Economic Analysis of the Relationship between Rule of Law, Trade Openness, Environmental Quality and Finance in Europe

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ABSTRACT

This study investigates the multidimensional role of the Rule of Law (RRL) Index in shaping environmental sustainability, trade openness, and financial development across 38 countries of the Organization for Security and Co-operation in Europe (OSCE) and selected European economies during the period 2012–2022. The Rule of Law Index is chosen as the central institutional measure because, unlike other governance indicators such as control of corruption or regulatory quality, it captures the broader legal and institutional environment. It directly reflects property rights protection, contract enforcement, access to justice, and constraints on discretionary power—all of which are critical for environmental governance, cross-border trade, and financial market stability.

The study focuses on OSCE and European states divided by legal systems, first legal system is Monist system (mainly EU members), where the international law is automatically part of domestic law. The second system is Dualist system (other OSCE states), in this legal system the international agreements require domestic incorporation before becoming binding.

This distinction is crucial, as it allows the research to test how the rule of law interacts with international environmental, trade, and financial obligations. The OSCE region was selected because it provides a unique legal diversity (monist vs. dualist systems) and represents both developed and developing economies, offering a natural comparative setting and ensuring the generalizability of results.

Methodologically, the study applies advanced econometric approaches, including Method of Moments Quantile Regression (MMQR), Feasible Generalized Least Squares (FGLS), and Robust Augmented Least Squares with Endogenous Breaks (RALS-EG) cointegration techniques. These methods allow robust testing across quantiles and heterogeneous country groups, while addressing cross-sectional dependence and slope heterogeneity. The dataset integrates variables covering the rule of law, renewable energy consumption, economic growth, population dynamics, financial institutions, technological innovation, trade liberalization, and foreign direct investment (FDI).

The empirical findings show that a stronger rule of law significantly reduces ecological footprint, demonstrating that effective legal systems play a central role in curbing environmental degradation and promoting sustainability. At the same time, rule of law and economic growth enhance trade openness, although financial institutions exert a constraining effect on trade flows in both OSCE and European economies, pointing to structural rigidities in the financial sector. Regarding financial development, the results reveal that rule of law, technological innovation, and FDI inflows consistently strengthen financial systems across all quantiles, while economic growth exerts stronger influence only at higher levels of development. Notably, trade openness exhibits short-term adverse impacts on financial performance but shows potential for long-term benefits.

Overall, the findings underline that the rule of law is not an external background factor, but a foundational determinant of sustainable development, linking legal institutions with ecological, trade, and financial outcomes. The results carry clear policy

implications: reinforcing legal systems, promoting renewable energy, restructuring financial institutions, and strategically channeling FDI are essential for climate targets, sustainable trade policies, and long-term financial stability in the OSCE region.

Keywords: Rule of law, monism,dualism, Europe, Environmental Quality, Economic Growth, Foreign Direct Investment, Financial Development, International Trade, Rule of Law, Monism, Dualism, MMQR, PMG-ARDL, OSCE

ÖZ

Bu çalışma, 2012–2022 dönemi boyunca Avrupa Güvenlik ve İşbirliği Teşkilatı'na (AGİT) üye 38 ülke ile seçilmiş Avrupa ekonomilerinde Hukukun Üstünlüğü (Rule of Law, RRL) Endeksinin çevresel sürdürülebilirlik, ticaret açıklığı ve finansal gelişme üzerindeki çok boyutlu rolünü incelemektedir. Hukukun Üstünlüğü Endeksi, yolsuzluğun kontrolü veya düzenleyici kalite gibi diğer yönetişim göstergelerinden farklı olarak daha geniş bir hukuki ve kurumsal ortamı yansıttığı için temel kurumsal ölçüt olarak seçilmiştir. Bu endeks, mülkiyet haklarının korunması, sözleşmelerin uygulanması, adalete erişim ve takdir yetkisinin sınırlandırılması gibi çevresel yönetişim, sınır ötesi ticaret ve finansal piyasa istikrarı açısından kritik unsurları doğrudan yansıtmaktadır.

Çalışma, hukuk sistemlerine göre ayrılan AGİT ve Avrupa devletlerine odaklanmaktadır. Birinci hukuk sistemi Monist sistemdir (çoğunlukla AB üyeleri), burada uluslararası hukuk otomatik olarak iç hukukun bir parçasıdır. İkinci sistem Dualist sistemdir (diğer AGİT devletleri), bu hukuk sisteminde uluslararası anlaşmaların bağlayıcı hale gelmeden önce iç hukukta kabul edilmesi gerekir.

Bu ayrım, hukukun üstünlüğünün uluslararası çevre, ticaret ve finansal yükümlülüklerle nasıl etkileşime girdiğini test etme imkânı sağladığı için önemlidir. AGİT bölgesi, monist ve dualist sistemleri bir araya getiren eşsiz hukuki çeşitliliğiyle hem gelişmiş hem de gelişmekte olan ekonomileri temsil ederek doğal bir karşılaştırmalı ortam sunmakta ve elde edilen sonuçların genelleştirilebilirliğini sağlamaktadır.

