Analysis of Regulatory quality and dynamic correlations among stock markets: A panel approach

Abstract

While prior studies have explored stock market co-movements through macroeconomic, trade, and financial factors, the direct influence of regulatory institutions and global market structures on market correlations remains underexplored. Our study examines the relationship between RQ (measured by the Regulatory Quality Index (RQI)), GP (measured by the Global Power Index (GPI)) and market integration on their influence of the stock market correlations. We use time-varying correlation models and construct a novel correlation index to assess the extent to which regulatory strength and geopolitical influence drive market integration. Our findings reveal a significant positive relationship between RQ, GP, and stock market co-movements, suggesting that well-developed regulatory frameworks and economic dominance contribute to increased financial interconnectedness. We also provide a sub-sample analysis for robustness and understanding of the differences in the relationship among developed and developing markets. This study introduces a new theoretical perspective by linking RQ and GP to market behaviour through their effects on risk premiums and investor confidence. The results have broad implications for policymakers and investors, emphasising the importance of governance structures in developing financial stability and global market integration.

Keywords: regulatory quality, global power, financial market integration, stock market correlations, governance, G20 markets.

1. Introduction

The implementation of the International Financial Reporting Standards (IFRS) has contributed to the gradual alignment of regulatory frameworks across global markets, enhancing transparency, strengthening accountability and boosting economic efficiency. The global economy has undergone significant transformations due to the increasing influence of international and domestic institutions. Groups such as the G20, G7, and BRICS have played an important role in shaping regulatory frameworks and political discussions worldwide. Additionally, organisations like the World Bank and the United Nations have influenced cultural, political and social behaviours, further driving the globalisation of economies. As the world moves towards a more interconnected economic system, these institutions have spurred growth and power dynamics, particularly in developed economies. Motivated by the influence of these multilateral institutions on regulations and international financial reporting standards, this study investigates the relationship between regulatory quality (RQ), global power (GP, and the convergence of stock markets.

Regulatory Quality refers to the government's ability to formulate and implement policies that promote private sector development and economic growth. GP, on the other hand, measures a nation's influence relative to other countries, encompassing economic, political and military dimensions. While previous studies have explored various factors influencing stock market correlations, such as economic variables and market volatility (Asgharian, Christiansen & Hou, 2023; Liu, Ma & Liu, 2022; Gupta & Guidi, 2012). The understanding of the relationship between RQ, GP and stock market convergence remains underexplored. This study aims to fill this gap by examining how changes in RQ and GP influence stock market correlations through changes in relative risk premia and returns. To this end, we pose the following research question. Do regulatory quality and global power positively influence stock market correlations over time? To address this question, we use a sample of G20 financial

markets to understand the dynamic relationship. Using stock market index data, we derive correlation indexes that capture the return relationships between each market and others. We also use a panel dataset and construct a correlation index to measure stock market linkages across nations, influenced by the relationship between RQ and GP.

To the best of our knowledge, this is the first study to propose a theoretical framework that examines the interplay between RQ, GP, and changes in stock market correlations, reflected upon the relative returns and risk premia. Variations in investor confidence across markets are anticipated to influence the allocation of resources within an economy, as represented in stock market returns. The literature on stock market integration has primarily focused on economic and financial factors, such as trade policies, monetary unions and industry-level integration. However, the role of RQ and GP in shaping market co-movements has been largely overlooked. Our study contributes to the literature by developing a theoretical framework that links RQ and GP to stock market correlations through intermediary variables such as risk premiums and returns. The findings have important implications for policymakers, regulators, and investors, particularly in the context of global portfolio diversification and the development of international trade agreements.

The remainder of the study is organised as follows. Section 2 presents the institutional context. Section 3 provides the Literature Review. Section 4 discusses the theoretical and conceptual frameworks. Section 5 discusses the variables in the study. Section 6 presents the data and methodology. Section 7 presents the model estimation, Section 8 provides estimation and discussion of results, and Section 9 provides concluding remarks.

2. Institutional Context

The integration of global markets has been a key driver of economic growth and development. Economic integration can take various forms, including free trade areas, customs unions, and monetary unions, each with its own set of policies and regulations. The G20, as a

forum for international economic cooperation, has played a significant role in promoting market integration through bilateral and multilateral trade agreements.[1] However, the effectiveness of these agreements often depends on the RQ of the participating countries and their relative GP.

Regulatory quality is crucial for ensuring transparency, investor confidence, and the efficient functioning of financial markets. For example, the 1997 Asian financial crisis highlighted the importance of strong regulatory frameworks in restoring investor confidence and attracting foreign direct investment (FDI). Researchers have examined the changes in government reform and how they benefit Asian countries. For example, Rammal & Zurbruegg (2006) investigate how the quality of regulatory environments influences intra-ASEAN FDI flows. Their findings indicate that enhancing regulatory quality is crucial for maintaining FDI flows within the ASEAN region. However, RQ cannot be examined independently, as global economic and political forces play a critical role in shaping financial governance across nations.

Global power dynamics influence regulatory frameworks through trade negotiations, diplomacy and policymaking. Powerful nations often exert significant influence over weaker economies, shaping their regulatory environments and investment climates. Public discourse suggests that global trade and economic policies are largely influenced by the dominant economies, shaping the development of financial integration (Gupta, Haddad & Selvanathan, 2024). Gupta et al. (2024) highlight the role of globalisation in accelerating market convergence, emphasising its implications for investor confidence, capital allocation, and stock market returns.

The integration of stock markets is influenced by a variety of factors, including trade policies, monetary policies and global economic conditions. For instance, the 2008 Global

[1] See, Haddad (2023) for a comprehensive literature survey on market integration.

Financial Crisis (GFC) led to significant changes in financial regulation and oversight, impacting market integration across the globe. The COVID-19 pandemic further emphasised the interconnectedness of global markets, as countries implemented various fiscal and monetary policies to mitigate the economic impact of the crisis.

3. Literature Review

Firms play a crucial role in facilitating capital flows within an economy. Capital rises as companies consult with investors to provide additional capital to the business in the form of either debt or equity. Investors invest in assets with a view of risk return trade-off and will risk assets if it rewards them with a higher return, creating a strong relationship between firms and investors; however, to ensure the stock market is reliable, RQ is important in enforcing policies that provide appropriate safeguards and transparency (Clapham et al., 2023). Globalisation has caused major shifts in the economy with greater influence from global factors and developed economies exerting more influence on developing economies, creating a power imbalance. Despite ongoing changes in the convergence of markets over time, researchers have not investigated the relationship between RQ and GP on the changes in stock market correlations over time.

Policy uncertainties and RQ can significantly influence investment decisions. Al-Thaqeb and Algharabali (2019) discussed policy uncertainties as the economic risk associated with unknown future government policies and regulatory frameworks. The uncertainty leads to a further increase in the risk that businesses and individuals will delay their spending and investments due to market uncertainty. The changes in the business environment, investment opportunities, trade and policy are important to consider for future investment. Sound RQ provides a better assessment of the risk-return of assets in businesses.

Global Power has the potential to influence the regulations of weaker nations and investments through trade negotiations and other direct or indirect influences on international trade and investment. Regulatory changes in an economy aim to modify existing regulations and implement targeted adjustments to ensure the effective functioning of markets (Polemis & Stengos, 2020). Thus, within its role, it ensures investors receive quality information, reducing information asymmetry between investors and firms (Cascino et al., 2019)[2]. Over time, global markets have seen a stronger response to financial crises, accounting and corporate governance scandals, and financial innovations (Cascino et al., 2019). The RQ and GP can also affect the efficiency of real investment decisions and traders' welfare.

Previous research has explored regulatory frameworks through the lens of regulatory focus theory (Higgins, 1998). This theory posits that self-regulation operates differently based on individual needs for alignment with personal standards and goals; however, this framework focuses primarily on individual motivation and prevention, such as safety. While studies have examined the role of economic variables in influencing regulatory frameworks (Cesario et al., 2013), they often overlook the impact of the resulting RQ on stock market behaviour.

Research has examined the impact of economic variables on stock market correlations (Dimic et al., 2016). Studies have also examined the impact of relative volatility on stock market correlations (e.g., Prasad et al., 2018; Gupta & Mollik, 2008). However, a gap exists in our understanding of how RQ and GP may impact stock market convergence.

The subsequent section provides an overview of the broader literature in the area of RQ and GP. Our study addresses market integration, specifically the impact of RQ and GP on the market co-movements (time-varying) occurring among financial markets. Therefore, the

[2] This study adopts the definition of RQ as the ability of the government to make and implement policies and regulations that allow and promote economic development.

following section reviews literature concerned with the factors that may influence financial markets' convergence over time.

3.1 Understanding Market Integration

Integration refers to the interconnectedness of individual economies or financial markets, specifically how they move and respond in relation to other markets. This concept highlights the extent to which economic conditions, policy changes, or financial shocks in one market can influence others. In this section, we provide a comprehensive review of the existing literature on both economic and stock market integration. This includes a discussion of key theories, empirical findings, and the factors driving integration across different regions and markets. We also explore the concept of time-varying correlations, which serve as a measure of integration in this study, including how the strength and directions of these relationships change over time. This is followed by a review of the literature on RQ and GP, our two main variables of interest in this study. This approach enables a deeper understanding of the fluctuating nature of market integration, particularly in response to global events, regulatory changes, or shifts in economic power.

Economic Integration

Several factors in the integration of the economy can influence RQ, including trade, policies (monetary and fiscal), and availability of resources. The integration of economies can be influenced by the relationship between different factors, such as trade, RQ, GP, economic policies and culture. Economic integration can take various forms, including free trade areas, customs unions, and economic unions. In a free trade area, tariffs against non-member countries. The common market is a well-known form of economic integration that removes restrictions on trade and movement of factors (see for example, Balassa, 1994). On the

contrary, a monetary union eliminates separate currencies and unifies monetary policies. Within a monetary union, monetary policy is determined collectively rather than individually by each country.

