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The impact of economic freedom on economic growth in countries with high and low regulatory quality—lessons for Viet Nam

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This article aims to analyze the impact of economic freedom on economic growth, considering the influence of varying regulatory qualities (RQ) among nations. Analyzing data from 54 countries from 2008 to 2022, Bayesian linear regression results on two sample groups, categorized based on RQ, reveal that economic freedom positively affects economic growth regardless of high or low RQs. Additionally, separate regression analyses for Vietnam indicate no significant difference from other countries. However, control variables uncover differences between the two groups, particularly in corruption control and financial development, with their effects varying across nations. Notably, in Vietnam, government expenditure on education, inflation, fixed capital formation, and population growth rate exhibit regression outcomes contrary to those of other countries in the two groups. The suggested policy implications align with the regression results, aiming to strengthen economic freedom. They support policymakers in achieving this.

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Introduction

Economic theory posits that economic freedom influences motivation, production efforts, and resource utilization efficiency. Since the 1980s, Ricardo advocated for free markets to stimulate the economy, while Adam Smith, alongside other economists, argued that the freedom to choose and allocate resources, competition in business, trade, and assurance of property rights are central to economic progress (North and Thomas, 1973). The meaning of economic freedom has been extended in Smith's (2002) research when he elucidated how the invisible hand of the market impacts increasing economic prosperity. While Von Mises, May (2005) expounded upon the doctrine of freedom, emphasizing the harmony of rightful benefits in a free society based on the principle of private ownership of the means of production. Additionally, this study suggested that the principles of liberalism hinge on knowledge, a profound appreciation of private property, and social cooperation. Von Mises, May (2005) juxtaposed liberalism with other potential social order systems such as socialism, communism, and fascism.

In his study, Gwartney (2008) also echoed Friedman's emphasis on the detrimental effects of restrictions on trade freedom and capital flow management, which can limit trade profits, diminish output and earnings of economic activities, and hinder investment incentives.

Hayek (2020), a key figure in neoliberalism, argued that government economic intervention would suppress freedom—the primary growth driver. Broad competition, global trade, and asset reliability are foundational pillars of economic growth (Mushtaq et al., 2022). It is widely believed that free societies have emerged and developed solely due to economic freedom. This approach to economic management is deemed far more effective than any alternative (Ahmed et al., 2023).

The empirical evidence presented thus far supports the idea above, although employing diverse research methodologies across various regions and periods has further confirmed the significant momentum that economic freedom contributes to economic growth (Abate, 2022; Sulasni and Surbakti, 2022; Sekunmade, 2021; Bergh and Bjørnskov, 2021; Wu, 2011; Altman, 2020; Gwartney et al., 2022; Panteli and Delipalla, 2022).

Economic freedom is intricately linked to institutional quality. Strong regulatory quality preserves economic freedom and fosters macro-political stability, high-quality regulations, a conducive business environment, and effective corruption control. This supports a more efficient economic system, minimizing unnecessary operational costs for businesses and stimulating economic growth (Kesar and Jena, 2022; Cebula and Foley, 2012). However, studies with controversial findings exist, such as Doucouliagos (2005) or Uzelac et al. (2020). Uzelac et al. (2020) demonstrated that economic freedom in certain aspects fails to yield a significant impact and may even negatively influence economic growth. Additionally, Mahran (2023) observed that organizational quality did not significantly affect development in Nigeria Mahran (2023) or China (Brkić, 2020).

The exception underscores the interplay between economic freedom, regulatory quality, and economic growth. This has inspired the authors to undertake extensive research using a large global sample, employing Bayesian regression methodology to analyze two groups of countries with differing levels of regulatory quality. Moreover, the authors conduct a separate analysis of Vietnam, which falls within nations with low regulatory quality. This approach allows for the identification of unique factors specific to the country. Subsequently, policy recommendations tailored to the particular contexts of the country groups and Vietnam are derived.

In addition to the general introduction, the remaining parts of the study are arranged as follows: Definitions; The relationship

between economic freedom and economic growth; Description of variables and research data; Research results and discussion; Conclusion and policy implications.

Definitions

Economic freedom. Adam Smith, a distinguished economist, addressed the concept of economic freedom early on, particularly about the free market, highlighting the pivotal role of competition and market freedom in fostering development. Indeed, economic freedom plays a crucial role in assessing and comprehending a country's economic and political development. Factors such as private property rights, business management, and market freedom are pivotal in determining the extent of economic freedom. Economic freedom offered a robust, accurate strategy for progress and economic realization (Torstensson, 1994). No government can ensure absolute freedom for its citizens, and governments that permit a high degree of freedom hold varying perspectives on what constitutes essential freedoms. This aligns with the nature of freedom, enabling individuals and societies to chart a course toward prosperity (Kesar and Jena, 2022). Numerous empirical studies have elucidated the correlation between economic freedom and economic advancement, as Clark and Lawson (2008) and Cebula and Mixon (2012) demonstrated. However, these studies often utilize only one or two economic freedom indicators, such as property rights, labor freedom, and economic openness, or simultaneously regress multiple diverse economic freedom indicators (Kesar and Jena, 2022).

Later, in 1995, organizations such as the Heritage Foundation and the Fraser Institute took steps to assess economic freedom among countries by constructing indices and releasing the annual World Economic Freedom Rankings. The Heritage Foundation defined economic freedom as the absence of government coercion or restriction on the production, distribution, or consumption of goods and services beyond what is essential to safeguard and uphold citizens' freedom. The Heritage Foundation's rankings served as a valuable resource for research and aided businesses and investors in making informed decisions when selecting markets and business partners (Ecer and Zolfani, 2022).

Here are the details of the ranking from The Heritage Foundation. The Economic Freedom Index is based on four main aspects and 12 component factors, as follows:

Rule of Law is the first main criterion, including three sub-criteria such as property rights (1), government integrity (2), and judicial effectiveness (3).

Government size, the second main criterion, includes three sub-criteria such as government spending (4), tax burden (5), and fiscal health (6). Regulatory efficiency is the third main criterion, including three sub-criteria such as business freedom (7), labor freedom (8), and monetary freedom (9).

Finally, the main criterion for open markets includes three sub-criteria, such as trade freedom (10), investment freedom (11), and financial freedom (12).

The Heritage Foundation uses a simple average weight method to determine the economic freedom index, considering equal weight values for the criteria (Ecer and Zolfani, 2022).

Economic growth. Economic growth is commonly defined as the augmentation of a country's production capacity, signifying its ability to produce more goods and services over time while discounting the impact of inflation. Furthermore, it is perceived as a sustainable enhancement in the quality of life, closely intertwined with the economic well-being of a nation's populace. This progression often materializes through the accumulation of material

wealth, the development of human resources, and advancements in technology (Deardorff, 2001).

Various indicators and methodologies have been employed to gauge the level of economic growth, including the GDP growth rate and per capita GDP growth. Additionally, indices such as the Human Development Index (HDI) and Sustainable Development Index (SDI) offer a multidimensional perspective on development, encompassing economic factors and aspects related to quality of life and social welfare.

However, economic growth is frequently quantified primarily through a country's gross domestic product (GDP), which needs to account for unpaid social services such as childcare and housework. Nevertheless, economic growth remains a cornerstone of a nation's economic growth, as it generates overall benefits across various economic sectors and has the potential to enhance the quality of life through the equitable distribution of assets (Razmi and Refaei, 2013).

Countries boasting high GDPs often foster conducive environments for private enterprises, creating employment opportunities and bolstering income levels. Higher-income consumers are empowered to make discretionary purchases, thereby augmenting the level of economic freedom within the nation. Consequently, economic freedom and economic growth are interdependent, synergistically contributing to the holistic advancement of an economy (Brkić, 2020).