Metodolojik olarak çalışma, Momentler Yöntemi Kuantil Regresyonu (MMQR), Uygulanabilir Genelleştirilmiş En Küçük Kareler (FGLS) ve İçsel Kırılmalarla Güçlendirilmiş Sağlam En Küçük Kareler (RALS-EG) eşbütünleşme teknikleri gibi gelişmiş ekonometrik yaklaşımları kullanmaktadır. Bu yöntemler, kesitsel bağımlılık ve eğim heterojenliğini dikkate alarak farklı kuantiller ve heterojen ülke grupları arasında sağlam testler yapılmasına olanak tanımaktadır. Veri seti; hukukun üstünlüğü, yenilenebilir enerji tüketimi, ekonomik büyüme, nüfus dinamikleri, finansal kurumlar, teknolojik yenilik, ticaretin serbestleştirilmesi ve doğrudan yabancı yatırım (DYY) gibi değişkenleri kapsamaktadır.

Ampirik bulgular, hukukun üstünlüğünün ekolojik ayak izini önemli ölçüde azalttığını göstermektedir; bu da etkili hukuk sistemlerinin çevresel bozulmayı sınırlamada ve sürdürülebilirliği teşvik etmede merkezi bir rol oynadığını kanıtlamaktadır. Aynı zamanda hukukun üstünlüğü ve ekonomik büyüme, ticaret açıklığını artırmaktadır. Ancak finansal kurumlar, hem AGİT hem de Avrupa ekonomilerinde ticaret akışlarını kısıtlayıcı bir etki göstermekte, bu da finansal sektördeki yapısal katılıklara işaret etmektedir. Finansal gelişme açısından bulgular, hukukun üstünlüğü, teknolojik yenilik ve DYY girişlerinin tüm kuantillerde finansal sistemleri güçlendirdiğini, ekonomik büyümenin ise yalnızca daha yüksek gelişme düzeylerinde daha güçlü bir etki gösterdiğini ortaya koymaktadır. Dikkat çekici bir şekilde, ticaret açıklığının finansal performans üzerinde kısa vadeli olumsuz etkileri
olsa da uzun vadede fayda sağlama potansiyeli bulunmaktadır.

Genel olarak bulgular, hukukun üstünlüğünün dışsal bir arka plan unsuru değil, sürdürülebilir kalkınmanın temel belirleyicisi olduğunu; hukuki kurumları ekolojik,

ticari ve finansal sonuçlarla doğrudan ilişkilendirdiğini ortaya koymaktadır. Sonuçlar, güçlü hukuki sistemlerin pekiştirilmesi, yenilenebilir enerji kullanımının teşvik edilmesi, finansal kurumların yeniden yapılandırılması ve DYY'nin stratejik yönlendirilmesi gibi iklim hedefleri, sürdürülebilir ticaret politikaları ve uzun vadeli finansal istikrar için açık politika sonuçları taşımaktadır.

Anahtar Kelimeler: Hukukun Üstünlüğü, Monizm, Dualizm, Avrupa, Çevresel Kalite, Ekonomik Büyüme, Doğrudan Yabancı Yatırım, Finansal Kalkınma, Uluslararası Ticaret, MMQR, PMG-ARDL, AGİT

DEDICATION

To the entire family of Hennadiy Komissaryuk

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
AMG	Augmented Mean Group
ARDL	Autoregressive Distributive Lag Model
CADF	Cross-sectional Augmented Dickey-Fuller
CO2	Carbon Emissions
CD	Cross-sectional Dependency
CF	Gross Capital Formation
CIPS	Cross-sectional Im, Pesaran, and Shin
CO2	Carbon Emissions
CS-ARDL	Cross-Sectionally Augmented Autoregressive Distributed Lag
CSD	Cross Sectional Dependence
DH	Dumitrescu-Hurlin test
DI	Domestic Investment
EF	Ecological Footprints
EG	Economic Growth
EKC	Environmental Kuznets Curve
ETS	EU Emissions Trading System
EU	European Union
FTA	Free Trade Agreement
GDP	Gross Domestic Product
GFN	Global Footprint Network
INF	Inflation Rate
MMQR	Method of Moments Quantile Regression

OSCE	Organization for Security and Co-operation in Europe
PMG-ARDL	Pooled Mean Group Autoregressive Distributed Lag
POP	Population
R&D	Research and Development
RALS	Residual Augmented Least Squares
REC	Renewable Energy
RRL	Rule of Law
SDGs	Sustainable Development Goals
SH	Slope Heterogeneity
TO	Trade Openness
WB	World Bank Development Indicators
WTO	World Trade Organization
WJP	World Justice Project

Chapter 1

INTRODUCTION

1.1 Background and Motivation of the Study

This research fills a crucial gap in the recent academic literature, since the interplay between the economic and legal aspects is hardly dealt with in one single analysis. The significance of this study arises from the fact that the intersection of structures of legal institutions, and in particular the Rule of Law, has been relatively neglected or weakly theorized among authors working on core economic indicators. Although there are studies that have examined and tested such legal factors or an economic factor separately, the amalgamation of these factors offers new perspectives that are critical for assessing the contribution of institutions to overall development. By grounding the analysis in the context of Organization for Security and Co-operation in Europe (OSCE) countries, in particular those with a monist versus dualist legal system but sharing the same geopolitical and economic environment, the research fulfills a rare and unique comparison of the effects of legal integration models.

This dissertation revolves around three pillars of sustainable development: environmental governance, trade openness, and financial development. Although each section uses its own models and tests, the research as a whole constitutes a single, integrated research agenda. The common thread across all three parts is the Rule of Law (RRL) as the institutional platform for economic and environmental outcomes.

