature reveals both similarities and contradictions. The observed causal relationship from economic growth to global and social integration aligns with previous research, which has established economic growth as a facilitator of globalisation, particularly through human capital development and financial market expansion (Guan et al., 2020). However, in contrast to this study's lack of evidence linking growth to economic and political integration, earlier research has found financial and political globalisation to be positively associated with economic growth in upper-middle-income nations (Chang et al., 2013), thereby suggesting a possible interrelation between the variables.

The unidirectional causal pathways identified in this study highlight the need for region-specific policy interventions that focus on leveraging economic growth to drive global and social integration. Investments in social infrastructure will contribute to economic development, which will in turn reinforce interpersonal, informational, cultural and overall global integration.

5.4. Global integration and economic growth in the low-income category

Low-income nations are often characterised by extreme levels of inequality, unemployment, underdeveloped human capital, weak institutional quality, and poor infrastructure compared to their global counterparts. However, over time, these nations have experienced gradual transformation due to various factors, including debt relief, integration into global value and financial chains, increased emphasis on human capital development, and more strategic policy regulations (Steinbach, 2019). The bidirectional and unidirectional causal relationships identified in this study can be attributed to these dynamics, which have allowed the low-income group to develop a largely symbiotic relationship between globalisation and growth.

Contrary to the study's findings, which indicate that economic growth drives economic globalisation, numerous existing scholarly discussions have established a reverse causality, where economic integration is seen as a precursor to economic growth in low-income nations (Asongu et al., 2020; Iwegbu & de Mattos, 2022; Nguea, Fotio, & Baida, 2022; Nguea et al., 2024). Meanwhile, this study's confirmation of a bidirectional causal relationship between economic growth and social integration, as well as a unidirectional causal connection from political globalisation to growth, aligns with existing literature that identifies both social and political integration as key drivers of economic expansion in low-income countries.

The adoption of Western lifestyles by low-income African nations has been found to influence their economic growth prospects, reinforcing the role of social globalisation. Additionally, active participation in international organisations and treaties—which are key stimulants of political globalisation—has been identified as a positive contributor to economic development in low-income nations (Rao & Vadlamannati, 2011). Accordingly, this study can be seen as both reinforcing and expanding upon existing empirical research.

While globalisation can be regarded as a catalyst for economic growth in low-income nations, excessive dependence on global integration may also increase their vulnerability to external shocks and global fluctuations. These findings highlight the need for context-specific policy interventions aimed at strengthening domestic institutions and infrastructure, maximising the benefits of globalisation, and promoting sustainable development.

6. Conclusion

This study evaluated the causal relationships between globalisation and its sub-dimensions (economic, social, and political) with economic growth, classified under four income groups: low, lower-middle, upper-middle, and high-income nations. The analysis was conducted using a panel of 97 countries over a 51-year period (1971–2021). The Panel Granger Causality test was deployed to examine causal progressions, with data obtained from the World Bank and the KOF Swiss Economic Institute for economic growth and globalisation indices, respectively.

Low-income economies could benefit from incorporating globalisation dynamics into their development strategies, enhancing opportunities to transition into a higher income category. Nations experiencing extreme levels of poverty, inequality, and weak governance should align socio-economic policymaking with the UN SDGs to reduce disparities by 2030 and achieve prosperity.

Middle-income economies should focus on sustainable development mechanisms within globalisation to extract benefits for domestic and cross-border economic expansion. Strengthening global partnerships and enhancing investment attraction in domestic economies should be prioritised.

High-income nations, meanwhile, should emphasise environmental sustainability, particularly by evaluating the adverse effects of industrialisation on climate change. Additionally, they should provide assistance to developing and least-developed nations, facilitating their transition towards sustainable development by 2030.

In conclusion, a significant association between globalisation dynamics and economic growth has been identified across all income groups. Hence, targeted policy interventions can enhance economic performance within each income classification. A discussion on income-specific policy recommendations, aligned with the UN SDGs, is elaborated in the following section.

7. Policy recommendations

Through a comprehensive analysis of the causes and interrelations between globalisation, its sub-dimensions, and economic growth, the study identifies key policy avenues to improve globalisation indices for nations across different income groups. These recommendations are designed in alignment with the UN SDGs.