Regulatory quality. Regulatory quality serves as a crucial determinant in the capacity of the regulatory system to ensure transparency, fairness, and efficiency in managing economic and social activities.

Assessment of a country's regulatory quality encompasses various aspects, including the transparency and fairness of regulations, the ability to mitigate manifestations of corruption, and effectiveness in policy implementation, establishing an accessible and equitable business environment. Conversely, deficient regulatory quality can give rise to market risks and pose challenges to fairness and development (Ciftci and Durusu-Ciftci, 2022).

The World Bank has developed the Regulatory Quality Index, which gauged "perceptions of the government's ability to formulate and implement sound policies and regulations that permit and promote the development of the private sector" (World Bank, 2018). Similarly, the Organization for Economic Cooperation and Development has devised the Policy and Regulatory Governance Index, a composite index measuring three primary principles: stakeholder participation, regulatory impact analysis, and post-implementation evaluation. However, within the scope of this article, we adhere to the methodologies outlined by the World Bank, which involve:

Scorecard criteria. Utilizing a scorecard to evaluate each country based on a spectrum of criteria related to institutional quality, encompassing transparency, fairness, and enforcement.

Opinion polls. Conducting opinions among businesses, business communities, and other stakeholders to gauge perceptions of institutional quality and enforcement efficacy.

Document analysis. Examining legal documents, reports, and other pertinent documents to understand how regulations are formulated and enforced in specific countries.

International comparison. Comparing countries' progress in establishing and implementing policies and regulations to support private sector development.

Ultimately, countries are ranked on a scale from 0 to 100, with 0 representing the lowest ranking and 100 indicating the highest ranking (Kaufmann et al., 2011).

The relationship between economic freedom and economic growth in the context of regulatory quality

In the historical and theoretical context of the relationship between economic freedom and economic growth, empirical studies employing diverse research scopes and methodologies have depicted a complex, multidimensional understanding of how economic freedom influences economic growth. Additionally, the quality of regulation exhibits a degree of compatibility with economic freedom in certain aspects, thereby impacting economic growth. With such intertwined relationships, scholars have embarked on endeavors to comprehend the intricate interplay between the regime of economic freedom and its role in shaping economic growth in conjunction with institutional frameworks (Fig. 1).

Encouraging economic growth is a well-established endeavor governments pursue (Djankov et al., 2008). Economic growth can stem from endogenous resources like natural resources, capital, and human capital, as well as exogenous forces such as foreign direct investment, technology transfer, or global trade, particularly in an era where globalization is irreversible.

Consequently, governments exert considerable effort to harness all available resources to foster economic growth for their nations. Numerous studies have been conducted to assess and analyze the factors driving economic growth, with research on economic freedom holding particular significance. The findings of these studies consistently reveal a robust correlation between various indicators of economic freedom and economic growth among countries (Dawson, 1998; De Vanssay and Spindler, 1994; Spindler and Miyake, 1992).

One of the pioneering contributions in this field was made by Islam (1996), who highlighted that countries with higher income levels tend to demonstrate greater economic freedom, while conversely, low-income countries exhibit lower levels of economic freedom. Similarly, Acemoglu et al. (2005) observed that reduced economic freedom in low-income countries can precipitate a decline in per capita income.

Furthermore, a nation with fewer regulations tends to have greater economic freedom than one with more regulations. Greater economic freedom indicates that the government has established an adequate legal framework and robust law enforcement mechanisms to protect property rights and individual rights (Gwartney and Lawson, 2003). Conversely, low economic freedom is observed when the government imposes certain types of taxes, policies, or expenditures that contradict citizens' choices, freedoms, and market coordination. Based on this observation, we can conclude that the higher a country's level of economic freedom, the more rapid its economic growth and development.

According to Friedman (2010), economic freedom can promote economic growth by influencing the efficient utilization of resources. On the other hand, Mamun et al. (2020) focused not on external resources but on demonstrating that economic growth is driven by a range of endogenous factors, particularly capital formation, regulatory quality, research, and development. The indirect positive impact of economic freedom on economic growth through stimulating physical capital is also established by studies such as (Doucouliagos and Ulubasoglu, 2006; Gwartney et al., 2004; Chheng, 2005; and Al-Gasaymeh et al., 2020). Smaller-scale research by Bennett (2016), conducted across 50 U.S. states and 10 Canadian provinces, also emphasized the positive influence of economic freedom. Specifically, it highlights that components of economic freedom, such as government size,

taxation, and labor freedom, lead to an increase in per capita income.

Endogenous growth theories offer a theoretical foundation for understanding the relationship between market openness and economic growth within the framework of deepening globalization. Numerous studies have explored the correlation between economic freedom indicators such as foreign direct investment, free trade, and economic growth. For instance, Gurgul and Lach (2011) investigated the relationship between economic freedom, foreign direct investment, and economic growth during the transition period of EU countries from 2000 to 2009. Their findings underscored the positive association between enhanced economic freedom, growth, and income development, both theoretically and empirically.

Economic freedom can positively impact economic growth through avenues such as knowledge transfer, capital accumulation, and an improved investment climate (Bayar, 2016). Similarly, Kacprzyk (2016) examined the link between economic growth and five dimensions of economic freedom across a cohort of 28 European Union countries over five years. Kacprzyk (2016) uncovered evidence that free trade, secure property rights, and regulatory policies positively influence economic growth.

Continuing this line of research and broadening its scope, Sulasni and Surbakti (2022) conducted a study on East and Southeast Asian countries from 2000 to 2020, a period characterized by economic globalization trends and FDI attraction strategies. Their findings again affirmed that economic freedom and foreign direct investment (FDI) positively impact economic growth, while inflation negatively influences it. Similarly, a study by Ciftci and Durusu-Ciftci (2022) provided evidence of a causal relationship between economic freedom, FDI, and economic growth for the top FDI-attracting countries between 1995 and 2019. These studies contributed to understanding the crucial role of economic freedom in promoting global competition and international trade, both integral factors for economic growth (Altman, 2020; Ahmed et al., 2023; Duan et al., 2022). Again, empirical evidence suggests that countries with more significant economic freedom experience higher economic growth over the long term. Furthermore, economic freedom is identified as one of the drivers behind cross-border disparities in economic growth (Duan et al., 2022).

Economic freedoms play a significant role in a country's economic growth and prosperity (Brkić et al., 2020) and are deemed crucial for bolstering investment in some nations (Assi et al., 2020). Countries characterized by high levels of economic freedom typically exhibit less government intervention and enjoy stable markets (Economou, 2019; Puška et al., 2023). However, exceptions exist to the notion that economic freedom alone guarantees investment attractiveness, particularly when confronted with factors such as democracy and economic growth (Brkić et al., 2020). Some studies have provided cautionary assessments regarding the complexity of this relationship, suggesting that alongside its positive aspects, economic freedom may exhibit a negative correlation or be statistically insignificant concerning growth (Doucouliagos, 2005). Moreover, a single measure cannot adequately capture the intricate economic environment, and high composite indices may pose challenges in drawing policy conclusions. While economic freedom is crucial for economic growth, increasing economic freedom in a generalized sense may not always translate to positive outcomes for economic growth, as some components of the index may have negligible impacts on economic growth, and even some significant variables may yield adverse effects (Uzelac et al., 2020).

Economic freedom and regulatory quality share a close relationship, prompting research into their simultaneous impact on economic growth. Regulatory quality, as explored previously,

encompasses various dimensions. La Porta et al. (1997) delved into legal variables such as adherence to the rule of law, safeguarding property rights, contract enforcement capabilities, and legal heritage, elucidating their causal connection with economic growth. Enhanced government regulations of superior quality foster a more efficient economic system, primarily by reducing interference in market activities and partly by avoiding unnecessary escalation of business operation costs, which can impede economic growth (Cebula and Foley, 2012). Ogbuabor, Orji, et al. (2020) further affirmed that robust institutions and creating a conducive political and legal milieu for individuals and enterprises to thrive can positively influence economic growth.