The first part looks at environmental governance and the ecological footprint. Here is where the real rule of law operates to calibrate state capacity to translate international agreements into domestic regulations, carry out regulation and hold governments and private actors to account. A robust legal system alleviates environmental pollution through enforcement of ecologic standards and support for the use of renewable energy.

The second part examines trade openness. Theories of the open economy macroeconomic indicate that trade integration is very much driven by institutional quality. Rule of law is associated with lower transaction costs and the promise of greater predictability and credibility in international relations. The contract enforcement and reduction in corruption that the rule of law brings in turn helps to promote greater integration into GVCs as well as export-led growth. At the same times, the results suggest that the financial institutional fortress that limits trade openness is relatively weak, confirming the importance of the legal reform agenda.

The third is financial development (where the relationship to legal institutions in even more direct). * Clear property rights, contracts that are enforced, and public judicial systems also make possible investor confidence, credit expansion, and access to world capital markets. The results also tracen the way of technological innovation and of FDI with the rule of law: by that way, with combined, financial markets deepen, inclusion advances, and long-term stability is enhanced.

The three of these together add up to a strong research plan. Each looks at a different aspect of development — environmental, commercial and financial — but each is examined through one institutional prism: the rule of law. This set-up has the

advantage that the dissertation can establish a more general theoretical contribution to institutional economics and open economy theory, by showing that the rule of law is not only a legal principle, but a key driver for sustainable development, across several sectors.

Moreover, the comparison between monist and dualist legal systems makes this coherence clear. By examining how various legal traditions mediate the influence of the rule of law, the analysis also offers an institutional transmission mechanism that affects environmental outcomes, trade policy reform and financial development.

Thus the thesis tells a circuitous story: the rule of law is the institutional superstructure that cements environmental sustainability, economic openness and financial progress. Rather than as three distinct essays, the research should be seen as an integrated project that aims to investigate one of the key issues at the heart of contemporary economics: the way in which legal quality relates to, and has an impact on, the course of sustainable growth in open economies.

The Rule of Law Index (RRL), which was created by the World Justice Project, is the key institutional measure employed in this analysis. It is a composite measure that measures the perceived observance of legal norms in practice, such as judicial independence, the absence of corruption, open government, effective criminal justice, regulatory enforcement, and access to civil justice. In contrast to the other, more nuance indicators of governance that cover wider aspects of governance, RRL which focuses on aspects of the legal institutional structure is particularly suited to address the level of the environmental performance, trade openness, and financial development on diverse legal systems.

A cornerstone conceptual clarification in the analysis is made with the monist and dualist perspectives on the modalities of integration of international law. In monist systems, because international legal rules become part of the domestic legislation as soon as a treaty is ratified, they are not affected by the margin of appreciation the second that a treaty is assented to the principle is directly applicable and must be taken into account. By contrast, dualist systems have to obtain ratification by the national legislature as a precondition for international treaties to become part of domestic law which tends to delay and complicate the process of legal harmonization. This distinction provides the analytical framework for comparative analysis of legal effectiveness in economic governance in OSCE countries.

The distinction between monist and dualist countries is particularly relevant in the context of OSCE and European states, as the region embodies both traditions. Many European Union member states operate under monist systems, which facilitate the rapid adoption of EU and international legal standards. In contrast, several other OSCE countries follow dualist traditions, where domestic translation of international obligations may face delays, political bargaining, or even incomplete incorporation. For the purposes of this research, such heterogeneity provides a unique natural experiment to assess how differences in legal systems condition the effectiveness of the rule of law. By comparing monist and dualist systems, the study is able to capture whether the institutional pathways through which the rule of law operates, particularly in shaping environmental governance, trade openness, and financial development, all are uniform across countries or vary according to their legal traditions.

The research itself is divided into three parts which are separate but interrelated analyses. Part I considers the function of the RRL in environmental governance,

including how the quality of institutions influences the design and effectiveness of environmental laws, particularly in international contexts like the Paris Agreement. The second part investigates how legal systems and the RRL matter for trade openness and trade flows, how different legal systems produce different patterns of flows of goods, services and capital across borders. The third part considers financial development by assessing how the RRL interacts with economic growth, technology innovation, foreign direct investment, and trade openness in determining the depth and breadth of financial systems.

In each of the three domains - environment, trade and finance – the economic growth is used as a shared independent variable to determine how it interacts in legal as well as economic processes. This choice permits an integrated investigation of the role played by legal robustness in either dampening or magnifying the economic consequences that are associated to growth, thereby allowing a comprehensive macro-level viewpoint.

From a methodological perspective the study uses state of the art econometric methods such as MMQR and CS-ARDL to take into consideration distributional heterogeneity, slope variation and dynamics in panel data. The choice of these models was made to properly measure the multivariate interaction of institutional and economic factors, especially taking into account countries with different legal environments and economic development stages.

It appears that countries with higher RRL scores are more likely to have better environmental performance, higher trade openness, and more developed financial systems. Moreover, the evidence obtained comparing Member Countries of the OSCE

on the basis of their monist or dualist character reveals that the monist system facilitates more rapid and uniform legal integration, thereby helping to ensure the effectiveness of international standards. This is especially so in areas involving the swift transposition of supranational directives, as in environmental law or trade regulation. Conversely, dualist systems are all too frequently characterised by underperformance and institutional fragmentation which also get in the way of economic and regulatory effectiveness.