Economic integration necessitates a combination of monetary, fiscal, social, and national policies, and is strengthened through bilateral and multilateral trade agreements (Nicita, 2013). However, inefficiencies in corporate investment and atypical investment behaviour can affect the efficacy of monetary policy (see, for example, Wan & Lee, 2023). Researchers employ fiscal policy variables in empirical models to investigate how governmental macroeconomic tax policies influence economic conditions by assessing spillover effects (Bashir et al., 2024).

Stock Market Integration

Market integration as a process elucidates the factors influencing integration. It facilities cross-border investments, benefiting businesses and promoting overall economic development. These market movements provide social advantages (Lehkonrn, 2015). Market integration changes over time due to various international and domestic factors, including COVID-19, the 2008 Global Financial Crisis (GFC), FDI, International Agreements, and other policies. Click and Plummer (2005) used cointegration techniques to examine stock market integration in Southeast Asia. Their findings indicate that capital markets within ASEAN exhibit integration, demonstrating a "long-run" equilibrium among stock markets[3]. Vieito et al. (2023) explored herding behaviour in the Latin American Integrated Markets (MILA) using ARCH and GARCH type models. They found strong herding behaviour under general market conditions, and moderate to partial herding behaviour under specified market circumstances, such as bull and bear markets. MILA countries have strengthened their regulatory frameworks

[3] Lucey et al. (2017) look at the time-varying relationship between Gold and Inflation.

to ensure a more transparent information environment with improved information quality (Vieito et al., 2023).

Siddiqui (2009) finds that the economies of India and China have segregated during the previous 25 years of growth, despite the evidence that global markets have largely integrated. The globalisation of economies can also affect market growth. Cross-border investments and changes in financial and economic development in different countries have taken different paths over time.

3.2 Time-Varying Correlations

From an investment perspective, an understanding of long-run cointegration can provide information for a longer-term investment horizon for strategic asset allocation and longer-term fixed investment guide. However, portfolio management also aims to exploit short term inefficiencies in markets and engage in tactical asset allocation by reallocating investments. Changes in correlations among markets can be estimated using high-frequency data, and investors can estimate correlations using daily data for international markets. Estimates of time-varying correlations have been estimated among assets using asymmetric dynamic conditional correlations generalised autoregressive conditional heteroskedasticity (ADCC GARCH) type models. GARCH-type models were proposed by Engle (2002), and then an asymmetric variation of the same model was proposed by Cappiello et al. (2006). The ADCC GARCH model of Cappiello et al. (2006) can be used for estimating time-varying correlations between assets simply and has been instrumental in overcoming of the shortcoming of Pearson correlations that implicitly assumed that the correlations for the sample

period remained constant and a single value estimated using Pearson' correlations represented the relationship among variables over the sample period[4].

Researchers have used different GARCH estimation methods in estimating correlations over time. For example, Kalotychou et al. (2014) used the DCC GARCH model for the estimation of correlation for sector portfolios. Similarly, Gupta and Donleavy (2009) used ADCC GARCH to estimate correlations for assets in the construction of internationally diversified portfolios. The objective of our study is to look at the factors that drive these changes in correlations. Time-varying correlations are influenced by several factors, e.g., risk premiums and returns, trade, macroeconomic factors, labour movements, policy frameworks, and globalisation. Gupta and Mollik (2008) and Loretan and English (2000) discussed these factors through the underlying theories of market integration and changes in correlations. These studies document that market integration is influenced by these factors as economies change over time. Loretan and English (2000) also showed that correlations can be affected by other factors without affecting the variances of the underlying series.

3.3 The Influence of Regulatory Quality

Regulatory Quality is defined as the government's ability to make and implement policies and regulations that enable and promote economic development. RQ influences various factors, including trade and investments. The influence of trade and market integration can affect the outcome of the regulation. Production factors have become more freely available with the increased level of integration in global markets. As a result, regulations can become a competitive advantage or disadvantage. They can either attract firms or become one of the reasons that they move to another country with more favourable regulations. The economy's

[4] Over time researchers have used moving window of time to overcome the shortcoming posed by Pearson's correlations. Moving window of time correlations used simple technique by moving time window; for example drop previous month (or week) and add month thus creating a time series of correlations (Tilfani & El Boukfaoui, 2019)

growth depends on the effects of regulation that in turn could affect the country's stage of market integration (see, for example, Sillberberger, 2016). Ofoeda et al. (2024) found that a stronger institutional quality and regulatory framework are required to achieve an efficient financial system.

It is known that stringent regulations come at a high cost, and less stringent regulations are cheaper but less trustworthy. Policymakers need to maintain a balance between the costs and regulatory benefits. Firms in developing and developed economies have different regulatory requirements. Developed economies have significantly more capital and resources, which enable them to develop their portfolio and risk tolerance, allowing for quick decision-making (see, for example, Hemrajani et al., 2023). Developed economies generally have stricter regimes, and firms are required to have regulated entities to demonstrate compliance with the regulations. Developing economies may need to consider adopting regulatory tools and frameworks, which will depend on many factors, including bureaucratic expertise, resource availability, political constraints, and economic impacts (see, for example, Taylor et al., 2012).

In the study of banking regulation, Teixeria et al. (2020) found a positive and statistically significant relationship between investor protection and banking risk. Regarding the determinants of a bank's efficiency, Kalyvas and Mamatzakis (2014) showed that the effect of some banking regulatory measures on banks' efficiency depends on the institutional quality. Evidence from literature in this section suggests that RQ across economies that are at different levels of economic growth and maturity may affect firm performance differently and, as such, influence market performance differently.

3.4 The Role of Global Power Dynamics

Global Power influences factors that involve global dynamic shifts that may lead to market integration. Global economic integration influences international trade, the development of negotiations with global actors, and assists strong legal and institutional frameworks. International trade is influenced by global powers such as the World Trade Organisation (WTO), World Bank and the International Monetary Fund (IMF). GP changes over time and creates a systematic diversity between rising and establishing powers.

Trade and industrial policies interact with overall economy. Dur (2008) looked at the European Union (EU) trade policymaking, which often suggests that delegating trade authority from the national to the European level has strengthened the autonomy of public actors in formulating trade policies. GP's influence on investment is also derived from its potential impact on diversification (Pukthuanthing & Roll, 2009). The less correlated the market is, the more benefits there are in diversifying investments across markets and vice versa.

3.5 Combined Impact of Regulatory Quality and Global Power

Political power addresses the needs of international institutions and policymakers, ultimately affecting market integration by balancing the power between politics and markets. The theoretical understanding of the political factors examines the formation of the WTO, the International Monetary Fund (IMF), and the World Bank. The WTO's establishment was intended to formalise, deepen, and widen an international system of trade regulation and bring greater coherence in global economic policy, drawing on the work of the IMF and the World Bank. This will also help to develop other organisations and unions, including the World Intellectual Property Organisation (WIPO), the International Telecommunications Union (ITU), and the International Organisation for Standardisation (ISO; Wilkinson, 2002).

Economic growth influences policy performance, making the administration's actions central to managing macroeconomic conditions (Agenor et al., 2012). Economic growth has an impact on consumer and investor confidence in the future of the economy; the increased global interdependency enables an enhancement of consumer confidence in the future economy (De Boef et al., 2004). Brumat and Freier (2023) examined the European influence on immigration and refugee policy liberalisation in South America and found that South American policymakers adopted liberal migration legislation in response to the perceived restrictive shifts in EU migration governance, which contributed to unintended consequences. Some migration policies often fail to achieve their declared objectives or have unintended consequences.

3.6 Major Global Influences

Stock market correlations are influenced by local and global factors, including global economic conditions, geopolitical strengths and events, trade policies and tariffs, global market sentiments, and global monetary policies. These factors may influence the returns of stocks differently in each market, and collectively, market returns for each country may be affected by these factors differently.

Environmental awareness: The shift in regulations and global dynamics has brought our attention to the evolving nature of environmental sustainability and its impact on the economy, society, and environment. Several global issues have revealed the importance of environmental awareness, including climate change, limited resources, pollution, and regulations. Corporate strategies will require companies to set goals that consider the shift to a greener economy, shifts in investor behaviour, and ultimately, influence stock market dynamics. Investors in the contemporary investment landscape are becoming more interested in a company's environmental performance alongside traditional financial metrics. Environmental awareness

has sparked a transformation in the green economy, including clean energy, the preservation of natural resources, sustainable transportation, and resource-efficient technologies. Companies leading these transformations may experience increased investor interest and higher stock prices, as they capitalise on the growing demand for sustainable solutions. Different levels of environmental awareness are evident across nations which affect investment returns differently across nations. Shahbaz et al. (2013) found that economic growth and energy consumption increase CO_2emissions, while financial development and trade openness improve environmental quality. Paramati et al. (2017) found a link in stock market returns, investments, and CO_2 emissions globally.

Education level: The relationship between stock market returns and the average education level of the population is diverse. Education can increase financial literacy and investment awareness, though stock returns can also be influenced by the impact of education in many ways. Factors include, financial literacy, risk perception, access to information, and behavioural biases. Mushafiq et al. (2023) found that risk aversion, risky investment intentions, financial literacy, and cognitive abilities guide investment choices. Ultimately, a link exists between increased levels of financial literacy and better investment decisions. Zhang et al. (2023) found that financial education can help improve investors' stock investment performance by building good investment habits and increasing risk tolerance to promote better investment opportunities. Kaustia et al. (2023) found individuals from educated backgrounds have a stronger effect on participating in investments and financial markets. Similarly, Chen et al. (2023) conducted a country-wise study in Taiwan to determine if financial literacy is a determinant of market participation. In summary, education plays a major role in financial markets through the influence of investor decisions making and stock market returns. While

higher level educated individuals are able to make better investment decisions and ultimately influence the dynamics of the stock market returns.

Overall economic growth: Economic growth at both individual and national levels can influence stock market returns, indicating broader economic conditions and investor financial health. Researchers have examined the link between economic strength and stock market growth. Ramzan et al. (2024) argue that growing global sustainability awareness may boost corporate valuations and attract investors. Shapiro (1988) suggests stock market returns should align with long-term economic activity, as stocks reflect expected discounted earnings, but evidence of this relationship is controversial. Fischer and Merton (1984) identified a positive correlation between economic activity and stock market returns, while Ritter (2004) found a negative relationship between GDP per capita and stock returns across 16 countries from 1900 to 2002.