Moreover, regulatory quality encompasses corruption control and oversight efficacy. Inadequate quality undermines institutional legitimacy (Liu et al., 2018). Conversely, effective corruption control can bolster economic growth, a phenomenon observed across diverse economies, including Africa (Fayissa and Nsiah, 2013), Asia (Huang and Ho, 2017), and Arab nations (Drebee et al., 2020). Analyzing institutional variables' impact on economic activity (GDP) in 19 Central and Eastern European (CEE) countries from 1999 to 2016 revealed significant institutional environment enhancements, particularly in corruption control. Regression outcomes underscored the positive and substantial influences of corruption control and democracy on GDP (Uzelac et al., 2020). Ogbuabor, Orji, et al. (2020) concluded that corruption, governmental inefficiency, weak rule of law, subpar governance quality, and political instability significantly impede growth across 13 West African countries.

Furthermore, regulatory quality can be gauged through governance quality or economic infrastructure, encompassing aspects such as marketization, governmental management capacity, and regulatory frameworks collectively termed "governance" by economists. A robust governance quality constitutes a pivotal determinant of economic growth. Good governance quality facilitates resource efficiency, mandates effective infrastructure policy implementation, safeguards fundamental individual rights, and fosters equitable opportunities for stakeholders, positively impacting growth. Additionally, effective governance, focusing on regulatory quality, optimal allocation of public capital, and efficient anti-corruption measures, can establish a conducive business environment for economic growth. The positive correlation between sound governance and economic growth has been empirically evidenced across numerous regions (Zallé, 2019; Drebee et al., 2020; Al-Saadi and Khudari, 2020).

Beyene (2022) studied the effect of governance on growth in 22 African countries by exploring the impact of each dimension of governance individually and creating a composite index of governance. The results showed that the aggregate governance index positively impacts growth despite the adverse effects of corruption and individual government performance. This also meant that growth is necessary to improve good governance, while governance drives growth in BRICS countries (Mahran, 2023).

From a different perspective, regulatory quality can be understood as the stability of politics. Kesar and Jena (2022) argued that the political stability of BRICS countries during 2002–2018 positively influenced growth. Meanwhile, Mahran (2023) demonstrated that corruption follows a U-shaped pattern, where it initially positively impacts economic growth during specific periods and then diminishes. In line with this flow of research, Uzelac et al. (2020) also affirmed that political stability drives growth, along with legal institutions and economic freedom promoting economic growth. Overall, the legal framework, political stability, and economic freedom shaped the economic reality in the CEE region (Uzelac et al., 2020).

Despite experimental results from various studies emphasizing the crucial role of regulatory quality and economic freedom in

economic growth across nations, a few studies also highlight these factors' negative impact. For instance, Ogbuabor, Onuigbo, et al. (2020) found that organizational quality had an insignificant influence on Nigeria's development when using an autoregressive distributed lag model. Another exceptional result pertains to China, a unique case where improvements in economic freedom do not always correlate positively with actual GDP growth (Wu, 2011). This exception underscores the complexity of the relationship between organizational factors and economic growth.

The above findings underscore the multidimensional nature of economic freedom intricately intertwined with economic growth. Economic freedom emerges as a catalyst for fostering economic advancement. Employing Bayesian research methodologies, this study broadens its scope to encompass 54 nations globally, categorizing them into high and low-regulatory-quality groups. This approach aims to delineate the correlation between economic freedom and economic growth with greater clarity. By delving into the specifics of the Vietnamese case, the study furnishes unique insights into policy implications tailored for both country groupings and Vietnam. These insights are pivotal for optimizing the potential of economic freedom to propel economic progress. Thus, this research augments the ongoing discourse surrounding economic freedom and economic growth, offering nuanced perspectives tailored to diverse regulatory landscapes.

Description of variables and research data

Description of variables

Economic growth (GDP). The economic growth rate (GDP growth,%) determines the economic growth variable. Economic growth is pivotal in a nation's economic growth, heralding overarching advantages across diverse economic sectors and potentially enhancing the quality of life through equitable asset allocation (Razmi and Refaei, 2013; Carlsson and Lundström, 2002).

Economic freedom (EF) is measured using the Economic Freedom Index, with the annual Economic Freedom Index from The Heritage Foundation (IEF) considered a paramount yardstick for assessing economic freedom across nations (Ecer and Zolfani, 2022). The Economic Freedom Index evaluates ten facets of economic freedom, assigning scores ranging from 0 to 100 to each factor, where 100 denotes maximum liberty. These scores are then averaged to derive each country's overall economic freedom score. The ten elements encompass business freedom, trade freedom, financial freedom, government spending, monetary freedom, investment freedom, property rights, freedom from corruption, and labor freedom (Wu, 2011).

In this investigation, the economic freedom index is not segmented into specific categories; instead, the aggregate levels of economic freedom from The Heritage Foundation, Fraser Institute, and Freedom House have been utilized.

Regulatory quality. The author employs the RQ Index from the World Bank, designed to assess perceptions regarding the government's competence in crafting and executing sound policies and regulations conducive to private sector advancement. This index furnishes a country's score on a composite scale, measured in units of standard normal distribution, spanning from -2.5 to 2.5.

Evaluation criteria encompass a spectrum of factors, including the prevalence of regulations, bureaucratic hurdles confronting businesses, governmental intervention in economic affairs, labor market regulations, tax system intricacy and efficacy, investment appeal, and numerous other considerations deemed pertinent for incorporation into the composite index reflecting institutional quality (Saravakos et al., 2022).

In addition, the study also uses a group of control variables included in the model based on previous studies, along with measurement methods and symbols detailed in Table 1.

Data and model research. Based on Hayek's 2020 theory on promoting economic growth and inheriting studies on the relationship of economic freedom with economic growth when considering the role of regulatory quality of Abate (2022), Panteli and Delipalla (2022), the study's model is delineated as follows:

$$\begin{aligned} GDP_{i,t} = & \alpha_1 EF_{i,t} + \alpha_2 FCF_{i,t} + \alpha_3 TAX_{i,t} \\ & + \alpha_4 EX_{i,t} + \alpha_5 CC_{i,t} + \alpha_6 GEOE_{i,t} \\ & + \alpha_7 FDI_{i,t} + \alpha_8 POP_{i,t} + \alpha_9 LABOR_{i,t} \\ & + \alpha_{10} INF_{i,t} + \alpha_{11} UNE_{i,t} + \alpha_{12} FD_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (1)$$

Where:

$GDP_{i,t}$: The economic growth rate of country i in year t
 $EF_{i,t}$: Economic freedom index of country i in year t
 $FCF_{i,t}$; $TAX_{i,t}$; $EX_{i,t}$; $CC_{i,t}$; $GEOE_{i,t}$; $FDI_{i,t}$; $POP_{i,t}$; $LABOR_{i,t}$; $INF_{i,t}$; $UNE_{i,t}$; $FD_{i,t}$: are respectively: Fixed capital formation, Tax revenue, Government expenditure, Corruption control, Government expenditure on education, Foreign direct investment, Population growth rate, Labor force, Inflation, Unemployment rate, and Financial development.

$\varepsilon_{i,t}$: Residual.

The research data includes 54 countries, the period from 2008 to 2022 will be divided into two groups, with differences in regulatory quality. Table 1 below describes in detail the variables and the expected sign of the variables along with the reference source and collection of the variables used in the research model.

Methodology. Bayesian Regression has many outstanding advantages compared to traditional frequentist methods (Berger and Sellke, 1987; Allenby, 1990). Winter et al. (2017) conducted a comprehensive assessment spanning 15 years, noting a nearly fivefold increase in the utilization of Bayesian methods in empirical studies from 2010 to 2015.