In closing, this article contributes to the literature by providing a comparative, comprehensive analysis of environmental, trade, and finance institutions as seen through the lens of legal form. It reasserts the universal importance of the Rule of Law as a guarantor of good governance, economic development and institutional stability. The results are of policy significance particularly for OSCE countries that need legal coherence and institutional stability to support sustainable economic and environmental improvement.

1.2 Outline of the Thesis

Next chapter studied the connection between the Ecological Footprint and the Rule of Law Index, renewable energy, economic growth and population. The chapter contains the introduction section, the literature review presented in section 2. Methodology presented in section 3, results and discussion at section 4, and conclusion is presented in section 5.

Chapter 3 examines the influence of the Rule of Law index on the Trade openness, the chapter contains 5 sections of introduction. Review of the literature, methodology used for the research, results and discussion and results respectively. The chapter 4 investigates the role of the Rule of Law index on financial development of OSCE

countries. This chapter also contain five sections: introduction, literature review, methodology, discussions and conclusion. Chapter 5 contains conclusions and policy implications of all study.

Chapter 2

HOW DOES THE RULE OF LAW IMPROVE ENVIRONMENTAL CONDITIONS? EVIDENCE FROM EUROPEAN COUNTRIES

2.1 Introduction

Undoubtedly, since the dawn of humanity, the human race has perceived nature only as an inexhaustible source of material goods it can use. However, after being confronted with adverse consequences of their impacts on nature and the environment in general, humanity has been convinced of the necessity of its rational use and is focusing on the protection of environment for both today and tomorrow. Protecting the environment involves the creation of a system of scientifically-based also international as well as state legislations, aimed at ensuring the rational use, breeding and conservation of natural resources, the protection of the environment from pollution and destruction for benefit of both existing humans and future generations.

The difficulty lies in the fact that the environment does not belong to any specific state, but is commonly used by all countries. It is not possible to use the definition of private property in this case, because the atmosphere and water resources tend to move between countries and continents, crossing their borders, and it is not possible to stop this process be erecting walls or fences. Every country can impose restrictions on the emissions of harmful waste into the atmosphere, but it cannot prohibit this action in a

neighboring country that continues to emit emissions into the atmosphere; thus, polluting not only its own air but also affecting other countries. In this case, it is necessary to impose restrictions and legal norms on the environment at the international level, to introduce fines, penalties and sanctions against states violating international statues.

The Rule of Law plays a critical role in this process. A prevalent model in the literature of environmental governance is the logic chain which links institutional quality to enforcement capacity, and from there to environmental performance (often as a kind of formula, 'better enforcement leads to better environmental outcomes'). At the base of this chain is the supremacy of the law, and the integrity, stability and efficiency of the legal establishments. It is also the quality of the institutional environment – as measured by e.g., the Rule of Law Index (RRL) – which guarantees that the environmental laws are passed but also consistently implemented over time. Strong rule-of-law systems are defined by legal certainty, equality of application of the law, effective access to justice and adherence to institutional norms. These elements contribute to a plausible legal context in which regulatory action is feasible and anticipated. Second in the chain comes enforcement, which relies significantly on the institutional backbone created by rule of law. In settings where legal institutions are robust, authorities have the power and resources to police environmental behaviour, investigate transgressions and implement punishments. Useful enforcement tools range from fines and license revocation by administrative authorities through criminal prosecutions to judicial remedies. The existence of clear surveillance and monitoring mechanisms and the expectation of relatively fixed sanctions generate a perceived probability of being caught and sanctioned that considerably adds to the deterrent effect. Recent technologies, including remote sensing, electronic emissions monitoring

and data publicization, thereby increased the efficiency and transparency of enforcement. The problem, however, is that these mechanisms need to be legally binding and operationally credible within the overall institutional structure.

The ultimate result of the chain is better environmental practice. Such laws are more likely to be obeyed, engender less pollution, and be more responsive to regulatory responses in communities with stronger rule of law and enforcement capacity. For instance, in countries with high RRL index scores, environmental courts have levied heavy penalties upon polluters and forced them to restore where they had violated it. Conversely, nations with weak enforcement despite having environmental laws on paper often experience persistent degradation due to lack of institutional authority or political will. The rule of law is a necessary pre-condition of enforcement and enforcement is the vehicle whereby legal standards are converted into measurable environmental effects.

One of the most important examples of this international level cooperation is the “Paris Agreement on Climate Change”. The most significant global threat in the 21st century is thought to be the phenomenon of climate change and global warming, both of which are caused by pollutants (Raza et al., 2024). In order to prevent the worst effects of global warming, 196 nations signed the “Paris Agreement on Climate Change” in 2015. The agreement stipulates that the average temperature increase over the course of the century should be kept well below 2 degrees Celsius (Muhammad & Long, 2021). The reason for this action is the profound understanding of all of these 196 nations is that if humanity considers enduring life on this planet, it must change the way it is impacting the Earth. Human activities have become so pervasive and

profound that the Earth is rapidly moving into a less biologically diverse, less forested, much warmer, and likely wetter and stormier state (Steffen, W., et al., 2007).

From a legislation perspective, each country can create their own domestic statutes to protect the environment and, in this research, we will provide examples of such legislation. In the case of pollution, this protection becomes very complicated and largely inefficient. It is acknowledged that the daily activities of humans are continually increasing, and this has a strong impact on the functioning of the natural systems of our planet, and the most serious of which is the emissions of carbon dioxides into the atmosphere.