7.1. Policy recommendations for the low-income category

Low-income nations should enhance global integration by improving market accessibility and promoting sustainable practices, given the bidirectional relationship identified between globalisation and economic growth. The impact of economic growth on economic integration highlights the need to broaden access to global markets, participate in trade facilitation agreements, and eliminate trade barriers to expand export capacity.

Restrictive economic policies hinder growth opportunities; hence, lifting unnecessary trade restrictions through international cooperation is strongly recommended. These efforts contribute towards SDG 1: No Poverty, SDG 8: Decent Work and Economic Growth, and SDG 17: Partnerships for the Goals, helping eradicate poverty, enhance productivity, and improve market access.

In terms of sustainability, low-income nations should promote sustainable production methods and facilitate technology transfers to boost economic growth while integrating into the global economy, aligning with SDG 9: Industry, Innovation, and Infrastructure. Additionally, greater participation in international and intergovernmental organisations can enhance political globalisation, supporting SDG 16: Peace Justice and Strong Institutions by 2030.

7.2. Policy recommendations for the lower-middle income category

For lower-middle-income nations, fostering investment in human capital can significantly boost economic integration, as indicated by the bidirectional causal relationships observed in this study. Policies aimed at enhancing infrastructure development and expanding cross-border trade will further stimulate economic growth, aligning with SDG 17.

Investments in education and training programmes will accelerate social integration and economic growth, increasing access to skilled labour. Such initiatives contribute to achieving SDG 4: Quality Education, SDG 5: Gender Equality, SDG 8: Decent Work and Economic Growth, and SDG 10: Reduced Inequalities, ensuring inclusive and equitable workforce participation.

7.3. Policy recommendations for the upper-middle income category

Upper-middle-income nations can maximise economic growth to further stimulate globalisation, particularly by strengthening global and social ties. Given the unidirectional impact of economic growth on globalisation and social integration, efforts should focus on human capital development and financial market expansion, in line with SDG 4: Quality Education and SDG 8: Decent Work and Economic Growth.

This can be achieved through skill development programmes, targeted investment in education, and expanding portfolio investments. Additionally, policies promoting cultural exchange and digital connectivity will enhance global social integration, supporting the objectives of SDG 9: Industry, Innovation, and Infrastructure by 2030.

7.4. Policy recommendations for the high-income category

High-income nations should invest in digital and technological advancements to sustain economic and social globalisation, given their direct impact on economic growth. These initiatives align with SDG 7: Affordable and Clean Energy, through investments in renewable technologies, and SDG 9: Industry, Innovation, and Infrastructure, by allocating resources to research and development.

Additionally, financial integration policies should be strengthened to eliminate economic growth externalities while maintaining high levels of global integration, supporting SDG 12: Responsible Production and Consumption. Expanding production capacities while minimising environmental harm is essential for meeting SDG 13: Climate Action, SDG 14: Life Below Water, and SDG 15: Life on Land.

7.5. Policy recommendations to address Variances between the income groups

To reduce disparities among income groups, tailored policy interventions should be developed to address specific challenges while aligning with globalisation trends. Regular monitoring and evaluation of globalisation-related policies will ensure effective cross-income integration. Embedding the UN SDGs into national policy frameworks and sustaining commitment towards their achievement by 2030 will yield positive long-term development outcomes.

Constraints of the study and prospects for future research

The study's scope was limited to a panel of 97 countries and a 51-year timeframe due to data availability constraints. While the KOF Globalisation Index offers a comprehensive measure of globalisation, its composite nature may obscure subtle trends within each sub-dimension. Additionally, country-specific dynamics and environmental effects of globalisation were not fully accounted for, potentially limiting the index's applicability.

The Panel Granger Causality test also has limitations, as it cannot be applied to non-stationary, unbalanced, or interdependent datasets and only detects short-term relationships. Moreover, the use of a first-generation unit root test restricted the study's ability to account for cross-sectional dependence within panels.

Future research should explore the globalisation-growth nexus on finer temporal and regional scales, incorporating additional variables to assess environmental dimensions. Methodological enhancements, including cointegration tests, second-generation unit root tests, and Wavelet Coherence analysis, are recommended to capture long-term causal relationships and address cross-sectional dependencies.