International trade: International trade significantly influences stock market returns by affecting various economic factors and market dynamics. In export-reliant countries, stock market performance is closely tied to global trade, making them sensitive to shifts in demand, trade policies, and exchange rates. Strong export performance generally boosts returns, while trade disruptions or protectionist measures can cause volatility and reduce returns. Trade patterns also impact specific sectors, with agreements and tariff changes affecting market sentiment and investment. Trade liberalisation and tariff reductions often enhance investor confidence, particularly in export-oriented nations. Kose et al. (2006) found higher stock returns in countries more integrated into the global economy, highlighting the role of international trade in shaping stock market correlations. Thus, international trade can serve as a common factor influencing return correlations across stock markets.

3.7 Additional influences

Culture: As market integration develops, so do the changes in culture and its relevance in the process of globalisation. Culture as an integral part of the economy has not attracted much attention as a determining factor influencing market integration and stock market co-movements. Participants from similar cultural backgrounds ought to act similarly in their decision-making process. Globalisation, as a process, continues to evolve with the development of modern transport, the adaptation of culture, and trade, ultimately leading to market integration. Woodside and Zhang (2013) employ cross-cultural experiments to investigate the complex societal and cultural influences on the willingness to test market integration. Whereas, Singh et al. (2017) used data from G20 countries to analyse the impact of culture on the co-movements of the stock markets.

The increase in consumption and travel in international markets has the potential to influence culture. Conversely, culture influences the consumption of goods and services, trade, and travel. Czaika and De Haas (2014) found the increasing globalisation in the world have affected global migration patterns.

Political and other factors: Political power influences the needs of international institutions and policymakers, ultimately affecting market integration by balancing the power between politics and markets (Underhill, 2000). The theoretical understanding of the political factors looks at the formation of the WTO, the IMF and the World Bank. The WTO's establishment is intended to formalise, deepen, and widen an international system of trade regulation and bring greater coherence in global economic policy, drawing on the work of the IMF and World Bank. This will also help develop other organisations and unions, including the World Intellectual Property Organisation (WIPO), the International Telecommunications Union (ITU), and the International Standard Classification of Occupations (ISCO) (Wilkinson, 2002).

The 2008 GFC highlighted the weaknesses in the regulatory systems, which led to substantial changes in financial regulation and oversight. The impact of the crisis led to increased regulatory oversight aimed at improving the monitoring and oversight of major financial institutions. Other impacts include reforms in banking regulation to improve their risk management standards. These impacts can influence the changes in international markets through market integration.

Theoretically, the linkage between international markets is influenced by changes in economic growth, international trade, and stability within economies. In comparison, changes in market integration are measured by the co-movements of asset returns among these markets. Asset returns in the domestic sector are influenced by the investment environment, which includes the relative risk and return patterns of a firm within the economy. To provide a conducive investment environment within an economy, policymakers develop regulations that promote a transparent flow of information and accurate assessment of risk and return for investors. Depending on the domestic needs of policymakers, these regulations can implement policies and regulations that are influenced by both international and domestic factors. If the regulations are influenced by international factors, changes in regulations will lead to a positive change in co-movements, whereas if the changes are more influenced by domestic factors, it will result in a negative change in co-movements.

After reviewing the literature in the area, there is less exploration of the impact of RQ and GP on market integration, specifically examining the changes in stock market correlations over time. The literature review identifies several factors that form the basis of our theoretical model and outlines the variables of our study. While previous studies have examined economic and financial integration from various perspectives, such as trade policies, monetary unions, and industry-level integration, a gap remains in the research area specifically addressing the influence of RQ and GP on stock market co-movements. This gap presents an opportunity for

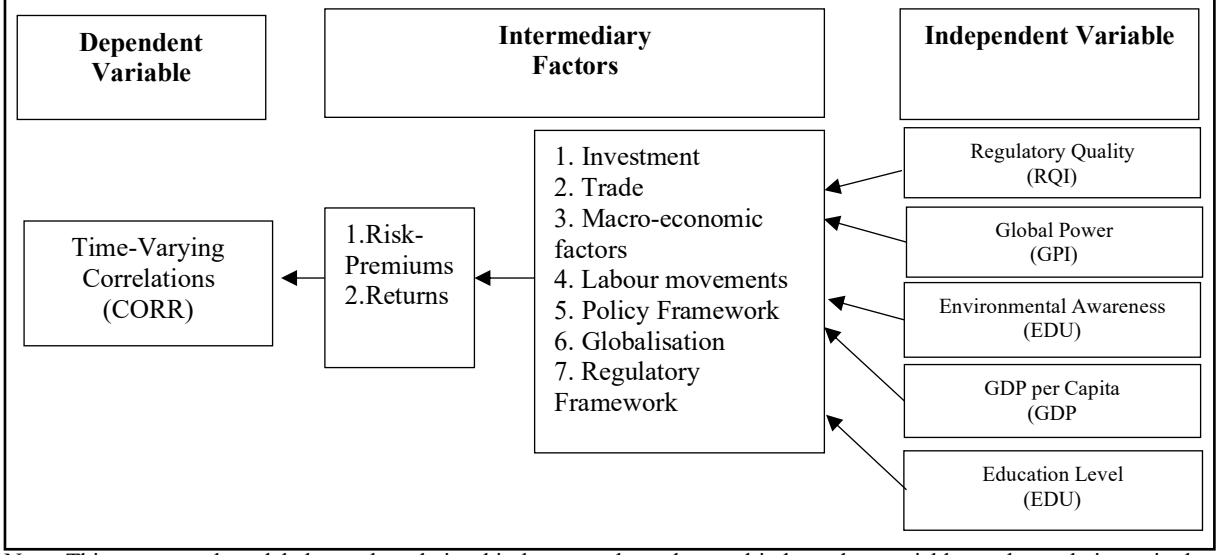
the current study to contribute to the literature by investigating how changes in RQ and GP affect changes in correlations of stock markets across different nations over time.

4. Theoretical and Conceptual Frameworks

Our study is grounded in the theoretical framework of market integration, which posits that the co-movements of stock markets are influenced by domestic and global factors. RQ and GP are key determinants of market integration, as they shape the regulatory environment and influence investor behaviour. Changes in RQ and GP can lead to changes in risk premiums and returns, which in turn affect stock market correlations.

The conceptual framework of this study is illustrated in Figure 1. The independent variables that are RQ, GP, ENV, EDU and GDP influence stock market correlations, that is our dependent variable, through intermediary factors such as investment, trade, macroeconomic conditions, labour movements and policy frameworks. These intermediary factors affect the risk premiums and returns of stock markets, leading to changes in their co-movements over time.

Figure 1: Conceptual Framework



Note: This conceptual model shows the relationship between dependent and independent variables and correlations via the intermediary factors.

The framework highlights the complex interplay between RQ, GP and stock market convergence. By examining these relationships, this study provides a deeper understanding of the factors driving market integration and the implications for global investors and policymakers.

5. Variables

Our study employs seven variables to investigate the relationship between RQ, GP, and stock market correlations. Our dependent variable is time-varying correlations (CORR), which measures change in co-movements of returns of the stock market (see, Bekaert & Harvey, 1995; Cappiello et al., 2006). The correlation index is a self-constructed index used to measure the changes in market co-movements.[5] Our independent variable and main variable of interest is the regulatory quality index (RQI), which reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and

[5] See Section 5 for construction method.

promote private sector development (Kaufmann et al., 2011). Our other independent variable and main variable of interest is the global power index (GPI) which measures the changes in nation's power compared with other nations (Song & Yuan, 2012). A strong nation in GP is increasingly dominant in negotiating bilateral and cultural lateral trade agreements. They are also likely to exert more influence on global policy frameworks.

The rest of the independent variables are as follows. The environmental CO_2 emission (ENV) measures aggregate awareness of individuals regarding the sustainability of the environment (Iqbal & Kalim, 2023). More (or less) if the public is aware of the environment, they are more (or less) likely to behave similarly with the public of other countries, this influences relative policy framework. The educational, tertiary level school enrolment (total gross) (EDU) measures the average education of the public in the country (Fomba et al., 2023). A higher level of education is likely to influence individuals in making more informed decisions that are likely to influence policy makers and both investment decisions. GDP per capita (current US$) (GDP) measures the per capita wealth of individuals in the country. A commonly used control variable in most economic studies. Lastly, trade is also used as a common factor for GDP per capita, which uses the sum of exports and imports of goods and services measured as a share of gross domestic product.

Strong economies are known to have the potential to influence policies in weaker economies, and stronger economies may behave in a similar manner to achieve common objectives. Due to similar interests, there may be a positive influence of RQI on market correlations. However, a weaker level of GP may not significantly impact other countries' policy formations and may be influenced by stronger economies.

6. Data and Methodology

Our study uses panel data from 17 markets of the G20 economies spanning the period from 1996 to 2022. The data includes stock market indexes, regulatory quality index (RQI), the global power index (GPI), environmental awareness (ENV), education levels (EDU), and GDP per capita (GDP). The stock market data is collected on a monthly basis, while other variables are available on an annual basis. The following sections will provide further details of the methodology used in this study.

6.1 Estimating Time-Varying Correlation

The methodology involves three main steps. First, pairwise time-varying correlations are estimated for each market pair. We obtained 136 pairs of correlations. Second, a scaled correlation index is constructed for each market using 136 pairs across 17 markets[6]. This scaling used the capitalisation of each market and the total market capitalisations of all markets. Finally, panel regression analysis is conducted to test the relationship between the scaled correlation indexes and the independent variables.

6.2 Estimating Pairwise Time-Varying Correlations

To capture the dynamic nature of stock market correlations, we use Cappiello et al.'s (2006) Asymmetric Dynamic Conditional Correlation (ADCC) GARCH model to construct pairwise time-varying correlations for each of the market pairs. This model has been extensively used in the estimation of time-varying correlations (Wang et al., 2024). We describe Cappiello et al. (2006) ADCC GARCH approach below. First, we discuss the DCC GARCH framework. First, we discuss the DCC-GARCH framework.