Many countries have assumed the responsibility to protect the environment and this is stated in their respective constitutions. For example, Article 45 of the Spanish Constitution states: "Everyone has the right to enjoy an environment suitable for personal development, as well as the duty to preserve it" [1], while the Belgian Constitution stipulates the right to lead a life in keeping with human dignity, which includes the right to the protection of a sound environment (Article 23)[2] . Section 112 of the Norwegian Constitution states: "Every person has the right to an environment that is conductive to health and to a natural environment whose productivity and diversity are maintained."[3]

[1] Constitution of Spain, information Retrieved on dated 11-04-2024 for details click to https://www.senado.es/web/conocersenado/normas/constitucion/detalleconstitucioncompleta/index.html?lang=en

[2] Belgian Constitution, information Retrieved on dated 11-04-2024 for details click to https://www.dekamer.be/kvvcr/pdf_sections/publications/constitution/GrondwetUK.pdf

[3] Norwegian Constitution, information Retrieved on dated 11-04-2024 for details click to https://www.nhri.no/en/report/climate-and-human-rights/4-section-112-of-the-norwegian-constitution/

From the legislation perspective, of particular importance are European Union Directives such as the Industrial Emissions Directive (2010/75, IED)[4] , the Ambient Air Quality Directive (2008/50)[5] , the Waste Framework Directive (2008/98)[6] , the Water Framework Directive (2000/60)[7] among others. In 2021, the European Commission proposed that a revision be made to the Directive 2008/99/EC [8] on the protection of the environment through criminal law, and that the list of environmental crime offences be updated, to create a list of the sanction types and levels, to improve the collection of statistical data, and to ensure more powerful international investigation and prosecution.

Thus, based on the content of these constitutional norms and in conjunction with the interests of society, state must protect environmental rights and legitimate interests of humans and citizens via legal mechanisms. At this point it is necessary to refer to the differences between countries regarding the way in which international law comes into effect within each domestic legal system in case of conflict between them. In the literature, monist and dualist approaches are often defined in terms of how international law comes into effect at all countries. The monist system separates international law and national law into two different parts of single system and treats them in the same way; consequently, international law is automatically passed into the domestic state's legal system. This means that when the State ratifies the rule of law,

[4] Industrial Emissions Directive, information Retrieved on dated 11-04-2024 for details click to https://eur-lex.europa.eu/eli/dir/2010/75/oj

[5] Ambient Air Quality Directive, information Retrieved on dated 11-04-2024 for details click to https://eur-lex.europa.eu/eli/dir/2008/50/oj

[6] Waste Framework Directive, information Retrieved on dated 11-04-2024 for details click to https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0098

[7] Water Framework Directive, information Retrieved on dated 11-04-2024 for details click to https://eur-lex.europa.eu/eli/dir/2000/60/oj

[8] [8] revision of Directive 2008/99/EC, information Retrieved on dated 11-04-2024 for details click to https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32008L0099

then it is automatically and fully transferred into the national law and comes into force. Resultantly, international law has higher authority, and is therefore higher in the hierarchy of all domestic legal norms. However, in the dualist legal system, international law and national law are treated separately as two different legal systems, so international law does not automatically become a part of national law. The only way to do so whenever this rule will be confirmed and incorporated into national law by the statute at the national level, without approving from the state that international law does not get the higher place at the hierarchy of the country's domestic legal norms (Verdier, P.H. et al, 2015). Some countries cannot be categorized as either monist or dualist because they use both systems at the same time but under some conditions (Laws, J., 2000). For example, international law statutes regarding human rights are immediately transferred into the domestic law system without approval at the national level and all other statues are not. Decisions on the environmental laws at the Paris agreement belong to international law legislation, and monist countries must immediately apply them and these new changes must come into the force in the domestic law norms immediately. However, dualist system countries are not forced to do so.

In this perspective, it is important to highlight the fact that the state has a duty to protect the environment, and it must implement better legal mechanisms and strong institutions that will legislate the strong rule of law with the goal to creating a legal environment with legal rules and legal enforcement. As institutions influence behavior and incentives in real life, they forge the success or failure of nations (Acemoglu, Robinson,2012)[9] . The strong rule of law enhances the institutional quality of a nation,

[9] Acemoglu, D., Robinson ,J.A(2012) Why Nations Fail. The origins of power, prosperity, and poverty.Profile Books, for more information click to https://profilebooks.com/work/why-nations-fail/

which in turn is a significant factor in determining whether or not the Paris accord and other measures connected to environmental pollution will be successful (Muhammad & Long, 2021; Salman et al., 2019). Institutions are responsible for formulating and regulating environmental regulations so that carbon emissions (Muhammad & Long, 2021) and ecological footprint (Shahbaz et al., 2023) can be reduced. These institutions can be classified into a wide variety of categories, including political, governmental, legal, and social institutions, among others, and they are impacted by a wide variety of circumstances (Goel et al., 2013).

Over the course of the last several years, researchers have begun to acknowledge the significance of institutional variables in relation to environmental degradation (Abid, 2016; Eskander & Fankhauser, 2020; Muhammad & Long, 2021). A viable and unbiased institutional system's characteristics are good governance, political stability, and a lack of corruption, which in turn can be possible and effective with the strict rule of law in the nations. This emphasizes the importance of environmental sustainability by linking it to essential rights and responsibilities of humanity.