CRedit authorship contribution statement

Irushi Sandanayaka: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Methodology, Formal analysis, Data curation, Conceptualization. **Danushi Rathnayake:** Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Methodology, Formal analysis, Data curation. **Dinithi Athalage:** Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Formal analysis, Data curation. **Piyara Wijesuriya:** Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Methodology, Formal analysis, Data curation, Conceptualization. **Ruwan Jayathilaka:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Project administration, Methodology, Formal analysis, Conceptualization.

Statements and declarations

All authors certify that they have no affiliations with or involvement

in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

Conflict of interest

The authors declare that they have no competing interests.

Availability of data and materials

All data generated or analysed during this study are included in this published article and its supplementary information files.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ssaho.2025.101399>.

References

- Abid, M., & Alotaibi, M. N. (2020). Crude oil price and private sector of Saudi Arabia: Do globalization and financial development matter? New evidence from combined cointegration test. *Resources Policy*, 69, 1–15. <https://doi.org/10.1016/j.resourpol.2020.101774>
- Abubakar, M. (2024). Globalisation and output growth nexus in sub-saharan Africa: The critical role of trade liberalisation. *Journal of the Knowledge Economy*, 15(1), 2218–2240. <https://doi.org/10.1007/s13132-023-01230-y>
- Acheampong, A. O., Boateng, E., Amponsah, M., & Dzator, J. (2021). Revisiting the economic growth–energy consumption nexus: Does globalization matter? *Energy Economics*, 102, 1–18. <https://doi.org/10.1016/j.eneco.2021.105472>
- Ahmad, M., Jiang, P., Murshed, M., Shehzad, K., Akram, R., Cui, L., et al. (2021). Modelling the dynamic linkages between eco-innovation, urbanization, economic growth and ecological footprints for G7 countries: Does financial globalization matter? *Sustainable Cities and Society*, 70, 1–13. <https://doi.org/10.1016/j.scs.2021.102881>
- Akaike, H. (1969). Fitting autoregressive models for prediction. *Annals of the Institute of Statistical Mathematics*, 21(1), 243–247. <https://doi.org/10.1007/BF02532251>
- Akaike, H. (1983). Statistical inference and measurement of entropy. In G. E. P. Box, T. Leonard, & C.-F. Wu (Eds.), *Scientific inference, data analysis, and robustness* (pp. 165–189). Madison: University of Wisconsin. Academic Press.
- Alariqi, M., Long, W., Singh, P. R., Al-Barakani, A., & Muazu, A. (2023). Modelling dynamic links among energy transition, technological level and economic development from the perspective of economic globalisation: Evidence from MENA economies. *Energy Reports*, 9, 3920–3931. <https://doi.org/10.1016/j.egy.2023.02.089>
- Ali, A., & Imai, K. S. (2015). Crises, economic integration and growth collapses in african countries. *Journal of African Economies*, 24(4), 471–501. <https://doi.org/10.1093/jae/ejv010>
- Anwar, S., & Cooray, A. (2012). Financial development, political rights, civil liberties and economic growth: Evidence from South Asia. *Economic Modelling*, 29(3), 974–981. <https://doi.org/10.1016/j.econmod.2012.02.009>
- Awad, A. (2024). Do ICT and economic globalisation offer benefits to all nations? Findings from a moments quantile regression. *Environment, Development and Sustainability*, 26(3), 5817–5841. <https://doi.org/10.1007/s10668-023-02938-2>
- Baidoo, S. T., Tetteh, B., Boateng, E., & Ayibor, R. E. (2023). Estimating the impact of economic globalization on economic growth of Ghana: Wavelet coherence and ARDL analysis. *Research in Globalization*, 7, 1–14. <https://doi.org/10.1016/j.resglo.2023.100183>
- Balsalobre-Lorente, D., Sinha, A., Driha, O. M., & Mubarik, M. S. (2021). Assessing the impacts of ageing and natural resource extraction on carbon emissions: A proposed policy framework for European economies. *Journal of Cleaner Production*, 296, 1–14. <https://doi.org/10.1016/j.jclepro.2021.126470>
- Bassani, T., Magagnin, V., Guzzetti, S., Baselli, G., Citerio, G., & Porta, A. (2012). Testing the involvement of baroreflex during general anesthesia through Granger causality approach. *Computers in Biology and Medicine*, 42(3), 306–312. <https://doi.org/10.1016/j.combiomed.2011.03.005>