[6] We have backfilled for some countries (Argentina, Brazil, Japan, South Africa and Turkey) to achieve the maximum coverage.

Let r_t be a n x 1 vector of assets returns and assume they are conditionally normal with mean 0 and conditional covariance matrix H_t. That is,

$$r_t \mid I_{t-1} \sim \text{Normal } (0, H_t)$$

This matrix H_t can be decomposed as follows:

$$H_t = D_t R_t D_t$$

where $D_t = diag\ (h_{1,t}^{\frac{1}{2}}, \ldots h_{n,t}^{\frac{1}{2}})$ is a n x n diagonal matrix of time-varying standard deviations from univariate GARCH model with $h_{i,t}^{\frac{1}{2}}$ is on the i[th] diagonal and $R_t = diag\ (q_{1,t}^{-\frac{1}{2}}, \ldots q_{n,t}^{-\frac{1}{2}})$ is the time-varying correlation matrix.

The Dynamic Conditional Correlation (DCC) model follows a two-stage estimation of the conditional covariance matrix H_t.

Stage 1:

Use one of univariate volatility models such as GARCH (Bollerslev et al., 1996) or EGARCH (Nelson, 1991) to fit for r_t and obtain estimate of $h_{i,t}$.

Stage 2:

Asset return r_t is transformed by their estimated standard deviations resulting from Stage 1 and use them to estimate the parameters of the conditional correlations.

For example, consider a case where the asset returns r_t follows as AR (1) process, which can be written as:

$$r_t = \mu + ar_{t-1} + e_t \qquad e_t \mid I_{t-1} \sim \text{Normal } (0, H_t) \tag{1}$$

and the time-varying variance $h_{i,t}$ follows as GARCH (1,1) model,

$$h_{i,t} = w_i + \alpha_i e_{i,t-1}^2 + \beta_i h_{i,t-1} \qquad \alpha_i + \beta_i < 1 \tag{2}$$

When Model (1) is estimated under (2), the standardised residuals ε_{it} can be calculated as

$\varepsilon_{it} = e_{it}/\sqrt{(h_{it})}$ or $\varepsilon_t = D_t^{-1} e_t$

Obviously, $E(\varepsilon_t \varepsilon_t') = D_t^{-1} E(e_t e_t') D_t^{-1} = D_t^{-1} H_t D_t^{-1} = R_t$

Following Engle (2002), we can write the resulting correlation matrix in the standard DCC model as

$$Q_t = S(1-\alpha-\beta) + \alpha(\varepsilon_{t-1}\varepsilon_{t-1}') + \beta Q_{t-1} \quad (3)$$

where Q_t is a symmetric positive definite matrix and S is the unconditional correlation matrix of the standardised residuals ε_t.

As this model does not allow for asymmetries and asset-specific news impact, the modified model that Cappiello et al. (2006) used for incorporating the asymmetrical effect and the asset-specific news impact can be written as:

$$h_{i,t} = w_i + \alpha_i \varepsilon_{i,t-1}^2 + \beta_i h_{i,t-1} + d_i \varepsilon_{i,t-1}^2 I(\varepsilon_{i,t-1}) \quad (4)$$

The indicator function $I(\varepsilon_{i,t-1})$ is equal to 1 if $\varepsilon_{i,t-1} < 0$ and 0 otherwise. For this specification, a positive value for d means that negative residuals tend to increase the variance more than positive ones. The asymmetric effect or leverage effect is designed to capture an often-observed characteristic of financial assets that an unexpected drop in asset prices tends to increase volatility more than an unexpected increase in asset prices of the same magnitude. This can be interpreted to mean that bad news increases volatility more than good news. For the ADCC model, the dynamics of Q are given by:

$$Q_t = (\overline{Q} - A'\overline{Q}A - B'\overline{Q}B - G'\overline{N}G) + A'\varepsilon_{t-1}\varepsilon_{t-1}'A + B'Q_{t-1}B + G'n_{t-1}n_{t-1}'G \quad (5)$$

Equation (5) estimates the correaltions for the dependent varibale. The matrices A, B and G are diagonal parameter matrices. The indicator function $n_t = I(\varepsilon_{i,t-1})$ is equal to 1 if $\varepsilon_{i,t-1} < 0$ and 0 otherwise and $\overline{N} = E[n_t n'_t]$. For $\overline{Q}$ and $\overline{N}$, expectations are infeasible and are replaced with sample analogues, $T^{-1}\sum_{t=1}^{T} \varepsilon_t \varepsilon'_t$ and $T^{-1}\sum_{t=1}^{T} n_t n'_t$, respectively. In this

context, Cappiello et al. (2006) only look for the asymmetrical effects and not the asset-specific news impacts.

6.3 Construction of Scaled Correlation Index

We construct capitalisation-weighted scaled correlation indexes using the correlations of each market pair from the pairwise correlations calculated using the ADCC GARCH model. We estimate 136 pairs[7] of correlations for 17 markets[8]. Using time series from 1996 to 2022 for 136 pairs of correlations, we construct an index for each stock market in our study. To get these capitalisations weighted scaled index for market $i(i = 1,2,..,17)$, we first multiply the correlation of the market i and j, by the capitalisation of market $i(Cap_i)$ and divide by the total of capitalisation of all markets (Cap_m). Since $i = 1,2,..,17$, we have 17 such indexes in relation to market i. We then sum these 17 scaled indices to get an index of correlation for Market i. Since $i = 1,2,..,17$, we will construct 17 indices, one for each market (see Gupta et al., 2024).

We use the following formula to calculate the index for country i (I_i).

$$I_i = \frac{\sum_{j=2}^{17} \rho_{i.j} \times Cap_j}{Cap_m} \quad (6)$$

For example, to construct the index for Argentina, $I_{Argentina}$; j = Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, South Africa, Turkey, the United Kingdom and the United States of America.

[7] We constructed the correlation matrix we look at the unique pairs, to construct the correlation indices we use 136 pairs.

[8] The G20 comprises 19 countries and the European Union (EU). Putting aside the EU countries, we studied data from the other 19 countries. For each, there is available data for RQI, GPI, ENV and GDP for the years 1996 to 2022 however, data for EDU is not available for Russia and Saudi Arabia. Thus, we have omitted them, and the stock markets included in the study are Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, South Africa, Korea, Turkey, the United Kingdom and the USA.

6.4 Data Source and Preliminary Data Analysis

We estimate model given by equation (7) using panel data set using data on 17 subjects (stock markets) over 27 years (1996 to 2022). The variables of interest are the correlations index, regulatory quality index (RQI), global power index (GPI), education (EDU), environment (ENV) and GDP per capita. The RQI measures government policies and regulations and promotes private sector development. The World Bank provides freely accessible data for RQI in percentile ranks, which indicates the country's rank among all other countries[9]. The GPI is a measure of the relative power of nations compared with other nations globally. The Rand Corporation (Heim & Miller, 2020) constructed this index, which incorporates economic factors and is a valid proxy for an individual country's power relative to the overall GP. The EDU represents educational level, which is determined by the tertiary level of education per thousand population in a country (Barro and Lee, 2013). ENV is the overall awareness of sustainability in a country proxied by the CO_2 emissions in tonnes (Paramati et al., 2017) and GDP per capita proxies for the overall growth of the country (Topuz, 2022). CO_2 emissions and GDP per capita data was obtained from the World Bank database[10], and GPI data collected from Rand Corporation[11]. We used annual data for 1996 to 2022 for all variables under consideration, except stock market indices that were used to calculate the correlations collected from Refinitiv workspace databases. Monthly stock market data was used monthly to estimate an ADCC GARCH model (Gupta & Donleavy, 2009). After estimating monthly correlations, we selected end of year correlations to construct annual time series.

[9] Data for RQI, https://data.worldbank.org/indicator/RQ.PER.RNK

[10] Data for these variables have been collected from the various world bank tables: The World Bank. (n.d). World Bank national accounts data and OECD National Accounts data files. https://data.worldbank.org/indicator/NY.GDP.MKTP.CD. The World Bank. (n.d). 2020. Washington, DC: World Resources Institute. https://data.worldbank.org/indicator/EN.ATM.CO2E.PC The World Bank. (n.d). 2022. UNESCO Institute for Statistics. https://data.worldbank.org/indicator/SE.TER.ENRR

[11] We thank Jacob L Heim at the Rand Corporation for providing data and methodology for estimation of GPI which allowed us to complete GPI for all 20 economies. Published paper only shows for a limited number of nations.

Table 1 presents the descriptive statistics for each variable used in our model. The data for RQI, GPI, ENV (CO_2emissions in tonnes)[12], EDU (population of adults with tertiary education)[13], and GDP per capita[14] for all the 17 markets, namely, Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, South Africa, Turkey, the United Kingdom, and the United States for the sample period 1996 to 2022. India had the lowest level of mean RQI at 40.28, and the highest RQI in the United Kingdom at 96.42, followed by Australia at 95.67. Australia had the lowest mean GPI at 0.01, while the GPI of the United States was the highest at 0.27, followed by China at 0.16. The magnitude of the standard deviation (SD) for GPI was small because the mean value of GPI for all markets was very small in magnitude; therefore, we calculated the coefficient of variation (CV) for GPI to understand the dynamics of changes in GPI. CV for RQI ranges between 3% and 16%, and CV for GPI ranges between 4% and 32%, showing a considerable variation in RQI and GPI over time.