First, it allows combining prior information with observational data to create a posterior distribution, which is useful when data is limited or expert knowledge needs to be integrated into the model. Second, the Bayesian method provides a point estimate and a posterior distribution, which helps assess the degree of uncertainty in model parameters, providing deeper insight into the variability and reliability of estimates. Third, Bayesian regression can handle complex models with many parameters and interactions well and when sample sizes are small because using prior information helps stabilize estimates and avoid bias overfitting. In addition, Bayesian models are flexible and can be easily extended to include non-linear factors, different distributions of errors, and complex interactions between variables, allowing for better adaptation to many types of data and practical problems. Finally, Bayesian regression provides the full posterior distribution, naturally supporting forecasting and allowing decision-making under uncertainty, optimizing decisions based on these distributions. (Gelman & Shalizi, 2013; Gelman, 2014).

The Bayesian regression method is deemed suitable for this study, which involves data from 2 groups of 27 countries from 2008–2022 and includes 12 variables. Bayesian regression excels in handling heterogeneous and complex data. Data from numerous countries often exhibit significant economic, political, social, and environmental variations. Bayesian regression allows for flexible modeling of these complex characteristics by incorporating country-specific prior information, thereby enhancing the accuracy and stability of estimates.

Table 1 Description of variables.

Variables	Explain	Sign of expectations	Studies	Data source
Dependent variable GDP	Gross domestic product (%)		(Hafer, 2015; Heckelman, 2000; Chheng, 2005; Abate, 2022; Altman, 2020; Wu, 2011; Carlsson and Lundström, 2002; Sulasni and Surbakti, 2022)s	World Bank
Independent variable EF	Economic freedom	+	(Abate, 2022; Sekunmade, 2021; Bergh and Bjørnskov, 2021; Wu, 2011; Altman, 2020; Carlsson and Lundström, 2002; Gwartney et al., 2022; Panteli and Delipalla, 2022)	Economic Freedom Index from The Heritage Foundation
Control variables FCF	Fixed capital formation (%GDP)	+	(Wu, 2011; Altman, 2020; Gouider, 2022; Panteli and Delipalla, 2022; Mahran, 2023)	World development indicators World Bank
TAX	Tax revenue (%GDP)	+	(Sulasni and Surbakti, 2022)	World Bank
EX	Expenditure (%GDP)	+	(Sulasni and Surbakti, 2022)	World Bank
CC	Control of corruption index	+	(Abate, 2022; Uzelac et al., 2020)	Transparency International Organization
GEOE	Government expenditure on education (% of Government	+		World development indicators
FDI	Foreign direct investment (% GDP)	+	(Sekunmade, 2021; Sulasni and Surbakti, 2022; Mahran, 2023)	World Bank
POP	Population growth (%)	+	(Wu, 2011; Mahran, 2023)	World Bank
LABOR	Labor force (%) (total population over 15 years old/total population)	+	(Gouider, 2022; Panteli and Delipalla, 2022)	World Bank
INF	Inflation (%)	-	(Wu, 2011; Sulasni and Surbakti, 2022)	World Bank
UNE	Unemployment rate (%)	-	(Panteli and Delipalla, 2022)	World Bank
FD	Financial development	+	(Uzelac et al., 2020)	World development indicators

Source: authors' analysis.

Table 2 Descriptive statistics of variables in the group of countries with high RQ.

Variable	Obs	Mean	Std. dev.	Min	Max
GDP	420	1,97333	3,557922	-14,8386	24,3704
EF	420	7,859714	0,314906	6,8301	8,6595
RQ	420	1,402265	0,369688	0,20145	2,0866
FCF	420	22,35208	3,956049	12,833	54,3044
TAX	420	20,67549	5,740737	7,9035	46,0461
EX	420	34,80487	8,735447	15,8398	62,3694
CC	420	1,420916	0,649935	0,0492	2,4355
GEOE	420	13,03712	2,40244	8,447	21,3661
FDI	420	9,686877	30,06354	-41,651	279,3473
POP	420	0,652126	0,842507	-2,4821	3,9314
LABOR	420	61,57803	3,810286	50,05	70,939
INF	420	2,224228	2,66911	-4,4781	19,705
UNE	420	6,875804	2,98337	2,55	19,48
FD	420	0,635169	0,202669	0,1965	0,9893

Source: authors' analysis.

Table 3 Descriptive statistics of variables in the group of countries with low RQ.

Variable	Obs	Mean	Std. dev.	Min	Max
GDP	420	2,781332	4,763084	-29,1	17,2908
EF	420	7,133089	0,54468	5,3912	8,2094
RQ	420	0,154878	0,448352	-1,08301	1,1741
FCF	420	22,49938	5,69612	10,6872	48,4123
TAX	420	16,96038	4,678106	7,6801	27,4539
EX	420	27,22817	10,92624	8,071717	60,2971
CC	420	-0,24449	0,578558	-1,3352	1,6153
GEOE	420	14,22172	4,755645	-8,98332	38,1062
FDI	420	4,146842	8,451334	-40,0866	109,0253
POP	420	0,440806	1,25232	-14,257	3,2848
LABOR	420	59,82984	9,314797	11,44611	85,44
INF	420	5,010096	5,449526	-1,7996	49,7211
UNE	420	8,102884	6,150994	0,14	33,559
FD	420	0,350047	0,161154	0,020688	0,7964

Source: authors' analysis.

Bayesian panel data regression effectively manages unobserved heterogeneity prevalent in panel data by integrating fixed and random effects and prior information into the analysis. This method is particularly adept at handling small data samples. Although the study encompasses data from 27 countries, analyzing data from individual countries or years can significantly reduce the number of observations. With its ability to incorporate prior information, Bayesian regression can provide more accurate estimates than traditional methods in small sample sizes.

With 11 independent variables and a prolonged period from 2008–2022, the relationships between variables can be complex and may include non-linear interactions. Bayesian regression allows for the flexible and efficient modeling of these intricate interactions. These advantages make Bayesian regression a robust and suitable tool for analyzing complex, heterogeneous, and uncertain data for this study.

Research results and discussion

Regression results of 2 groups of countries with high and low regulatory quality. To conduct this study, we calculated the average for the Regulatory Quality Index (RQ) for all countries in the overall sample from 2008 to 2022. Then, the research data was divided into two groups: one group of 27 countries with a higher

average RQ index than the world's average RQ and another group of 27 countries with an RQ index lower than the world's average RQ.

Descriptive Statistics. The basic statistics of the variables are also divided into 2 sample clusters represented in the two tables below:

The statistical results of the variables for the two groups of countries, each comprising 27 countries, for the period 2008–2022 (Tables 2 and 3) reveal that the two groups are divided based on the criteria of regulatory quality. Consequently, there is a significant disparity in the average value of the regulatory quality variable (RQ): 1.402265 in the group with high regulatory quality and 0.154878 in the 27 countries with low regulatory quality.

However, regarding the economic freedom variable (EF), the difference is less pronounced, with respective averages of 7.859714 and 7.133089 for the groups of countries with high and low regulatory quality. The two groups of countries exhibit notable differences concerning the GDP growth rate. Countries with low regulatory quality and economic freedom have an average GDP growth rate of 2.781332. In contrast, the countries with high regulatory quality and high economic freedom index have an average GDP growth rate during the research period of 1.97333.

Bayesian regression results with two groups of countries. Figures 2, 3: The analysis indicates that all parameter plots in the model are reasonable, and the diagnostic and correlation plots show low levels of autocorrelation. The plots exhibit consistent patterns and follow a normal distribution. Additionally, the plots demonstrate good mixing, as the autocorrelation coefficients of the plots fluctuate around 0.02, indicating consistency with the simulated distribution density and reflecting all effective lags within the range. Overall, the results suggest that the model is appropriate, and all lags fall within the effective range.