- Bekaert, G., Harvey, C. R., & Lundblad, C. (2011). Financial openness and productivity. *World Development*, 39(1), 1–19. <https://doi.org/10.1016/j.worlddev.2010.06.016>
- Burhan, N. A. S., Sidek, A. H., Kurniawan, Y., & Mohamad, M. R. (2015). Has globalization triggered collective impact of national intelligence on economic growth? *Intelligence*, 48, 152–161. <https://doi.org/10.1016/j.intell.2014.11.003>
- Carp, L. (2014). Financial globalization and capital flows volatility effects on economic growth. *Procedia Economics and Finance*, 15, 350–356. [https://doi.org/10.1016/S2212-5671\(14\)00521-8](https://doi.org/10.1016/S2212-5671(14)00521-8)
- Cengiz, O., & Manga, M. (2023). Does economic globalization trigger de-industrialization in western balkan countries? Empirical evidence based on augmented mean group estimator. *Regional Science Policy & Practice*, 16, 1–21. <https://doi.org/10.1111/rsp3.12709>
- Chang, C.-P., Berdiev, A. N., & Lee, C.-C. (2013). Energy exports, globalization and economic growth: The case of South Caucasus. *Economic Modelling*, 33, 333–346. <https://doi.org/10.1016/j.econmod.2013.04.027>
- Chang, C.-P., & Lee, C.-C. (2010). Globalization and economic growth: A political economy analysis for oecd countries. *Global Economic Review*, 39(2), 151–173. <https://doi.org/10.1080/1226508X.2010.483835>
- Coulbaly, S. K., Erbao, C., & Metuge Mekongcho, T. (2018). Economic globalization, entrepreneurship, and development. *Technological Forecasting and Social Change*, 127, 271–280. <https://doi.org/10.1016/j.techfore.2017.09.028>
- Dhingra, V. S. (2023). Financial development, economic growth, globalisation and environmental quality in BRICS economies: Evidence from ARDL bounds test approach. *Economic Change and Restructuring*, 56(3), 1651–1682. <https://doi.org/10.1007/s10644-022-09481-6>
- Dissanayake, H., Perera, N., Abeykoon, S., Samson, D., Jayathilaka, R., Jayasinghe, M., et al. (2023). Nexus between carbon emissions, energy consumption, and economic growth: Evidence from global economies. *PLoS One*, 18(6), 1–27. <http://10.1371/journal.pone.0287579>
- Dreher, A. (2006). Does globalization affect growth? Evidence from a new index of globalization. *Applied Economics*, 38, 1091–1110. <https://doi.org/10.1080/00036840500392078>
- Dumrongritikul, T., Anderson, H., & Vahid, F. (2019). The global effects of productivity gains in Asian emerging economies. *Economic Modelling*, 83, 127–140. <https://doi.org/10.1016/j.econmod.2019.02.004>
- Dutta, A. (2001). Telecommunications and economic activity: An analysis of granger causality. *Journal of Management Information Systems*, 17(4), 71–95. <https://doi.org/10.1080/07421222.2001.11045658>
- Ehigiamusoe, K. U. (2023). A disaggregated approach to analysing the effects of globalization and energy consumption on economic growth: New insights from low-income countries, 28(4), 3976–3996 <https://doi.org/10.1002/ijfe.2631>
- Eidgenössische Technische Hochschule Zürich. (2024). KOF globalisation index. Retrieved from <https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html>
- Elfaki, K. E., & Ahmed, E. M. (2024). Digital technology adoption and globalization innovation implications on Asian Pacific green sustainable economic growth. *Journal of Open Innovation: Technology, Market, and Complexity*, 10(1), 1–10. <https://doi.org/10.1016/j.joitmc.2024.100221>
- Falahaty, M., & Law, S. H. (2012). The effect of globalization on financial development in the MENA region. *Transition Studies Review*, 19, 205–223. <https://doi.org/10.1007/s11300-012-0242-6>
- Furqan, M. S., & Siyal, M. Y. (2016). Elastic-net copula granger causality for inference of biological networks. *PLoS One*, 11(10), 1–16. <https://doi.org/10.1371/journal.pone.0165612>
- Gaies, B., Goutte, S., & Guesmi, K. (2019). What interactions between financial globalization and instability?—growth in developing countries. *Journal of International Development*, 31(1), 39–79. <https://doi.org/10.1002/jid.3391>