South Africa had the lowest mean for EDU, at 14.74 people per thousand of the population with a tertiary qualification, whereas Australia had the highest mean level at 101.85. The CO_2 emissions for India were lowest at 1.37 and highest for the United States of America at 17.46. The United States of America had the highest mean for GDP per capita at 4.91E5, and India had the lowest mean at 1.18E4. Japan had the lowest mean for stock market index at 1.33E4 and the highest for Turkey. Brazil had the lowest mean level for Trade at 25.85 and the highest for Korea at 76.74. The CV of ENV for all countries was close to 10% and higher except for Australia, Canada, Germany, Japan and Mexico. The CV of GDP for all countries was high, indicating high volatility in GDP during the sample period. The CV for the stock market index for all countries was high. Stock market returns are generally volatile and

[12] Data for the CO_2emissions, https://data.worldbank.org/indicator/EN.ATM.CO2E.PC
[13] OECD (2023), Population with tertiary education (EDU; indicator). http://doi.org/10.1787/0b8f90e9-en
[14] OECD (2023), Gross domestic product (GDP; indicator). http://doi.org/10.1787/dc2f7aec-en

dependent on different underlying factors. The J-B statistic suggests a normal distribution; the p-value was not statistically significant in all cases. The J-B test statistic for ENV is above "3" for Argentina, Brazil, Canada, India, Indonesia, Japan, Mexico, and Turkey and below "3" for other markets; the p-value in all countries is statistically insignificant. The EDU J-B test statistic was above "3" in Canada, France, India, Italy, Korea, Turkey and the United Kingdom. It was below "3" in all other cases, with the p-value not statistically significant in most cases except for Canada and Korea. The J-B statistic in the case of GDP was above "3" for France, Indonesia, and Japan and below "3" in all other countries and was not statistically significant. The stock market index for all countries was not normally distributed. We used stock market returns in our analysis to estimate correlations.

Table 1: Descriptive statistics for country-wise data for all variables

Country	RQI (1)			GPI (2)			EDU (3)			ENV (4)			GDP per capita (5)			Stock Market Index (6)			Trade (7)		
	Mean	CV (%)	J-B test (p-value)	Mean	CV (%)	J-B test (p-value)	Mean	CV (%)	J-B test (p-value)	Mean	CV (%)	J-B test (p-value)	Mean	CV (%)	J-B test (p-value)	Mean	CV (%)	J-B test (p-value)	Mean	CV (%)	J-B test (p-value)
(1) Argentina	35.158	45.989	4.628 (0.098)	0.007	8.496	4.380 (0.111)	73.440	24.145	0.783 (0.675)	3.917	11.943	11.769 (0.002)	9.247E4	36.485	0.942 (0.624)	1.397E5	196.150	282.996 (3.533E-64)	31.260	22.717	2.094 (0.350)
(2) Australia	95.678	3.038	2.765 (0.250)	0.014	4.780	1.628 (0.443)	101.849	12.698	1.991 (0.369)	17.168	6.063	2.124 (0.345)	4.344E5	39.495	2.740 (0.253)	4.657E4	31.897	1.178 (0.554)	41.554	5.520	0.202 (0.903)
(3) Brazil	54.710	12.217	1.690 (0.429)	0.031	5.394	2.370 (0.305)	35.366	42.487	2.176 (0.336)	2.060	23.677	102.116 (6.693)	7.427E4	42.966	1.443 (0.485)	4.877E5	67.059	1.553 (0.459)	25.856	21.039	2.997 (0.223)
(4) Canada	94.431	1.781	0.173 (0.916)	0.221	12.503	3.015 (0.221)	67.116	12.769	11.612 (0.003)	15.965	5.081	5.308 (0.070)	3.922E5	29.712	2.886 (0.236)	1.189E5	34.082	0.731 (0.693)	68.202	9.328	2.690 (0.260)
(5) China	42.048	9.835	0.883 (0.642)	0.160	31.129	2.787 (0.248)	29.963	69.602	2.551 (0.279)	5.544	39.926	1.800 (0.406)	-4.994E4	-80.022	2.590 (0.273)	2.463E4	40.568	1.176 (0.555)	44.333	22.370	3.103 (0.211)
(6) France	83.387	4.529	1.923 (0.382)	0.051	15.714	2.258 (0.323)	57.915	11.401	3.499 (0.173)	5.438	12.375	2.058 (0.357)	3.565E5	21.509	3.348 (0.187)	4.448E4	25.604	0.381 (0.826)	56.762	10.876	1.151 (0.562)
(7) Germany	92.824	2.222	0.282 (0.868)	0.060	14.448	1.788 (0.408)	59.942	14.461	2.240 (0.326)	9.476	8.943	2.463 (0.291)	3.867E5	21.509	2.792 (0.247)	7.671E4	46.179	2.103 (0.349)	74.806	19.445	2.003 (0.367)
(8) India	40.288	15.136	1.243 (0.537)	0.071	21.215	1.957 (0.375)	17.877	47.813	3.139 (0.208)	1.373	44.508	56.838 (4.545E-14)	1.181E4	55.180	2.178 (0.336)	4.651E4	85.430	4.764 (0.092)	39.963	26.764	1.773 (0.412)
(9) Indonesia	43.244	26.715	1.203 (0.547)	0.018	13.924	1.864 (0.393)	24.700	41.126	2.909 (0.233)	1.796	33.507	93.806 (4.267E-21)	2.451E4	57.187	3.088 (0.213)	2.988E4	76.379	2.791 (0.247)	52.658	25.014	21.003 (2.749E-5)
(10) Italy	75.288	4.478	1.513 (0.469)	0.032	21.733	2.901 (0.234)	60.979	12.988	3.480 (0.175)	6.767	16.057	2.609 (0.271)	3.106E5	20.162	2.484 (0.288)	264.984	30.738	2.468 (0.291)	53.045	12.971	11.243 (0.003)
(11) Japan	82.007	8.838	2.713 (0.257)	0.064	21.737	2.086 (0.352)	56.300	12.111	2.913 (0.233)	9.247	4.729	4.501 (0.105)	3.866E5	10.666	6.479 (0.039)	1.339E4	25.6326	1.252 (0.534)	28.746	26.337	0.485 (0.784)
(12) Korea	75.718	8.867	1.973 (0.372)	0.025	10.612	1.524 (0.466)	90.077	14.533	7.716 (0.021)	2.450	32.869	1.244 (0.536)	2.233E5	36.873	2.132 (0.344)	8.660E5	63.881	1.097 (0.577)	76.746	19.478	1.467 (0.4802)
(13) Mexico	59.300	8.948	13.058 (0.001)	0.017	4.397	2.567 (0.276)	29.138	32.116	2.563 (0.277)	3.941	8.673	23.703 (7.124E-6)	9.028E4	20.541	2.342 (0.309)	3.097E5	68.017	2.975 (0.225)	60.948	21.606	2.553 (0.278)
(14) South Africa	63.657	11.795	5.343 (0.069)	0.007	3.279	2.462 (0.291)	14.744	48.092	1.244 (0.536)	7.573	10.077	2.202 (0.332)	5.739E4	30.575	1.689 (0.429)	1.540E4	46.764	2.247 (0.325)	52.231	12.373	0.318 (0.852)
(15) Turkey	59.046	9.552	6.262 (0.043)	0.015	7.492	0.851 (0.653)	62.789	61.154	3.371 (0.185)	4.122	23.099	6.679 (0.035)	8.156E4	39.533	2.995 (0.223)	609.162	108.950	379.480 (3.952E-83	52.276	17.616	18.960 (7.634E-5)
(16) The UK	96.428	2.405	1.040 (0.594)	0.045	14.962	3.349 (0.187)	60.630	9.590	38.121 (5.273E-11)	7.573	20.186	2.791 (0.247)	3.900E5	19.235	2.658 (0.264)	3.049E4	22.252	1.103 (0.575)	56.912	9.702	1.388 (0.499)
(17) The USA	92.016	3.295	1.829 (0.400)	0.273	9.972	3.188 (0.203)	82.434	7.334	2.918 (0.232)	17.463	13.277	2.474 (0.290)	4.915E5	24.989	0.825 (0.661)	1.744E4	54.505	10.325 (0.005)	26.139	10.376	1.638 (0.440)

Notes: The Table provides the descriptive statistics for all variables for the data used in the study. RQI measures the regulatory quality percentile; GPI measures relative power of countries over other countries; EDU measures school enrolment at Tertiary level; ENV measure CO_2 emissions metric tonnes per capita of population; GDP per capita measures current US dollar; Stock Market Index measures the index levels of broad-based markets. It is used as the price levels for the aggregate stock market. Trade measures the sum of exports and imports within a given country.

Table 2 presents the relationship between GPI and RQI and group correlations between GPI and RQI are presented in column 2. RQI and GPI are highly correlated in some markets, mostly in developed markets, including Australia, Germany, Japan, Korea, the UK, and the USA. However, group correlations are not too high at 0.135.

Table 2: The Correlation between GPI and RQI at Individual Country Level

Country	**Correlations**
1. Argentina	0.487
2. Australia	0.863
3. Brazil	0.358
4. Canada	-0.663
5. China	0.112
6. France	-0.589
7. Germany	-0.764
8. India	0.503
9. Indonesia	0.839
10. Italy	0.509
11. Japan	-0.858
12. Korea	0.944
13. Mexico	0.343
14. South Africa	-0.176
15. Turkey	-0.365
16. The UK	0.719
17. The USA	0.739
Variable	**Group Correlations**
GPI and RQI	0.135

Note: This table shows the correlations for Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, South Africa, Turkey, the United Kingdom and the United States of America for the period 1996-2022.

We also investigated multicollinearity issues with the data by estimating the variance inflation factor (VIF). Table 3 presents the centred VIF values. Table 4 presents the centred VIF values with trade. As can be seen, all VIF values are well below 5 in both tables, indicating a low multicollinearity level.

Table 3: Testing for Multicollinearity (with GDP per capita)

Multicollinearity Test (coefficient table)								
Unstandardised Coefficients				**Standardised Coefficients**			**Collinearity Statistics**	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	0.334	0.021		15.666	<0.001		
	RQI	0.004	0.000	0.666	10.709	<0.001	0.248	4.036
	GPI	-1.110	0.073	-0.541	-15.111	<0.001	0.748	1.337
	EDU	-0.001	0.000	-0.190	-4.481	<0.001	0.532	1.880
	ENV	-0.008	0.001	-0.304	-6.115	<0.001	0.387	2.581
	GDP	-3.207E-7	0.000	-0.042	-0.631	0.529	0.213	4.705
a. Dependent Variable: Corr								

Note: Intuitively GPI and RQI may have a relationship we separately estimated correlations among GPI and RQI. Correlations GPI and RQI =0.135. This is low and should not cause any issues.