The Bayesian method was executed using the Metropolis-Hastings (MH) algorithm, running the regression model 10,000 times, with each iteration producing a regression coefficient. Hence, the regression results table presents the mean values of the coefficients, accompanied by the standard deviation (Std. Dev) of the regression coefficients and the Monte Carlo standard error (MCSE). The MCSE of all parameters is very small (Flegal et al., 2008). With this approach, the closer the MCSE value is to 0, the more stable the MCMC chain. An MCSE value smaller than 6.5% of the standard deviation is acceptable, and an MCSE value smaller than 5% is considered optimal (Table 4).

The findings in Table 5 indicate a positive correlation between the EF variable and economic growth (GDP) for both groups of countries. This suggests that economic freedom is pivotal in stimulating economic growth across all nations, with probabilities of 0.9984 and 1. This inference underscores the significance of economic freedom in promoting efficient economic activity, both directly and indirectly. Economic freedom contributes to the economic advancement of countries, irrespective of the quality of regulations (Carlsson and Lundström, 2002; Gouider, 2022; Panteli and Delipalla, 2022). This is consistent with the viewpoint advanced by Gwartney and Lawson (2003), wherein higher economic freedom implies that governments establish effective legal frameworks and robust law enforcement mechanisms to safeguard property rights and individual liberties. These factors act as catalysts for capital accumulation, ultimately nurturing economic growth.

The variable groups, including FCF, FDI, POP, and TAX, positively influence economic growth, with relatively high probabilities overall. However, this probability is even higher in countries with low RQ. Specifically, the FCF variable, which

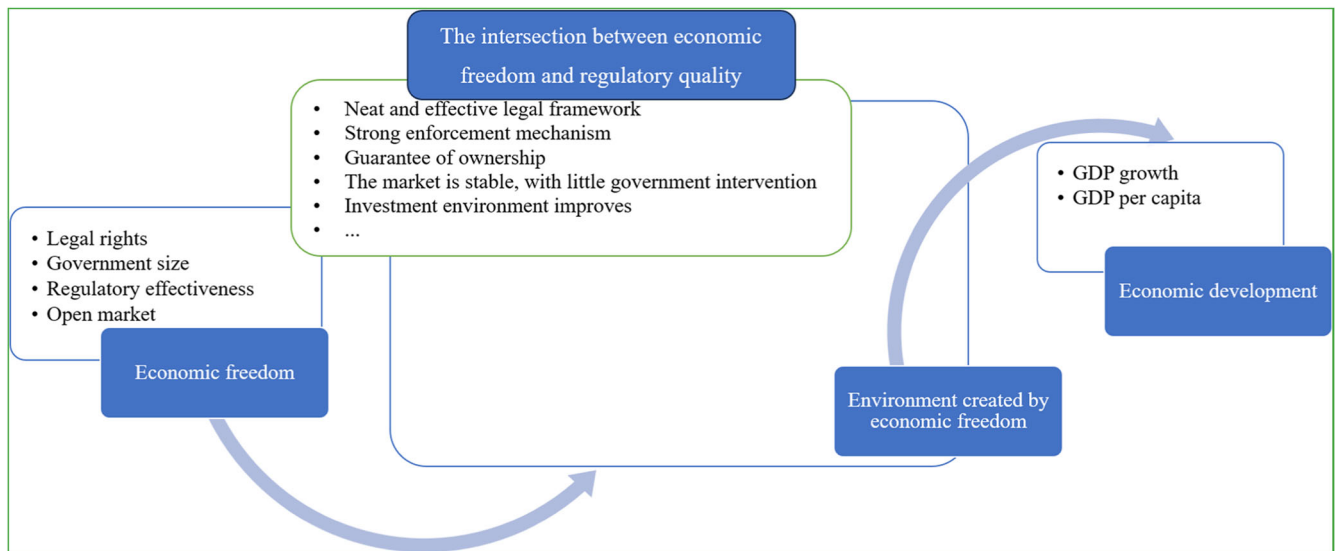


Fig. 1 The relationship between economic freedom and economic growth. Source: compiled by the author from previous studies.



Fig. 2 Convergence diagnostic chart with high FD. Source: authors' processing.

pertains to fixed capital formation, positively impacts economic growth, especially economic freedom, as elucidated by Gwartney and Lawson (2003). Nasir et al., (2021) study similarly arrived at this conclusion regarding variables associated with

fixed capital formation in a country. Additionally, as evidenced by numerous studies by Sulasni and Surbakti (2022) and Ciftci and Durusu-Ciftci (2022), the FDI variable is a vital resource for sustainable growth. FDI facilitates changes in science and

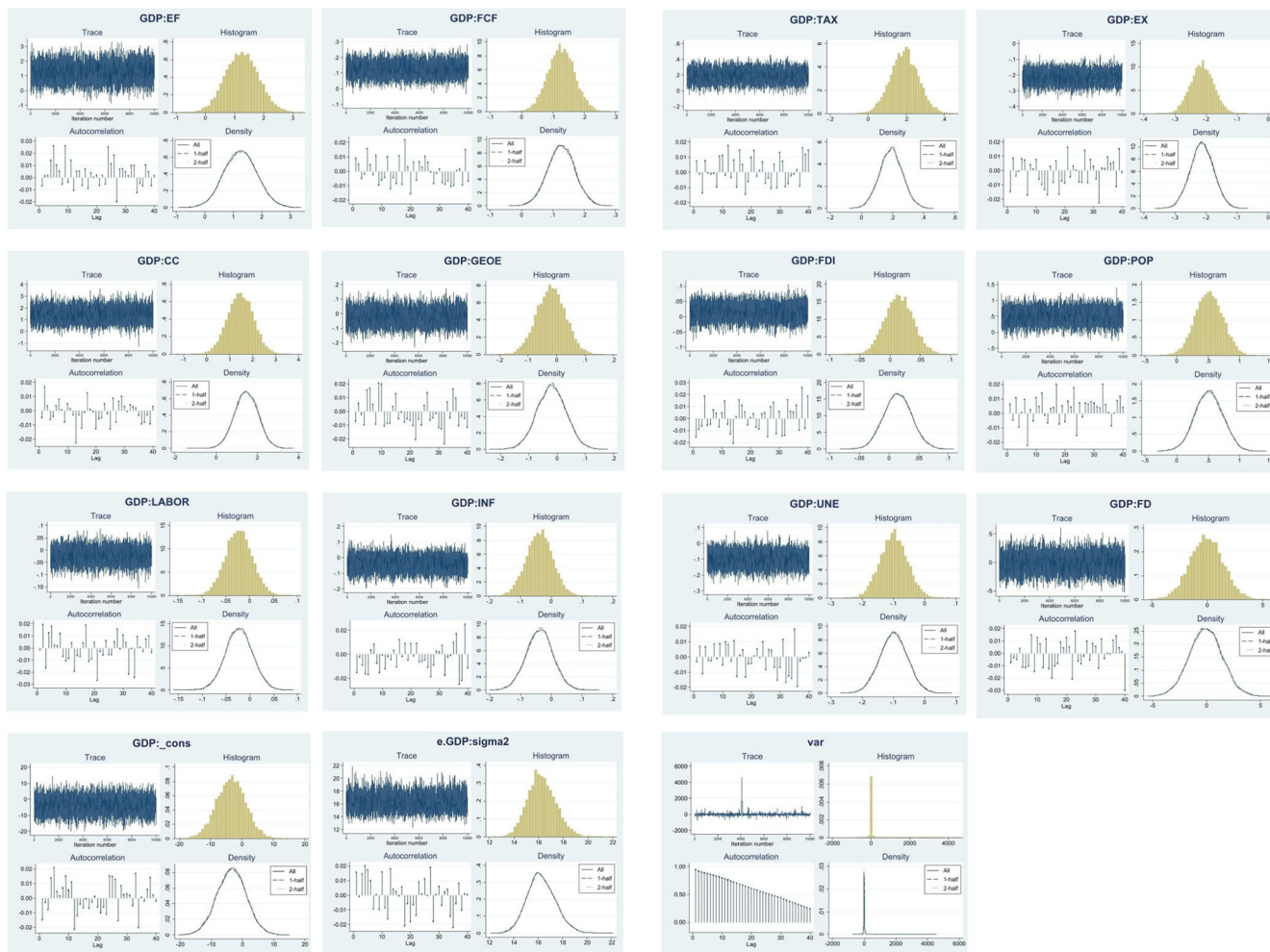


Fig. 3 Convergence diagnostic chart with low FD. Source: authors' processing.