- Gaies, B., Goutte, S., & Guesmi, K. (2020). Does financial globalization still spur growth in emerging and developing countries? Considering exchange rates. *Research in International Business and Finance*, 52, 1–19. <https://doi.org/10.1016/j.ribaf.2019.101113>
- Ghosh, A. (2017). How does banking sector globalization affect economic growth? *International Review of Economics & Finance*, 48, 83–97. <https://doi.org/10.1016/j.iref.2016.11.011>
- Glennice Fosah, M.-S., Mama, N., Dohba Dinga, G., & Nchofoung, T. N. (2023). The effect of globalisation on Sub-Saharan Africa's development thrives. *Research in Globalization*, 7, 1–8. <https://doi.org/10.1016/j.resglo.2023.100149>
- Gomes Neto, D., & Veiga, F. J. (2013). Financial globalization, convergence and growth: The role of foreign direct investment. *Journal of International Money and Finance*, 37, 161–186. <https://doi.org/10.1016/j.jimonfin.2013.04.005>
- Granger, C. W. J. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica*, 37(3), 424–438. <https://doi.org/10.2307/1912791>
- Groshek, J. (2011). Media, instability, and democracy: Examining the granger-causal relationships of 122 countries from 1946 to 2003. *Journal of Communication*, 61(6), 1161–1182. <https://doi.org/10.1111/j.1460-2466.2011.01594.x>
- Guan, J., Kirikkaleli, D., Bibi, A., & Zhang, W. (2020). Natural resources rents nexus with financial development in the presence of globalization: Is the “resource curse” exist or myth? *Resources Policy*, 66, 1–9. <https://doi.org/10.1016/j.resourpol.2020.101641>
- Gurgul, H., & Lach, L. (2014). Globalization and economic growth: Evidence from two decades of transition in CEE. *Economic Modelling*, 36, 99–107. <https://doi.org/10.1016/j.econmod.2013.09.022>
- Hannan, E. J., & Quinn, B. G. (1979). The determination of the order of an autoregression, 41(2), 190–195 <https://doi.org/10.1111/j.2517-6161.1979.tb01072.x>
- Hasan, M. A. (2019). Does globalization accelerate economic growth? South asian experience using panel data. *Journal of Economic Structures*, 8(1), 1–13. <https://doi.org/10.1186/s40008-019-0159-x>
- Iamsiraroj, S. (2016). The foreign direct investment–economic growth nexus. *International Review of Economics & Finance*, 42, 116–133. <https://doi.org/10.1016/j.iref.2015.10.044>
- Jayawardhana, T., Jayathilaka, R., Anuththara, S., Nimnadi, T., Karadanaarachchi, R., & Galappaththi, K. (2024). Exploring the dynamics of the elderly population and economic growth: A comparative analysis across continents. *Social Indicators Research*, 173(3), 543–568. <https://doi.org/10.1007/s11205-024-03353-4>
- Kandil, M., Shahbaz, M., & Nasreen, S. (2015). The interaction between globalization and financial development: New evidence from panel cointegration and causality analysis. *Empirical Economics*, 49, 1317–1339. <https://doi.org/10.1007/s00181-015-0922-2>
- Khan, M. T. I., Anwar, S., Sarkodie, S. A., Yaseen, M. R., & Nadeem, A. M. (2023). Do natural disasters affect economic growth? The role of human capital, foreign direct investment, and infrastructure dynamics. *Heliyon*, 9(1), Article e12911. <https://doi.org/10.1016/j.heliyon.2023.e12911>
- Kornilov, M. V., Syssoev, I. V., Astakhova, D. I., Kulminsky, D. D., Bezruchko, B. P., & Ponomarenko, V. I. (2020). Reconstruction of the coupling architecture in the ensembles of radio-engineering oscillators by their signals using the methods of granger causality and partial directed coherence. *Radiophysics and Quantum Electronics*, 63(7), 542–556. <https://doi.org/10.1007/s11141-021-10078-8>
- Kukreja, R. (2024). Does representation affect trust in political institutions?: Evidence from redistributing in India. *World Development*, 179, Article 106563. <https://doi.org/10.1016/j.worlddev.2024.106563>
- Latif, Z., mengke, Y., Danish, Latif, S., Ximei, L., Pathan, Z. H., ... Jianqiu, Z. (2018). The dynamics of ICT, foreign direct investment, globalization and economic growth: Panel estimation robust to heterogeneity and cross-sectional dependence. *Teleomatics and Informatics*, 35, 318–328. <https://doi.org/10.1016/j.tele.2017.12.006>