Environmental governance has the potential to become arbitrary in the lack of a legal framework and the execution of legal rights and obligations not only for the European Union but for all other countries. This means that it will be reliant on human judgment, in addition to being subjective and unpredictable.[10] Nevertheless, in the presence of imperfections and a weak adherence to legal principles, companies would readily

[10] Retrieved on 11-04-2024, for more details refer to "https://www.unep.org/explore-topics/environmental-rights-and-governance/what-we-do/promoting-environmental-rule-law-0"

violate pollution control regulations in order to attain optimal financial gain (Welsch, 2004). Therefore, the strict rule of law makes the nation's systems for formulating, implementing, and monitoring the strict environmental standards, strategies, and polices more effective and efficient. In this case, nations can reduce their own footprint by changing their consumption behavior, reducing waste, saving energy and the increasing consumption of recycled products (Hoekstra et al, 2014).

Prior research has mostly examined environmental quality by using environmental legislation (Wu et al., 2020), environmental regulations (Ahmed et al., 2021; Murshed et al., 2021), and institutional quality factors (Abid, 2016; Chowdhury et al., 2021; Haini, 2021; Muhammad & Long, 2021), rule of law variable was settled as a number of climate laws passed per year (Eskander & Fankhauser, 2020), and environmental laws (Yin et al., 2022). However, no previous study has taken the rule of law index as a comprehensive measure to explore its combined impact on the environment. Moreover, these researchers have focused on a single country, group of countries, or demographic divisions of countries. However, cross sectional and comparative analysis of the "Organization for Security and Co-operation in Europe" (OSCE) and separate European states is lacking. Additionally, differences between the monist and dualist countries have not been analyzed. In this paper we use the Rule of Law Index (RRL) as an explanatory variable, instead of an aggregate index of institutional quality, mainly for its granularity, conceptual clarity, and empirical policy relevance in environmental governance. The RRL (developed by the World Justice Project) is a validated, multi-dimensional measure of the extent to which legal norms are implemented in practice, including accountability, lack of corruption, enforcement of the regulatory environment, and access to justice. In contrast to their larger, more pervasive counterparts based on multiple dimensions of governance, the RRL provides

specific measures of institutional performance in the form of legal design and enforcement. This is especially true when describing environmental outcomes, since environmental regulation is highly contingent on the efficacy and functioning of the legal system. The use of RRL in this case is supported by empirical evidence that suggests that countries with greater rule of law scores experience better environmental protection results, such as low ecological footprints (EF) and high levels of innovation in pollution control, for example. Besides, the integration of RRL in the ecological footprint model is again highly supported by recent studies conducted by international organizations and peer-related studies, which stress that limited compliance and frailty of institution are two significant hurdles in the way of successful operation of environment governance systems. In the presence of weak rule of law, environmental policy is ineffective, as individuals and companies can flout the environmental policies, laws and standards. Today's rule of law programs should include programs to strengthen state capacity to make and enforce environmental law. The United Nations Environment Programme highlights that in the absence of a strong rule of law, environmental policies often remain ineffective, as compliance becomes arbitrary and enforcement mechanisms fail to produce positive outcomes [11]. There can be no environmental protection without rule of law. By encapsulating the legal institutional building blocks of environmental governance regulatory capacity, judicial integrity and transparency the RRL offers a more robust and policy-relevant proxy of environmental performance compared to generic governance indicators. Therefore, our model utilizes the RRL to show not only theoretical existence of environmental

[11] Received on 26-01-2024, for more details please refer to https://www.unep.org/explore-topics/environmental-rights-and-governance/what-we-do/promoting-environmental-rule-law

laws but also the actual realization and effectiveness of such laws which are necessary for the resolution of environmental problems.

This research is intentionally constrained to a simpler model to clarify the institutional and macro-level antecedents of ecological footprint. Our purpose here is not to propose a detailed specification of all potential drivers but to test, in addition to the rule of law, renewable energy use, economic growth and population, variables that are commonly identified in the literature as the main structural factors explaining environmental performance. Adding a more complete set of control variables, like trade openness and industrial composition, might lead to multicollinearity or might obscure the institutional mechanisms being studied. Furthermore, some of these omitted variables can serve as mediators or conduits through which institutional quality affects the environment, and controlling for them would mask instead of reveal the main relationships of concern. As such, the model is designed to concentrate on the fundamental political economy and macro-level determinants that might explain cross-national variation in ecological footprint. This framework could be developed in the future, for example by adding more dimensions like trade intensity or sectoral breakdowns to rapidly expand the scope of analysis.

The available research generally has been conducted in single countries or regions. This article will fill that lacuna by empirically comparing OSCE member states and European countries in a cross-sectional framework while taking into account the distinction between monist and dualist legal systems.

In the European Union (EU), enforcement of environmental directives is backed up by strong legal structure and reinforced by strong supranational organizations - most

notably the EU Emissions Trading System (ETS). The requirement to transpose directives is now underpinned by the principles of primacy and direct effect, requiring member states to apply EU law, including if it contradicts national legislation. Landmark judgments such as Costa v. ENEL (1964)[12] and Simmenthal (1978)[13] require national courts to refuse to apply inconsistent domestic statutes, meaning EU rules apply and shape national court decisions. Concurrently, the EU ETS represents a principal environmental policy based on a "cap-and-trade" system in which a cap on the amount of polluting gas that can be emitted is defined and tradable permits are issued to firms. This piecemeal, market-based system, inaugurated in 2005, currently accounts for some 40% of EU carbon emissions. The system has been an effective mechanism to reduce CO2(Carbon Dioxide), reducing emissions by 47 percent in the power and industry sectors between 2005 and 2023, by providing market incentives for reducing emissions and investing in low-emitted technologies. The use of legally binding standards and the institutionalized enforcement capacity of the ETS generate a common level of environmental protection across the member states. This leads to a de-facto monist legal and regulatory space in the area of environmental governance regardless of domestic constitutional heritage and an institutional context that is homogenous enough to be the same for comparison within the EU.