Table 4 Regression results with two groups of countries with high and low RQ.

	Low RQ			High RQ		
	Mean	Std. dev.	MCSE	Mean	Std. dev.	MCSE
EF	1,241168	0,429767	0,004298	3,296773	0,699728	0,006997
FCF	0,1140678	0,043625	0,00045	0,003966	0,044151	0,000442
EX	-0,1833656	0,034089	0,000341	-0,20249	0,03621	0,000362
TAX	0,01645	0,003165	0,016464	0,186219	0,049855	0,000511
CC	0,9821755	0,426571	0,004321	-1,0408	0,522772	0,005228
GEOE	-0,0143243	0,051346	0,000513	-0,22733	0,084196	0,000842
FDI	0,0152484	0,023691	0,000232	8,25E-05	0,005378	0,000053
POP	0,5033136	0,221825	0,002218	0,446444	0,249405	0,002494
LABOR	-0,011129	0,028121	0,000281	-0,18192	0,053535	0,000535
INF	-0,0189138	0,042791	0,000428	-0,00344	0,073176	0,000706
UNE	-0,0505416	0,039282	0,000393	-0,16196	0,066925	0,000669
FD	0,0104866	1,469423	0,014694	-3,11334	1,118551	0,011186
_cons	-2,32092	3,836862	0,038058	-0,93675	5,177274	0,051773
e.SDGI						
sigma2	16,45636	1,141298	0,01137	10,24272	0,728347	0,0074
var	1,070858	118,0217	4,40075	17,01407	232,1579	16,9086

Source: authors' processing.

technology and process management improvements, enhancing productivity and economic efficiency (Azam, 2021; Ziberi and Alili, 2021). Inflows of FDI positively impact various aspects, serving as a catalyst for domestic capital and human resources,

enhancing managerial and labor skills, fostering the creation of new business sectors, and driving technology transfer, including new products and production processes (Mahran, 2023; Kesar and Jena, 2022).

Table 5 Bayesian posterior interval test.

	Low RQ			High RQ			
	Mean	Std. dev.	MCSE	Mean	Std. dev.	MCSE	
{GDP:EX} < 0	1	0.00000	0	{GDP:EX} < 0	1	0.00000	0
{GDP:GEOE} < 0	0.6033	0.48924	0.0048924	{GDP:GEOE} < 0	0.9969	0.05559	0.0005559
{GDP:LABOR} < 0	0.6517	0.47646	0.0047646	{GDP:LABOR} < 0	0.9992	0.02827	0.002827
{GDP:INF} < 0	0.6696	0.47038	0.0047038	{GDP:INF} < 0	0.5178	0.49971	0.0049971
{GDP:UNE} < 0	0.9003	0.29961	0.0029961	{GDP:UNE} < 0	0.992	0.08909	0.0008909
{GDP:EF} > 0	0.9984	0.03997	0.0003997	{GDP:EF} > 0	1	0.00000	0
{GDP:FCF} > 0	0.9953	0.06840	0.000684	{GDP:FCF} > 0	0.5369	0.49866	0.0049866
{GDP:CC} > 0	0.9901	0.09901	0.0009901	{GDP:CC} < 0	0.9789	0.14372	0.0014372
{GDP:FDI} > 0	0.7358	0.44093	0.004409	{GDP:FDI} > 0	0.5066	0.49998	0.0049055
{GDP:POP} > 0	0.9877	0.11023	0.0010885	{GDP:POP} > 0	0.9621	0.19096	0.0019543
{GDP:FD} > 0	0.5042	0.50001	0.0050001	{GDP:FD} < 0	0.9975	0.04994	0.0004994
{GDP:TAX} > 0	0.9003	0.29961	0.0029961	{GDP:TAX} > 0	0.9999	0.01000	0.0001

Source: authors' processing.

TAX–Tax revenue is the primary source of government budget funding, supporting public expenditures, which stimulates economic growth (Nguyen et al., 2021). Moreover, it reflects private sector growth, leading to increased tax revenue (Sulasni and Surbakti, 2022).

POP–Similar to external capital factors and tax revenue, which influence government spending or the formation of fixed capital in the economy, the population also contributes as one of the input factors affecting a nation’s production scale (GDP) according to the Ricardo production model (Mohamed Sghaier, 2023).

Government investment in education (GEOE), LABOR, INF, and UNE all have a negative impact on economic growth in both groups of countries, regardless of the quality of regulations. The probability of this negative impact is even more specific in countries with high RQ.

GEOE: Government spending on education has been found to negatively impact the economic growth rate in 54 countries. Investment in education, particularly in human capital, yields long-term effects. However, in the short term, allocating a significant portion of the budget to education may strain resources for immediate economic growth, as indicated by research findings from Ifa and Guetat (2018) and Saad, Kalakech (2009). Moreover, allocating funds to education, especially tertiary education, where economic growth costs are financed through taxes, may outweigh the marginal benefits for economic growth, resulting in a negative impact (Deskins et al., 2009). Deskins et al. (2009) further suggested that it might only be after the economy reaches a certain threshold of development that any investment in higher education will lead to a Pareto improvement and an increase in the economic growth rate.

This relationship is not necessarily linear and can exhibit an inverted U-shape. This aligns with the notion that spending on education is inversely correlated with economic growth until a certain threshold of education expenditure is reached, beyond which the effect becomes positive (Vries, 2015).

The variable **LABOR** is when the labor force hurts economic growth, as Maestas et al. (2016); Chen et al. (2016); Mohey-uddin. (2007), and (Ali, 2015), can be attributed to population aging and the development of labor-replacing technologies. These factors reduce the effect of human labor on economic growth, especially in this era of significant technological changes in recent years.

When inflation (INF) decreases, it fosters a stable macro-economic environment, contributing to sustainable economic growth (Nguyen et al., 2021). High inflation rates can render investments less attractive domestically and internationally due to

the uncertainty they introduce about the future. Moreover, high inflation can impact the balance of payments as exports become more expensive, reducing a country’s GDP. This aligns with the research findings conducted by Ruzima and Veerachamy (2016).

The variable **UNE**, representing the unemployment rate, exhibits an inverse relationship with economic growth, as evidenced by numerous studies. The economy achieves full labor employment with low unemployment rates, optimizing human capital and generating positive economic effects (Tran et al., 2023; Panteli and Delipalla, 2022).

CC and **FD**, exhibit differences between two groups of countries:

In countries with low-Regulatory Quality (RQ), corruption control (CC) and financial development (FD) positively impact economic growth, with probabilities of 0.9901 and 0.5042, respectively. These research results align with Gharleghi’s (2020) and Tran et al. (2023) hypotheses and findings. They support Gharleghi’s (2020) conclusions regarding the varying impact of the informal economy and corruption on sustainable development among countries. Moreover, these findings are consistent with the “grease the wheels” theory proposed by Jiang and Nie (2014) and Hoinaru et al. (2020), which suggests that good governance enhances a nation’s competitive capacity, aiding in better control of the informal economy and improving people’s quality of life. Effective corruption control also facilitates sustainable growth in countries with low FD (Zhuo et al., 2020). Kesar and Jena (2022) argued that the political stability of BRICS countries during 2002–2018 positively impacted growth, while corruption exhibits a U-shaped impact, initially influencing growth positively in specific periods before diminishing effectiveness. This illustrates that the variable CC no longer positively impacts economic growth in countries with high corruption control indices and high regulatory quality, with a probability of 0.9789. Consequently, there is a decline in the growth rate of developed countries due to the increased effectiveness of government, political stability, and improved regulation by 1%, according to (Zhuo et al., 2020).