Table 4: Testing for Multicollinearity (with Trade)

Multicollinearity Test (coefficient table)								
Unstandardised Coefficients				**Standardised Coefficients**			**Collinearity Statistics**	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	0.318	0.018		17.555	<0.001		
	RQI	0.004	0.000	0.595	12.512	<0.001	0.416	2.402
	GPI	-1.066	0.073	-0.520	-14.523	<0.001	0.737	1.357
	EDU	-0.001	0.000	-0.215	-5.846	<0.001	0.695	1.440
	ENV	-0.007	0.001	-0.273	-5.381	<0.001	0.367	2.724
	Trade	0.001	0.000	0.098	2.784	0.006	0.761	1.313
a. Dependent Variable: Corr								

Note: Intuitively GPI and RQI may have a relationship we separately estimated correlations among GPI and RQI. Correlations GPI and RQI =0.135, this is low and should not cause any issues

7. Model Estimation and Hypothesis Development

For estimation, since we have data on 17 subjects (stock markets) over 27 years (1996-2022), we perform panel data estimation.[15]

We consider the following model for estimation:

$$Corr_{i,t} = \beta_0 + \beta_{RQI} RQI_{i,t} + \beta_{GPI} GPI_{i,t} + \beta_{EDU} EDU_{i,t} + \beta_{ENV} ENV_{i,t} + \beta_{GDP} GDP_{i,t} + u_{i,t} \quad (7)$$

In Equation (7), we have the dependent variable $Corr_{i,t}$ is the time-varying pairwise correlation and $RQI_{i,t}$, $GPI_{i,t}$, $EDU_{i,t}$, $ENV_{i,t}$ and $GDP_{i,t}$ per capita are the explanatory/ independent variables. The details on these variables are given in section 4.

Returns on assets (overall stock market) across different economies may be differently impacted by global factors. These differential changes in market returns will influence correlations in stock markets over time. Research thus far has looked at underlying factors that influence correlation (for example, see Luo et al., 2003). Similarly, RQ has the potential to change the correlations of markets over time, and the GP of the economies has the potential to influence the changes in market correlations over time. As such, we test the following two sets of hypotheses.

H1: Regulatory quality positively influences stock market correlations.

H_0: $\beta_{RQI} = 0$ (Changes in correlation are not influenced by changes in RQI)

H_1: $\beta_{RQI} > 0$ (Changes in correlations are influenced by changes in RQI)

[15] Multivariate GARCH models are able to estimate relationship between more than two variables however, Cappiello, Engle and Sheppard (2006) proposed model reduced multivariate GARCH models to estimate time-varying correlations in a bivariate context.

H2: Global power positively influences stock market correlations.

H_0: $\beta_{GPI} = 0$ (Changes in correlation are not influenced by changes in GPI)
H_1: $\beta_{GPI} > 0$(Changes in correlations are influenced by changes in GPI)

These hypotheses are based on the premise that stronger regulatory frameworks and greater GP lead to more stable and predictable investment environments, which in turn increase the co-movements of stock markets.

We expect the relationship between RQI, GPI, and correlations to be positive. We do not make *a priori* expectations for the signs of the relationship between correlations and the control variables (EDU, ENV, GDP per capita). The controlled variables, include carbon (CO_2) emissions measured in tonnes per capita (ENV), which is a proxy for a country's overall environmental awareness (Paramati et al., 2017). The impact of high CO_2 emissions may influence investors to invest in stocks that prioritise a green economy by opting for energy-efficient markets and or investments. The tertiary-level education proxies for differences in educational levels (EDU) and perceptions between nations. The increased educational opportunities in developed countries have made it difficult for developing countries to experience a fast-growing education system. A better education system, training, and skills lead to increased innovation and productivity and as such, better investment decision-making (Stewart, 1996). Higher education also provides the public with more evidence and information to use in making informed decisions. As such, their decisions may similarly affect the returns, resulting in positive correlations. However, politically, it may cause conflicts given the context and information provided for education, thus deviating from stock market convergence, and we find a negative relationship with EDU and market correlations. The GDP per capita (GDP) is used as a source of economic growth and the net worth of individuals in the economy. GDP per capita is commonly used as a proxy for economic activity. Its impact on correlations can be positive or negative, depending on the economic maturity of the economy. Trade is used as

a common factor in this study, using the sum of exports and imports as an overall measure of GDP per capita. Similarly, its impact on correlations can be positive or negative, depending on the economic maturity of the economy.

8. Estimation and Discussion of Results

Results for the analyses are first presented for the correlation indices that we estimated for the 17 markets as discussed in Section 6. In the construction of indices, we used the ADCC model for estimating time-varying correlations for each market pair from the 17 markets, namely Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, South Africa, Turkey, the United Kingdom, and the United States of America. We further used the time-varying correlations for market pairs to construct scaled correlations index for each market with other markets. The scaled correlation index was used as the dependent variable in the panel analysis to test if correlations are influenced by the RQI and GPI.

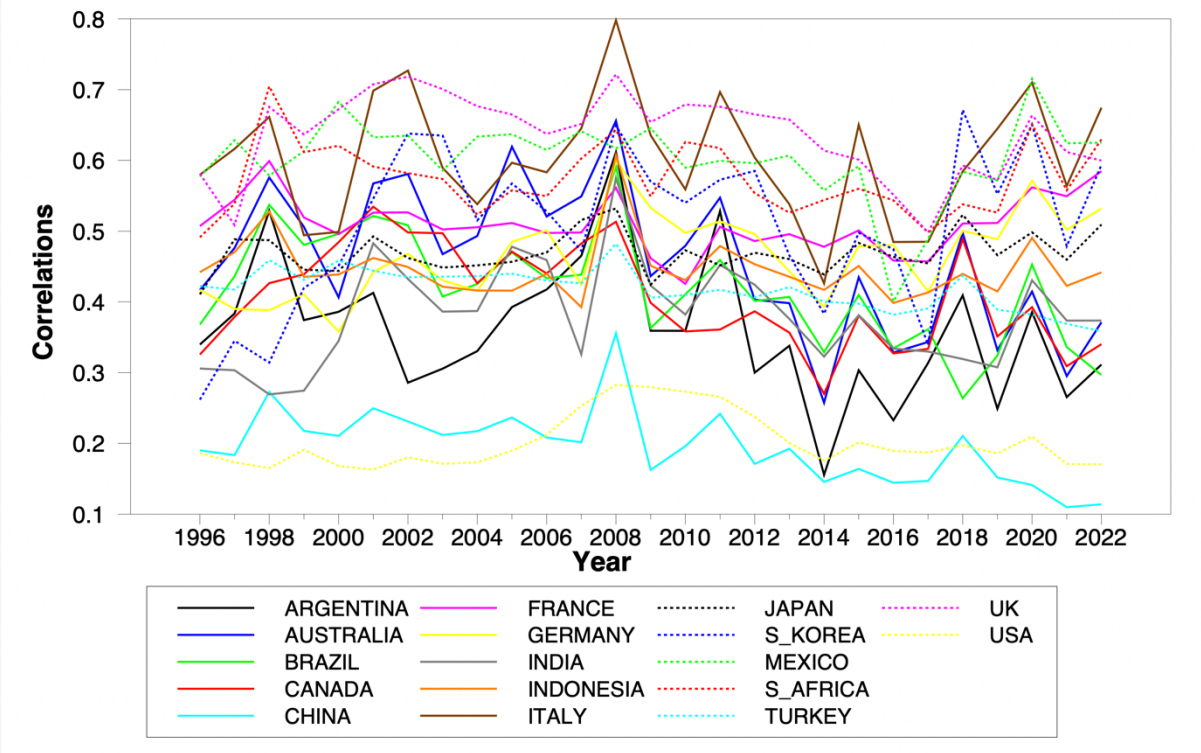
8.1 Time-Varying Correlations

To fulfil the research objective for this study we see conducted a test for relationship between RQ and GP's influence on markets, measured by time-varying correlations. Our study was motivated by the impact of RQ and GP on the convergence of the stock market. The research question directly aims to address the impact of stock market correlations influenced by RQ and GP. This impact on the stock markets was not uniform and was reflected in the correlations of stock market returns. This can be seen in the variations in correlations across different markets overtime.[16]

[16] Detailed results for correlation pairs have not been presented here but can be requested from authors.

From the 136 pairs of correlations estimated we have constructed scaled correlation indexes for each stock market with other markets. This resulted in 17 correlation indexes for 1996 to 2022. These are given in Figure 2. This shows year-wise line graphs from 1996 to 2022 for each of the market. The correlation indexes show that correlations for Australia and the United States of America with other markets are stable and lower than for other markets, and correlations for India are most volatile, followed by China and Argentina. The correlations in Italy are much higher than in most markets except for China and the United States of America; however, towards the end, most markets have higher correlations.

Figure 2: Year-wise index of correlations



Note: The graph shows the year-wise index of correlations for each country Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, South Africa, the United Kingdom and the United States of America.

8.2 Results

Since we are performing panel data estimation, the first step is to investigate the cross-sectional panel independence. This was required as the selection of tests for stationarity (or panel unit root test) of the time series variables is based on whether a panel time series is cross-

sectionally independent (CI) or cross-sectionally dependent (CD). We conducted a Breusch-Pagan (1979; BP) LM test and a Pesaran Scaled LM test for cross-sectional independence. The null hypothesis for the test is H_0: time-series is CI and $H_{A:}$ time series is CD. The results are presented in Table 5. Since the p-value for the two CI tests is less than < 1%, we rejected the null hypothesis at 1% level and conclude that the time series are CD (see for example, Selvanathan et al., 2022; Pesaran, 2007).