Resultantly, two different models were created for this study. The first, Model (1), contains all types of law systems of member countries of OSCE organization. The second model, Model (2), covers all European members states of the OSCE organization, which are monist due to the Europe Union's standardized legal framework and legislation, that ensures that all the participant states agree to act as

[12] Case 6/64, Flaminio Costa v ENEL [1964] ECR 585.
[13] Case 106/77, Stato v. Simmenthal Spa [1978] ECR 629.

one.[14] The goal of this is to establish the rule of law among nations, where international law governs over domestic laws.

We sampled countries for the purposes of this study from the full list of member countries of the Organization for Security and Co-operation in Europe (OSCE). The reason OSCE members were chosen, instead of focusing on one area only, including Europe or Asia, is that institutional diversity is required within a common political and geopolitical framework. OSCE states contain wide varieties of legal traditions (monist and dualist legal systems), which are useful for comparative institutional analysis. Yet, to ensure any worthwhile and fair comparison, it was essential that a number of states with different legal affiliations which possess similar international commitments and are subject to the same cooperative mechanisms to be identified the conditions that OSCE membership fulfils. Furthermore, the OSCE offers an unparalleled institutional setting for analysis of the rule of law dynamics in different juridical systems. This methodological choice guarantees comparability and reliability of the empirical analysis, and at the same time retains the institutional variation that is at the core of the research question.

Additionally, to fill the gap and to contribute to the exiting literature, we employed a complex nature of rule of law index along with renewable energy, economic growth, and population to assess the environmental quality of dualist system countries from the "Organization for Security and Co-operation in Europe" (OSCE) and separate European states that have a monist system.

[14] Retrieved on 11-04-2024, for more details refer to https://eur-lex.europa.eu/EN/legal-content/summary/treaty-on-the-functioning-of-the-european-union.html

The outcomes of this research will help the "Organization for Security and Co-operation in Europe" (OSCE) and separate European states to understand which of these systems is more effective in respect to the international law agreements regarding environmental protection. The aim of this research is to examine whether the rule of law index explains the ecological footprint variable in our sample, as well as whether renewable energy, economic growth, and population explain the ecological footprint variable in order to formulate, implement, and monitor environmental strategies, policies, and standards to mitigate the climate change effects on the environment.

The structure of this research paper is as follows: Sections two, three, four, and five present details on the literature, methodology employed, discussion of the outcomes, and conclusion, respectively.

2.2 Literature Review

2.2.1 Rule of Law and Ecological Footprint

As the rule of law greatly derives from an institutional context, environmental behavior is to a large extent influenced by that context whether at the organizational or national level. The RRL index reflects core institutional aspects such as legal certainty, regulatory enforcement, accountability, and availability of justice, which are also fundamental for successful environmental governance.

At the national level, the RRL index must be positively correlated with environmental performance indicators. Countries with well-functioning legal institutions are more capable of designing, implementing, and enforcing environmental regulations. In addition, governments with strong rule-of-law foundations are more effective in promoting corporate social responsibility, green finance, and low-carbon transitions.

In cross-border contexts, multinational firms adjust their environmental strategies based on the RRL index scores of host countries. Higher RRL index values indicate reduced institutional risk and more predictable enforcement, which in turn encourage long-term environmental investments.

To ensure that the "Sustainable Development Goals (SDGs)" are achieved in a fair manner, to guarantee equitable access via a rights-based approach, and to promote and protect environmental and other socio-economic rights, the existence of the rule of law is critical[15]. The ecology of law belongs to the one of the social sciences that deals with the evolution of physical and social entities, but the main subject of ecological processes are legal statues (van Witteloostuijn, 2003). However, researchers have focused on the environmental legislation (Wu et al., 2020), environmental laws (Yin et al., 2022), environmental regulations (Ahmad & Satrovic, 2023; Ahmed et al., 2021; Chu & Tran, 2022; Murshed et al., 2021; Nathaniel et al., 2021; Sun et al., 2022), institutional quality (Chowdhury et al., 2021; Emmanuel et al., 2023; Haini, 2021; Muhammad & Long, 2021; Raza et al., 2023; Sun et al., 2023; S. Wang et al., 2023; Zakari et al., 2022), and governance quality (Mahmoodi & Dahmardeh, 2022). Several researchers such as (Abid, 2016; Eskander & Fankhauser, 2020; Shahbaz et al., 2023) have focused on how the rule of law affects environmental quality. Secondly, these studies results are mixed in terms of their outcomes. For example, environmental quality is accelerated by environmental legislation (Wu, 2017; Wu et al., 2020), environmental laws (Yin et al., 2022), and environmental regulations (Ahmad & Satrovic, 2023; Ahmed et al., 2021; Chu & Tran, 2022; Murshed et al., 2021; Nathaniel et al., 2021; Sun et al., 2022). Additionally, the rule of law (Eskander & Fankhauser,

[15] Received on 26-01-2024, for more details please refer to "https://www.unep.org/explore-topics/environmental-rights-and-governance/what-we-do/promoting-environmental-rule-law-0"

2020; Shahbaz et al., 2023) decreases the carbon emissions and ecological footprint resulting in environmental quality.