- Law, S. H., Tan, H. B., & Azman-Saini, W. N. W. (2015). Globalisation, institutional reforms and financial development in East Asian economies. *The World Economy*, 38, 379–398. <https://doi.org/10.1111/twec.12168>
- Lee, C.-C., Lee, C.-C., & Chiou, Y.-Y. (2017). Insurance activities, globalization, and economic growth: New methods, new evidence. *Journal of International Financial Markets, Institutions and Money*, 51, 155–170. <https://doi.org/10.1016/j.intfin.2017.05.006>
- Love, I., & Zichino, L. (2006). Financial development and dynamic investment behavior: Evidence from panel VAR. *The Quarterly Review of Economics and Finance*, 46(2), 190–210. <https://doi.org/10.1016/j.qref.2005.11.007>
- Maizels, A., Palaskas, T. B., & Crowe, T. (1998). The prebisch-singer hypothesis revisited. In D. Sapsford, & J.-r. Chen (Eds.), *Development economics and policy: The conference volume to celebrate the 85th birthday of professor sir hans singer* (pp. 63–85). London: Palgrave Macmillan UK.
- Marques, L. M., Fuinhas, J. A., & Marques, A. C. (2017). Augmented energy-growth nexus: Economic, political and social globalization impacts. *Energy Procedia*, 136, 97–101. <https://doi.org/10.1016/j.egypro.2017.10.293>
- Meng, B., Xue, K., & Han, M. (2022). Digitalization, natural resources rents, and financial market risk: Evidence from G7 countries. *Resources Policy*, 79, 1–8. <https://doi.org/10.1016/j.resourpol.2022.103074>
- Muye, I. M., & Muye, I. Y. (2017). Testing for causality among globalization, institution and financial development: Further evidence from three economic blocs. *Borsa Istanbul Review*, 17(2), 117–132. <https://doi.org/10.1016/j.bir.2016.10.001>
- Nathaniel, S. P., Ahmed, Z., Shamansurova, Z., & Fakher, H. A. (2024). Linking clean energy consumption, globalization, and financial development to the ecological footprint in a developing country: Insights from the novel dynamic ARDL simulation techniques. *Heliyon*, 10(5), Article e27095. <https://doi.org/10.1016/j.heliyon.2024.e27095>
- Nguea, S. M., Noula, A. G., & Numba, I. (2024). Financial globalization and democracy: Implications for economic growth in african countries. *Journal of the Knowledge Economy*, 15(1), 3355–3379. <https://doi.org/10.1007/s13132-023-01311-y>
- Olorogun, L. A. (2024). Modelling financial development in the private sector, FDI, and sustainable economic growth in sub-saharan Africa: ARDL bound test-FMOLS, DOLS robust analysis. *Journal of the Knowledge Economy*, 15(2), 8416–8434. <https://doi.org/10.1007/s13132-023-01224-w>
- Pea-Assounga, J. B. B., Bambi, P. D. R., Jafarzadeh, E., & Nima Ngapey, J. D. (2025). Investigating the impact of crude oil prices, CO2 emissions, renewable energy, population growth, trade openness, and FDI on sustainable economic growth. *Renewable Energy*, 241, 1–16. <https://doi.org/10.1016/j.renene.2025.122353>
- Pigou, A. C. (1944). The Road to serfdom. *The Economic Journal*, 54(214), 217–219. <https://doi.org/10.2307/2225911>
- Qamaruzzaman, M. (2025). Driving energy transition in BRI nations: The role of education, globalization, trade liberalization, and financial deepening – a comprehensive linear and nonlinear approach. *Energy Strategy Reviews*, 57, 1–14. <https://doi.org/10.1016/j.esr.2024.101620>
- Radulović, M., & Kostić, M. (2024). Globalization and economic growth in Western Balkan countries. *Regional Science Policy & Practice*, 1–7. <https://doi.org/10.1016/j.rsp.2024.100031>
- Raihan, A., Voumik, L. C., Akter, S., Ridzuan, A. R., Fahlevi, M., Aljuaid, M., et al. (2024). Taking flight: Exploring the relationship between air transport and Malaysian economic growth. *Journal of Air Transport Management*, 115, 1–12. <https://doi.org/10.1016/j.jairtraman.2024.102540>
- Rao, B. B., & Vadlamannati, K. C. (2011). Globalization and growth in the low income African countries with the extreme bounds analysis. *Economic Modelling*, 28(3), 795–805. <https://doi.org/10.1016/j.econmod.2010.10.009>