Table 5: Test for Cross-sectional dependence (CD)

Variable	Cross-sectional dependence (CD) test	
	Breusch-Pagan LM test	**Pesaran Scaled LM**
(1)	**(2)**	**(3)**
CORR	757.032 (0.000)	37.655 (0.000)
RQI	861.807 (0.000)	44.008 (0.000)
GPI	1981.047 (0.000)	111.872 (0.000)
EDU	2315.062 (0.000)	132.125 (0.000)
ENV	1386.094 (0.000)	75.798 (0.000)
GDP	2322.034 (0.000)	132.547 (0.000)
TRADE	1308.735 (0.000)	71.107 (0.000)

Note: Statistical significance is given in the parenthesis.

Based on the panel dataset there is evidence to suggest for CD, we cannot use conventional tests for the existence of panel unit roots. We performed the commonly used CIPS panel unit test which assumes cross-sectional dependence. The CIPS panel unit test results for each variable under cross-sectional dependence are presented in Table 6. As can be seen, the variables Corr, EDU, ENV and GDP per capita are I(0) and RQI, GPI and TRADE are I(1).

Table 6: CIPS Panel unit root test under Cross-sectional Dependence

Variable	CIPS	P-value	Conclusion
(1)	(2)	(3)	(4)
CORR	-11.536	<0.01	I(0)
RQI	-5.70	>0.10	I(1)
D(RQI)	-3.820	<0.01	
GPI	-0.177	>0.10	I(1)
D(GPI)	-2.743	<0.01	
EDU	-3.126	<0.01	I(0)
ENV	-3.873	<0.01	I(0)
GDP	-178.573	<0.01	I(0)
TRADE	1.432	>0.10	I(1)
D(TRADE)	-2.946	<0.01	

Note: Statistical significance is given in the parenthesis.

We have included a Kao-residual cointegration test (Kao, 1999) in Table 7 with correlations as the dependent variable, to test for the null of no cointegration for dynamic panels, considering Augmented Dicky-Fuller test. As can be seen, the variables under consideration are panel cointegrated.

Table 7: Kao Residual Cointegration test Dependent variable Correlations

	t-Statistic	Probability
ADF (independent variables RQI, GPI, EDU, ENV and GDP)	-4.882	0.000
ADF (independent variables RQI, GPI, EDU, ENV and Trade)	-6.028	0.000

Since some of the variables in Equation (7) are I(1) and others are I(0) (see, Table 7) we could consider using the ARDL formulation of Equation (7) which can be written in the following two forms:

The first ARDL formulation of Equation (8) with long-run and short-run terms can be written as:

$$\Delta(Corr_{i,t}) = \beta_0 + \beta_1 Corr_{i,t-1} + \beta_2 RQI_{i,t-1} + \beta_3 GPI_{i,t-1} + \beta_3 EDU_{i,t-1} + \beta_4 ENV_{i,t-1} + \beta_5 GDP_{i,t-1}$$

$$+\sum_{j=1}^{q}\gamma_{0j}\Delta\left(Corr_{i,t-j}\right)$$
$$+\sum_{j=0}^{q}\gamma_{1j}\Delta\left(RQI_{i,t-j}\right)$$
$$+\sum_{j=0}^{q}\gamma_{2j}\Delta\left(GPI_{i,t-j}\right)$$
$$+\sum_{j=0}^{q}\gamma_{3j}\Delta\left(EDU_{i,t-j}\right)$$
$$+\sum_{j=0}^{q}\gamma_{4j}\Delta\left(ENV_{i,t-j}\right)$$
$$+\sum_{j=0}^{q}\gamma_{4j}\Delta\left(GDP_{i,t-j}\right)+u_{it} \quad (8)$$

If cointegration between Corr, RQI, GPI, EDU, ENV and GDP exists, then an error-correction model can be used to estimate the speed of adjustments of the disequilibrium caused by previous period shocks that re-converges to the long-run equilibrium (see for example, Selvanathan et al., 2023). The error correction form which corresponds to Equations (7) and (8) can be written as:

$$\begin{aligned}\Delta\left(Corr_{i,t}\right) = \alpha_0 &+\sum_{j=1}^{q}\gamma_{0j}\Delta\left(Corr_{i,t-j}\right)\\ &+\sum_{j=0}^{q}\gamma_{1j}\Delta\left(RQI_{i,t-j}\right)\\ &+\sum_{j=0}^{q}\gamma_{1j}\Delta\left(GPI_{i,t-j}\right)\\ &+\sum_{j=0}^{q}\gamma_{1j}\Delta\left(EDU_{i,t-j}\right)\\ &+\sum_{j=0}^{q}\gamma_{1j}\Delta\left(ENV_{i,t-j}\right)\\ &+\sum_{j=0}^{q}\gamma_{1j}\Delta\left(GDP_{i,t-j}\right)+\ \mu EC_{t-1}+u_{i,t}\end{aligned} \quad (9)$$

To test the relationship between RQI, GPI, and the time-varying correlations, we estimated panel regression using time-varying correlation indexes and the variable of interest (RQI) with other control variables for a panel of 17 markets from 1996 to 2022 (27 years).

The long-run and short-run panel estimation results with GDP per capita are shown in Table 8. RQI and GPI showed a positive and statistically significant relationship with correlation indexes among the panel of the 17 countries. Lag selection was based on the Akake information criterion (AIC) representing "1" lag. The estimated long-run coefficients of EDU were positive and statistically significant, and GDP and ENV coefficients were negative and statistically significant. Results for short-run coefficients were not statistically significant except for RQI. The error correction term was negative, less than "1" in absolute value and statistically significant.

Table 8: Panel ARDL Estimation Results with GDP per capita (Dependent variable = Corr)

Variable (1)	Estimates (2)	P-value (3)	Variable (4)	Estimate (5)	P-value (6)
Long-run			Short-run		
RQI	0.007***	0.000	D(RQI)	-0.006***	0.000
GPI	1.185**	0.035	D(GPI)	8.896	0.354
EDU	0.543E-3***	0.000	D(EDU)	0.003	0.326
ENV	-0.009***	0.000	D(ENV)	-0.012	0.172
GDP	-4.21E-06***	0.000	D(GDP)	2.01E-05	0.354
Error correction	-0.405***	0.000			

Note: *** represents 1% significance; ** represents 5% significance and * represents 10% significance.

We also considered trade as an alternative control variable because international trade can be considered as a common factor that may impact the relative returns of stock markets. Results of the estimated model with trade are presented in Table 9. It shows that long-run and short-run stock market returns relationship with RQI and TRADE were positive and significant at 1% level. EDU was negative and significant in the long-run and in the short-run still negative

but insignificant. The error correction term was negative, less than one in absolute value and statistically significant.

Table 9: Panel ARDL Estimation Results with Trade variable

Variable (1)	Estimates (2)	P-value (3)	Variable (4)	Estimate (5)	P-value (6)
Long-run			Short-run		
RQI	0.004***	0.000	D(RQI)	-0.006***	0.001
GPI	1.481***	0.004	D(GPI)	10.938	0.418
EDU	-0.001***	0.000	D(EDU)	-0.031	0.302
ENV	0.004***	0.000	D(ENV)	-0.031***	0.006
TRADE	0.004***	0.000	D(TRADE)	0.002***	0.009
Error correction	-0.401***	0.000			

Note: *** represents 1% significance; ** represents 5% significance and * represents 10% significance.

Our results from the panel ARDL with Trade, presented in Table 9, indicate that the relationship between trade and correlations is also positive and significant. However, the coefficient for Trade is small. From an economic standpoint, we would expect the coefficient of trade to be small, as RQI, GPI and correlations are indexes, whereas trade figures are expressed as a total of exports and imports as a proportion of GDP. Variations in RQI were small. As such, we divided the data based on RQI into four-quarters to re-estimate the ARDL models to see if the results for each of the quartiles were different.[17]

We use Ramsey RESET test (Ramsey, 1969) to detect for omitted variables and functional form of the model. Null hypothesis that coefficients are insignificant is rejected accepting the alternative that the functional form is correct, and our model does not suffer from omitted variable bias.[18]

[17] This analysis based on quartiles is presented in Appendix A. The notable difference is the relatively low significant result for GPI for the 3rd quartile (significant at 10% level) with the GDP per capita and fourth quartile with trade control variable (significant at 5% level). RQI was consistently significant at 1% level in all quartiles; however, the overall findings do not change.

[18] We have tested for omitted variables using Ramsey rest test (Ramsey, 1969) and find no evidence of omitted variables. Additionally, The panel ARDL (Autoregressive Distributed Lag) model is inherently designed to mitigate endogeneity concerns to some extent because, It controls for lagged dependent variables, which accounts for autocorrelation and dynamics. It incorporates lags of the independent variables, allowing for dynamic adjustments and reducing contemporaneous feedback issues (Pesaran, Shin & Smith (1999).

The RQI provides a measure for RQ, that influences markets, investment decisions and institutions. The GPI compiled by the Rand Corporation accounts for a country's economic activity. The independent variables GDP, EDU and ENV are influenced by the changes in correlations. International trade is an alternative variable considered as a common factor across financial markets that can also impact returns and the changes in stock market correlations. International trade creates better firm performance and allows for comparative advantage, including other market characteristics such as, firm strategies, resources and capabilities (Kaleka & Morgan, 2017). Caporale and Girardi (2015) examined the bilateral trade flows and financial linkages in business cycle co-movements across economies, particularly in Latin America, taking into consideration the increased level of global market integration.

9. Concluding Remarks

Our study examines the role of RQ and GP in shaping stock market correlations. By answering the question, "Does regulatory quality and global power positively influence stock market correlations overtime?" This is the first study to develop a theoretical relationship between RQ, GP, and stock market correlations. We provide empirical evidence for this theoretical relationship using a sample of selected markets from G20 countries. Previously, changes in market integration have been looked at from a financial market perspective and or from a consideration of macroeconomic factors. The findings of our study provide an understanding of the factors that drive changes in time-varying correlations contributing to market integration.