Furthermore, the **FD** variable does not provide positive support for economic growth in countries with high regulatory quality, with a probability of 0.9975. This finding is consistent with the research of Botev et al. (2019) and Ibrahim and Alagidede (2018), which suggested that the relationship between financial development and economic growth becomes evident when economies reach a certain level of synchronicity in the development of financial factors such as financial value-added, credit-to-GDP ratio, and stock market capitalization. These factors have varied

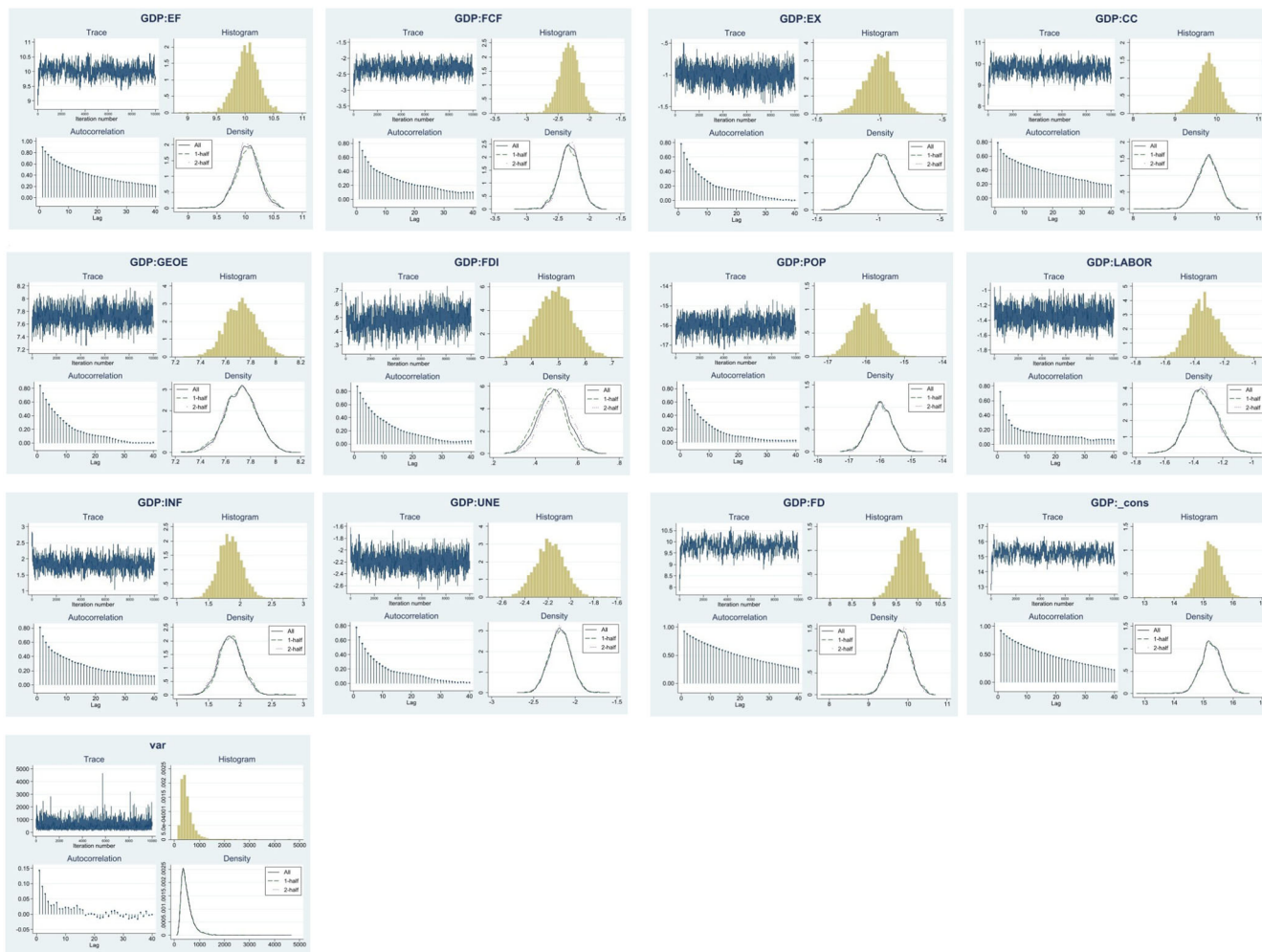


Fig. 4 Convergence diagnostic graph with Vietnam. Source: authors' processing.

impacts on economic growth and may diminish the overall effect of financial development. Additionally, other factors, such as overall economic growth and new trade openness, are necessary to harness financial development's impact on economic growth fully.

Regression results in Vietnam. Figure 4 also demonstrates consistent shapes and a normal distribution of cells, indicating a low level of correlation. The charts exhibit good mixing and consistency with simulated density and lag within an effective range. In summary, the model appears appropriate, with all delays falling within practical limits, and all parameter graphs in the model are reasonable.

The results presented in Table 6 indicate that all probabilities associated with independent variables influencing economic growth are at level 1.

Vietnam, up until 2007, fell within the category of countries with an EF index below 50. However, from 2008 to 2020, its score surpassed 50 and reached 60 in recent years. The improvements in regulations, establishment of legal infrastructure to attract investment, expansion of trade policies, and participation in numerous bilateral and multilateral trade agreements have yielded significant results for Vietnam's economic growth in recent years. Once again, this is reaffirmed by the regression results of the EF variable across the two groups of countries,

indicating that economic freedom consistently provides positive momentum for economic growth with a probability of 1 Fig. 5.

This study delves into the contrasting outcomes observed in Vietnam compared to those obtained in the two groups of countries, highlighting the following distinctions:

Firstly, while GEOE negatively impacts economic growth in both groups of countries, Vietnam presents a different scenario where investment in education has a positive effect on economic growth. This finding resonates with the conclusions drawn by Yén et al. (2022) and Trabelsi (2018). As education across all levels improves and receives more attention, enhancing cognitive abilities and career guidance, it leads to better labor allocation and efficiency. Consequently, the workforce becomes more adept at meeting market demands and aligning with economic structures, resulting in positive outcomes for economic growth (Hanushek and Woessmann, 2021).

Secondly, INF positively impacts economic growth in Vietnam, diverging from the negative impact observed in other countries within the study's sample. This aligns with Powell's findings (2002). Being a developing country with growth potential, Vietnam employs expansive monetary policies to stimulate economic growth, a phenomenon observed in studies on developing countries by Baharumshah et al. (2016) and Chimobi (2010).

Thirdly, concerning the formation of fixed capital and population growth rates, where other countries experience positive impacts, Vietnam encounters negative impacts on GDP growth rates with a

Table 6 Regression results and post-estimation tests for Vietnam.