- Rissanen, J. (1978). Modeling by shortest data description. *Automatica*, 14(5), 465–471. [https://doi.org/10.1016/0005-1098\(78\)90005-5](https://doi.org/10.1016/0005-1098(78)90005-5)
- Rostow, W. W. (1991). *The stages of economic growth: A non-communist manifesto* (3 ed.). Cambridge: Cambridge University Press.
- Schwarz, G. (1978). Estimating the dimension of a model. *Annals of Statistics*, 6(2), 461–464. <https://doi.org/10.1214/aos/1176344136>
- Shahbaz, M., Mallick, H., Mahalik, M. K., & Hammoudeh, S. (2018). Is globalization detrimental to financial development? Further evidence from a very large emerging economy with significant orientation towards policies. *Applied Economics*, 50(6), 574–595. <https://doi.org/10.1080/00036846.2017.1324615>
- Siegrist, H. (2001). Bourgeoisie/middle classes, history of. In N. J. Smelser, & P. B. Baltes (Eds.), *International encyclopedia of the social & behavioral sciences* (pp. 1307–1314). Oxford: Pergamon.
- Steinbach, R. (2019). Growth in low-income countries: Evolution, prospects, and policies. Retrieved from <https://openknowledge.worldbank.org/server/api/core/bitstreams/a97a268a-4d41-51f6-8733-ba0b416e39c3/content>.
- Stiglitz, J. E. (2003). Globalization and growth in emerging markets and the New Economy. *Journal of Policy Modeling*, 25(5), 505–524. [https://doi.org/10.1016/S0161-8938\(03\)00043-7](https://doi.org/10.1016/S0161-8938(03)00043-7)
- Sunde, T. (2017). Foreign direct investment, exports and economic growth: ADRL and causality analysis for South Africa. *Research in International Business and Finance*, 41, 434–444. <https://doi.org/10.1016/j.ribaf.2017.04.035>
- Tariq, G., Sun, H., Fernandez-Gamiz, U., Mansoor, S., Pasha, A. A., Ali, S., et al. (2023). Effects of globalization, foreign direct investment and economic growth on renewable electricity consumption. *Heliyon*, 9(3), Article e14635. <https://doi.org/10.1016/j.heliyon.2023.e14635>, 1–14.
- The World Bank Group. (2025). IBRD Top 8 countries voting power. Retrieved from <https://financesone.worldbank.org/ibrd-top-8-countries-voting-power/DS01463>.
- Tillaguango, B., Hossain, M. R., Cuesta, L., Ahmad, M., Alvarado, R., Murshed, M., ... Işık, C. (2024). Impact of oil price, economic globalization, and inflation on economic output: Evidence from Latin American oil-producing countries using the quantile-on-quantile approach. *Energy*, 302, 1–16. <https://doi.org/10.1016/j.energy.2024.131786>
- Triacca, U. (2001). On the use of Granger causality to investigate the human influence on climate. *Theoretical and Applied Climatology*, 69(3), 137–138. <https://doi.org/10.1007/s007040170019>
- Uddin, I., & Azam Khan, M. (2023). Global evidence on the impact of globalization, governance, and financial development on economic growth. *Journal of the Knowledge Economy*, 1–32. <https://doi.org/10.1007/s13132-023-01656-4>
- Usman, M., Jahanger, A., Makhdom, M. S. A., Balsalobre-Lorente, D., & Bashir, A. (2022). How do financial development, energy consumption, natural resources, and globalization affect arctic countries' economic growth and environmental quality? An advanced panel data simulation. *Energy*, 241, 1–13. <https://doi.org/10.1016/j.energy.2021.122515>