Research in time-varying correlations, thus far, has assumed that the changes in correlations among market pairs are caused by the changes in the volatility of the underlying market pairs; however, the literature in this area does not appropriately address the reasons for the changes in relative risk (underlying volatility) of these markets. Our study provides a

theoretical argument to establish the relationship between RQ, GP, and the intermediary variables that influence the risk premium and returns of the underlying markets. Changes in risk premiums in the underlying markets may cause changes in the relative returns of these markets, thereby changing the co-movements over time. RQ and GP also have the potential to influence the overall returns of the markets without influencing the risk premia by influencing the co-movements of the markets.

Based on panel unit root tests indicating cross-sectional dependence, we employed the ARDL model for our analysis. Our estimated results support the hypothesis that RQ and GP have a positive impact on the correlations of the stock markets. The coefficients of RQI and GPI are statistically significant. Similarly, the coefficient of RQI and GPI are positive when trade is included as an alternative variable to account for common factors that can influence stock returns.

The estimated coefficients for other variables EDU and ENV were statistically significant and the magnitude of the estimated coefficients for control variables were found to be very small. This suggests that the relationship may not be economically significant. The results suggest that ENV has a negative relationship with market correlations. It may be because environmentally aware people may focus more on local factors, thus affecting correlations negatively.

Findings of the study make an important contribution to market integration and its influence from RQ, GP and stock market correlations. Our findings are similar to Gupta et al., (2024) who find GP to positively influence stock market convergence over time in a group of 11 markets among G20 economies. Our findings have significant implications for policymakers, regulators, and investors, particularly in the context of global portfolio diversification and the development of international trade agreements. RQ and GP are important factors to consider for investors when making financial decisions, as these decisions

have the potential to influence changes in investment behaviour. For example, a portfolio manager from a market with a strong GP or RQ who seeks diversification benefits is less likely to benefit from diversifying into markets that have stronger and increasing GP or stronger RQ. Collectively, investors from stronger markets will benefit from investing in markets with weaker GP and weaker RQ. Policymakers also have a strong influence on trade policies in bilateral and multilateral trade negotiations.

Our study experiences shortcomings, beginning with the availability of the data period. Stock market data is generally available on a daily, weekly, and monthly frequency basis (we used monthly data for stock prices). However, data for ENV, EDU, GDP and Trade variables were only available on a quarterly or annual basis, except for data for GPI and RQI, which are only available on an annual basis. Secondly, due to the unavailability of data for certain markets, we had to eliminate two markets and work with only 17 markets. Finally, some of the unique differences in pairwise correlations were lost in the construction of scaled indexes. The benefit of index construction is that we can draw conclusions for global markets, which would not be possible otherwise. However, these shortcomings should not hinder the drawing of conclusions for this study. Future research could explore the impact of other factors, such as cultural and political differences, on stock market convergence. These 17 markets give a good representation of the G20 markets. Twenty-seven years of data provided a sufficient window of time for our analysis and the conclusions drawn to be valid.

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Appendix A: Panel ARDL Estimation Results for quartiles (Dependent variable = Corr)

Table A1: Panel ARDL Estimation for 1st Quartile with GDP per capita

Variable (1)	Estimates (2)	P-value (3)	Variable (4)	Estimate (5)	P-value (6)
Long-run			Short-run		
RQI	0.009	0.000	D(RQI)	-0.009	0.172
GPI	-1.548	0.000	D(GPI)	32.893	0.027
ENV	0.013	0.1759	D(ENV)	-0.014	0.057
EDU	-0.006	0.013	D(EDU)	-0.002	0.581
GDP	-1.09E-06	0.638	D(GDP)	7.68E-07	0.680
Error correction term	-0.442 (0.031)				

Note: Statistical significance for error correction term is given in the parenthesis. For all other coefficients it is in columns 3 and 6 labelled as p-value.

Table A2: Panel ARDL Estimation for 1st Quartile with Trade

Variable (1)	Estimates (2)	P-value (3)	Variable (4)	Estimate (5)	P-value (6)
Long-run			Short-run		
RQI	0.010	0.000	D(RQI	-0.010	0.121
GPI	-1.766	0.000	D(GPI)	25.614	0.114
ENV	0.019	0.022	D(ENV)	0.010	0.409
EDU	-0.008	0.000	D(EDU)	0.001	0.291
TRADE	0.001	0.618	D(TRADE)	-0.002	0.212
Error correction term	-0.353 (0.036)				

Note: Statistical significance for error correction term is given in the parenthesis. For all other coefficients it is in columns 3 and 6 labelled as p-value.

Variable (1)	Estimates (2)	P-value (3)	Variable (4)	Estimate (5)	P-value (6)
Long-run			Short-run		
RQI	0.001	0.070	D(RQI)	-0.008	0.002
GPI	0.784	0.424	D(GPI)	13.052	0.155
ENV	-0.0129	0.000	D(ENV)	-0.024	0.431
EDU	0.001	0.2742	D(EDU)	0.000	0.984
GDP	-2.14E-06	0.011	D(GDP)	-2.59E-06	0.386

Error correction term	-0.893 (0.001)

Table A3: Panel ARDL Estimation for 2nd Quartile with GDP per capita

Note: Statistical significance for error correction term is given in the parenthesis. For all other coefficients it is in columns 3 and 6 labelled as p-value.

Table A4: Panel ARDL Estimation for 2nd Quartile with Trade

Variable (1)	Estimates (2)	P-value (3)	Variable (4)	Estimate (5)	P-value (6)
Long-run			Short-run		
RQI	0.007	0.000	D(RQI	-0.009	0.000
GPI	3.050	0.000	D(GPI)	-6.338	0.662
ENV	-0.028	0.000	D(ENV)	-0.012	0.822
EDU	-0.002	0.007	D(EDU)	-0.011	0.074
TRADE	0.001	0.032	D(TRADE)	0.001	0.771
Error correction term	-0.762 (0.004)				

Note: Statistical significance for error correction term is given in the parenthesis. For all other coefficients it is in columns 3 and 6 labelled as p-value.

Table A5: Panel ARDL Estimation for 3rd Quartile with GDP per capita

Variable (1)	Estimates (2)	P-value (3)	Variable (4)	Estimate (5)	P-value (6)
Long-run			Short-run		
RQI	0.005	0.000	D(RQI)	-0.004	0.098
GPI	5.917	0.070	D(GPI)	-53.204	0.590
ENV	0.011	0.376	D(ENV)	-0.105	0.021
EDU	3.29E-04	0.418	D(EDU)	-0.024	0.042
GDP	-9.10E-06	0.006	D(GDP)	4.45E-06	0.569
Error correction term	-0.916 (0.077)				

Note: Statistical significance for error correction term is given in the parenthesis. For all other coefficients it is in columns 3 and 6 labelled as p-value.

Table A6: Panel ARDL Estimation for 3rd Quartile with Trade

Variable (1)	Estimates (2)	P-value (3)	Variable (4)	Estimate (5)	P-value (6)
Long-run			Short-run		
RQI	0.018	0.000	D(RQI	-0.009	0.208
GPI	-91.124	0.000	D(GPI)	101.875	0.285
ENV	-0.201	0.000	D(ENV)	-0.050	0.337
EDU	0.002	0.0072	D(EDU)	-0.031	0.029
TRADE	0.026	0.000	D(TRADE)	0.011	0.161
Error correction term	-0.214 (0.180)				

Note: Statistical significance for error correction term is given in the parenthesis. For all other coefficients it is in columns 3 and 6 labelled as p-value.

Table A7: Panel ARDL Estimation for 4th Quartile with GDP per capita

Variable (1)	Estimates (2)	P-value (3)	Variable (4)	Estimate (5)	P-value (6)
Long-run			Short-run		
RQI	0.004	0.000	D(RQI)	-0.001	0.7988
GPI	15.807	0.000	D(GPI)	123.221	0.291
ENV	0.010	0.032	D(ENV)	-0.035	0.824
EDU	0.004	0.043	D(EDU)	-0.022	0.001
GDP	-1.94E-05	0.000	D(GDP)	-1.91E-04	0.221
Error correction term	-0.423 (0.497)				

Note: Statistical significance for error correction term is given in the parenthesis. For all other coefficients it is in columns 3 and 6 labelled as p-value.

Table A8: Panel ARDL Estimation for 4th Quartile with Trade

Variable (1)	Estimates (2)	P-value (3)	Variable (4)	Estimate (5)	P-value (6)
Long-run			Short-run		
RQI	0.016	0.000	D(RQI	-0.004	0.472
GPI	-2.092	0.034	D(GPI)	-20.149	0.498
ENV	0.404	0.000	D(ENV)	-0.091	0.577
EDU	-0.028	0.000	D(EDU)	-0.008	0.600
TRADE	-0.001	0.397	D(TRADE)	0.001	0.723
Error correction term	-0.476 (0.031)				

Note: Statistical significance for error correction term is given in the parenthesis. For all other coefficients it is in columns 3 and 6 labelled as p-value.

Appendix B: Quantile Regression results with GDP per capita (Dependent variable =Corr)

Variable	Quantile (25%)	Quantile (50%)	Quantile (75%)
RQI	0.004 (0.000)	0.003 (0.000)	0.004 (0.000)
GPI	-0.866 (0.000)	-1.117 (0.000)	-1.309 (0.000)
ENV	-0.009 (0.000)	-0.005 (0.001)	-0.006 (0.001)
EDU	-7.58E-04 (0.017)	-8.13E-04 (0.000)	-0.001 (0.000)
GDP	-7.87E-07 (0.158)	-6.13E-07 (0.300)	1.02E-07 (0.900)

Note: Statistical significance is given in the parenthesis.

Appendix C: Quantile Regression results with Trade variable (Dependent variable =Corr)

Variable	Quantile (25%)	Quantile (50%)	Quantile (75%)
RQI	0.003 (0.000)	0.003 (0.000)	0.003 (0.000)
GPI	-0.914 (0.000)	-1.096 (0.000)	-1.259 (0.000)
ENV	-0.008 (0.000)	-0.004 (0.005)	-0.003 (0.143)
EDU	-7.68E-04 (0.005)	-0.001 (0.000)	-0.001 (0.000)
TRADE	5.10E-04 (0.176)	6.07E-04 (0.065)	0.001 (0.002)

Note: Statistical significance is given in the parenthesis.