	Mean	Std. dev.	MCSE		Mean	Std. dev.	MCSE
EF	10.0344	0.2090101	0.015008	{GDP:EF} > 0	1	0.00000	0
FCF	-2.316135	0.1638247	0.008951	{GDP:FCF} < 0	1	0.00000	0
EX	-0.996813	0.1209717	0.004803	{GDP:EX} < 0	1	0.00000	0
CC	9.79186	0.2667803	0.017239	{GDP:CC} > 0	1	0.00000	0
GEOE	7.725924	0.127511	0.005088	{GDP:GEOE} > 0	1	0.00000	0
FDI	0.4854379	0.069806	0.003629	{GDP:FDI} > 0	1	0.00000	0
POP	-15.99009	0.3601728	0.014337	{GDP:POP} < 0	1	0.00000	0
LABOR	-1.340593	0.101418	0.004241	{GDP:LABOR} < 0	1	0.00000	0
INF	1.845291	0.1864217	0.009801	{GDP:INF} > 0	1	0.00000	0
UNE	-2.181769	0.127845	0.005706	{GDP:UNE} < 0	1	0.00000	0
FD	9.805262	0.2800145	0.021427	{GDP:FD} > 0	1	0.00000	0
_cons	15.25265	0.3565518	0.026012				
e.SDGI							
sigma2							
var	497.0424	246.5912	3.6836				

Source: authors' processing.

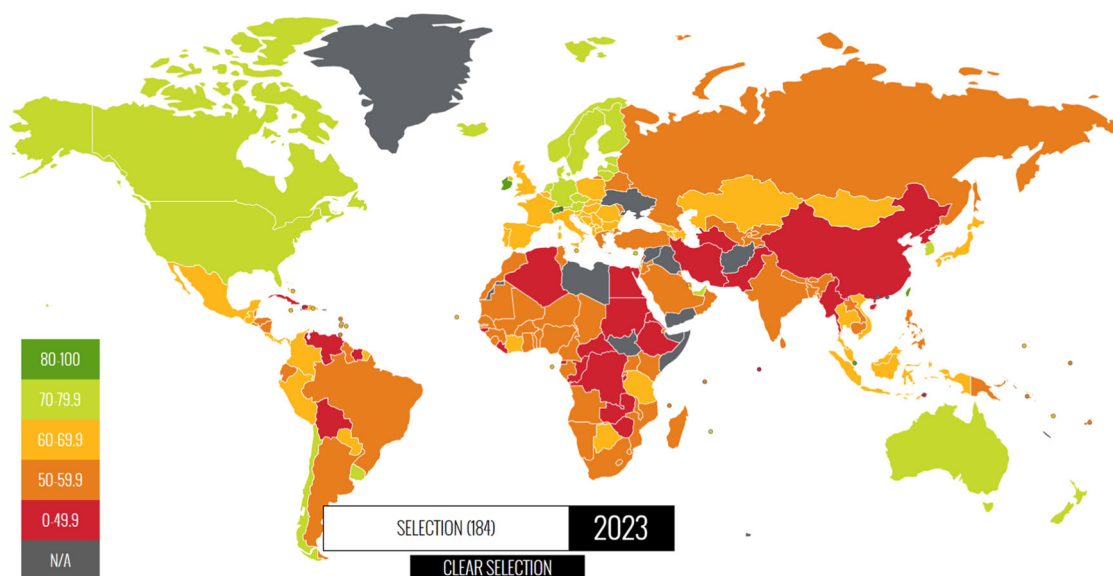


Fig. 5 The economic freedom index in 2023. Source: <https://www.heritage.org/index/visualize>. (This image was taken from the following website: <https://www.heritage.org/index/visualize>. Reproduced with permission of The Heritage Foundation; copyright © The Heritage Foundation for Educational).

probability of 1. This suggests that the adverse effects of rapid population growth among youth outweigh the positive impact of population growth among the working-age population (Headey and Hoge, 2009). Additionally, rapid population growth may be associated with poorer health conditions or higher inequality, which tend to impede economic growth (Dao, 2012).

Conclusion and implications

Conclusion. The findings of this research underscore the significance of economic freedom as a crucial determinant of economic advancement across nations. By examining the interplay between economic freedom and economic growth in 54 countries, categorized into two groups based on regulatory quality, this study offers valuable insights, with particular emphasis on the case of Vietnam.

The research findings highlight the pivotal role of economic freedom in driving economic growth across both sets of countries. Moreover, the study delves into the nuanced relationship between economic freedom and economic growth in the presence of various influencing factors. Through Bayesian regression analysis,

it is revealed that factors such as capital formation, foreign direct investment, population growth rate, and tax revenue positively influence economic growth. Conversely, variables, including government spending on education, labor force dynamics, inflation, and unemployment rate, exhibit adverse effects. Notably, the disparity between the two groups of countries emerges primarily in the variables of corruption control and financial development. In nations with lower regulatory quality, effective corruption control and financial development positively contribute to economic growth, while in countries with higher RQ, the inverse relationship is observed.

For Vietnam, economic freedom also positively impacts economic growth, along with other factors in the model. These findings align with the regression results for the two groups of countries mentioned earlier, with a few exceptions: (1) Government Spending on Education: While in other countries, government spending on education hurts economic growth, in Vietnam, it has a positive effect. (2) Inflation: Unlike other nations, inflation positively impacts economic growth in Vietnam. (3) Capital Formation and Population Growth Rate: These variables hurt

economic growth in Vietnam, whereas, in other countries, they have a positive effect.

These detailed findings offer a more profound insight into how economic freedom impacts economic growth globally. We enrich the existing body of empirical evidence on this subject. Moreover, policymakers can leverage these insights to prioritize essential factors that will propel economic growth in the future.

Implications. The results above indicate critical areas of economic freedom that policymakers need to pay attention to to maximize economic improvement. Focused efforts to enhance these components will elevate economic freedom and the quality of institutions, ultimately leading to economic growth.

For countries with low RQ, an integrated approach is essential. This includes better anti-corruption measures, more vigorous legal enforcement to protect property rights, appropriate regulations supported by robust law enforcement agencies, and improved government integrity. Reducing trade barriers and implementing effective fiscal policies are also crucial. Financial development contributes to legal framework consolidation, liquidity in the market, and overall economic growth.

For countries with high RQ, inflation poses a risk to growth. To maintain an optimal inflation rate, unemployment should remain low. Policies that boost economic growth without adverse inflationary effects are essential. Additionally, managing population growth through labor attraction and internal population encouragement helps avoid demographic challenges and ensures a workforce for future economic growth.

For Vietnam: Vietnam must continue attracting foreign direct investment to enhance productivity and stabilize the macroeconomy. This capital source is considered relatively safe long-term and can potentially become an economic driving force. Additionally, policymakers should encourage vigorous legal enforcement and implement reforms in critical areas such as trade barriers and property rights protection. These measures can promote economic growth and social welfare. Furthermore, like any emerging economy, Vietnam can initially leverage its population advantage to transition industries that require substantial labor from developed countries. However, comprehensive human capital development and other institutional factors are essential for sustained long-term economic growth. Therefore, education and training policies need improvement to enhance the quality of human capital over time.

Limitations of the article and future research directions. One significant area for improvement of the current study is its restricted scope, confined to only two groups of 27 countries, which may need to fully capture the global diversity and variability in economic, political, social, and environmental contexts. Additionally, the data used from various organizations may need to be updated in real time, potentially affecting the timeliness and relevance of the findings.

Future research should expand the geographical scope to include a broader range of countries, enhancing the generalizability of the results. Moreover, future studies could adopt different criteria for grouping countries, such as economic freedom indices or classifications based on FDI recipients and investors. This approach would allow a more detailed examination of how economic freedom impacts economic growth across diverse national contexts. Furthermore, it is crucial to incorporate additional variables when measuring economic development to compare and gain a more comprehensive understanding of the research problem.

Data availability

All data generated or analyzed during this study are included in this published article.

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Author contributions

Tran Thi Kim Oanh's tasks on the article development: Conceptualization, Supervision, Software. Chu Thi Thanh Trang's tasks on the article development: Data curation, Writing Original draft preparation, Reviewing and Editing. Nguyen Tan Hung's tasks on the article development: Translating and Editing. All authors read and approved the final manuscript.

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