- Villaverde, J., & Maza, A. (2011). Globalisation. *Growth and Convergence*, 34(6), 952–971. <https://doi.org/10.1111/j.1467-9701.2011.01359.x>
- Wang, Q., Li, Y., & Li, R. (2024). Ecological footprints, carbon emissions, and energy transitions: The impact of artificial intelligence (AI). *Humanities and Social Sciences Communications*, 11(1), 1–18. <https://doi.org/10.1057/s41599-024-03520-5>
- Wang, Q., Zhang, F., & Li, R. (2024). Artificial intelligence and sustainable development during urbanization: Perspectives on AI R&D innovation, AI infrastructure, and AI market advantage, 1–21. <https://doi.org/10.1002/sd.3150>
- Wang, Q., Zhang, F., Li, R., & Sun, J. (2024). Does artificial intelligence promote energy transition and curb carbon emissions? The role of trade openness. *Journal of Cleaner Production*, 447, 1–35. <https://doi.org/10.1016/j.jclepro.2024.141298>
- Wen, J., & Zhou, Y. (2025). Trade openness and urban green innovation: A dual perspective based on financial agglomeration and human capital accumulation. *Sustainable Futures*, 1–32. <https://doi.org/10.1016/j.sfr.2025.100478>
- Wijesekara, C., Tittagalla, C., Jayatilaka, A., Ilukpotha, U., Jayatilaka, R., & Jayasinghe, P. (2022). Tourism and economic growth: A global study on granger causality and wavelet coherence. *PLoS One*, 17(9), 1–21. <https://doi.org/10.1371/journal.pone.0274386>
- World Bank Group. (2024). The World Bank in middle income countries. Retrieved from <https://www.worldbank.org/en/country/mic/overview>.
- World Bank Group. (2025). World Bank group country classifications by income level for FY24 (july 1, 2023- june 30, 2024). Retrieved from <https://blogs.worldbank.org/en/opendata/new-world-bank-group-country-classifications-income-level-fy24>.
- Wu, J., Abban, O. J., Boadi, A. D., Addae, E. A., Akhtar, M., Hongxing, Y., et al. (2022). Time–frequency contained co-movement of renewable electricity production, globalization, and co2 emissions: A wavelet-based analysis in asia. *Energy Reports*, 8, 15189–15205. <https://doi.org/10.1016/j.egyr.2022.11.054>
- Xie, C., & Jin, X. (2023). The role of digitalization, sustainable environment, natural resources and political globalization towards economic well-being in China, Japan and South Korea. *Resources Policy*, 83, 1–11. <https://doi.org/10.1016/j.resourpol.2023.103682>
- Yang, X., Li, N., Mu, H., Zhang, M., Pang, J., & Ahmad, M. (2021). Study on the long-term and short-term effects of globalization and population aging on ecological footprint in OECD countries. *Ecological Complexity*, 47, 1–12. <https://doi.org/10.1016/j.ecocom.2021.100946>
- Zahonogo, P. (2018). Globalization and economic growth in developing countries: Evidence from sub-saharan Africa. *International Trade Journal*, 32(2), 189–208. <https://doi.org/10.1080/08853908.2017.1333933>
- Ze, F., Yu, W., Ali, A., Hishan, S. S., Muda, I., & Khudoykulov, K. (2023). Influence of natural resources, ICT, and financial globalization on economic growth: Evidence from G10 countries. *Resources Policy*, 81, 1–9. <https://doi.org/10.1016/j.resourpol.2022.103254>