Also, (Khan & Rana, 2021) analyze the effect of institution quality, the rule of law and regulatory effectiveness on environmental performance in 41 Asian countries and authors' finding is that building the rule of law is critical for environmental sustainability in the developing world. Likewise, (Emmanuel et al., 2023; Raza et al., 2023; Sun et al., 2023; S. Wang et al., 2023; Zakari et al., 2022) affirmed that institutional quality augments environmental quality by lowering carbon emissions and ecological footprint. Also, (Abid, 2016) found that the rule of law and carbon emissions are directly associated so that carbon emissions even though there is strong rule of law. Similarly, (Haini, 2021), in case of the ASEAN nations, concluded that institutional quality is insufficient for curbing carbon emissions and (Chowdhury et al., 2021) upheld that institutional quality is positively linked with ecological footprint in the case of 92 states.

Despite growing attention in the academic literature to the link between institutional quality, and in particular the rule of law, and environmental outcomes, there is still fragmentation and even sometimes contradictions in place in the existing knowledge. Conflicting findings are derived from variations in methodological setting, regional context and the type of institutional indicators. While some research emphasizes the significant role played by the rule of law in promoting environmental sustainability, others find modest or situation-dependent impact. In view of this uncertainty, the present study makes an original contribution by using a sophisticated econometric model integrating the Rule of Law Index (RRL). Building on the RRL as a multidimensional and implementation-oriented institutional measure, this study goes

beyond overall governance indicators to include the specific legal mechanisms affecting environmental outcomes. This focused approach has led to more conceptual clarity and empirical depth in understanding the role of legal institutions in environmental performance.

Accordingly, in this study, the rule of law index will be used to further validation of the following hypothesis: H_1 The rule of law reduces the ecological footprint in OSCE and European nations.

2.2.2 Economic Growth and Ecological Footprint

Researchers have invested a considerable amount of time and efforts into the investigating of the connection between the growth of the economy and the production of carbon dioxide. (Kuznets, 1955) provided an explanation for the relationship via the EKC (Environmental Kuznets Curve) model, which takes the form of inverted U-Shaped curve. According to this concept, during the early stages of development, nations place greater emphasis on industrialization in order to attain faster economic growth.

However, they do not take into consideration environmental concerns, which leads to an increase in pollution. When countries reach a high level of prosperity, they shift their focus to the management of carbon emissions. This is accomplished using modern technology and the implementation of stringent environmental rules and regulations. Moreover, researchers have found two conclusions regarding economic growth's effect on the environment. For example, (Arminen & Menegaki, 2019) in the case of "low, medium, and high income level states" affirmed that economic growth objectives are only obtained at the cost of environmental pollution. It is clear that high income countries consume more resources than those with lower income (Galli, A. et

al., 2010). Similarly, economic growth increase carbon emissions as evidenced by (Ali & Seraj, 2022; Eskander & Fankhauser, 2020; Haini, 2021; Atif Jahanger et al., 2023; Samour et al.; Yin et al., 2022) and ecological footprint (Ahmad & Satrovic, 2023; Ahmed et al., 2021; Ali et al., 2023; Ivan et al., 2023; Joof et al., 2023; Murshed et al., 2021; Nathaniel et al., 2021), which in turn creates an environmental imbalance. On the other hand, economic growth reduces the ecological footprint (Chowdhury et al., 2021; Destek & Sinha, 2020; Sun et al., 2022; Y. Wang et al., 2023) and carbon emissions (A. Jahanger et al., 2023), which in turn creates an environmental balance. Based on these inconsistent outcomes, we postulate that: H_2 Economic growth accelerates the ecological footprint in OSCE and European nations.

2.2.3 Renewable Energy and Ecological Footprint

The utilization of the renewable energy (REC) sources has the potential to significantly contribute to the reduction of emissions of greenhouse gases, which is necessary to resolve the problem of climate change[16]. The connection between REC, CO2, and EF has been investigated by researches such as (Ahmad & Satrovic, 2023; Ahmed et al., 2021; Appiah et al., 2023; Chu & Tran, 2022; Dai & Du, 2023; Destek & Sinha, 2020; Ivan et al., 2023; F. Joof et al., 2023; Liu et al., 2022; Murshed et al., 2021; Shahbaz et al., 2023; Sun et al., 2022). In the case of the United States of America, (Ali et al., 2023) utilized the Bootstrap Autoregressive Distributive Lag Model (ARDL) estimator to explain the effect of REC on EF. They showed that REC restores the level of EF in the country. Similarly, according to (Raza et al., 2024), using the clean energy source in Scandinavian states results in improving of environmental quality through the reducing of carbon emissions. The sole justification for the expansion of

[16] Retrieved on 27-01-2024, for more detailed refer to https://www.energy.gov/eere/environmental-impacts-clean-energy

sustainable energy is the destruction of the environment. The growth and evolution of the renewable energy sector has significant importance for overcoming most technical difficulties, such as the shortage of resources and the reduction of the degradation ratio that is now occurring in the top ten countries that use renewable energy (A. Jahanger et al., 2023). Likewise, (Ali & Seraj, 2022) employed the Cross-sectionally augmented Autoregressive Distributed Lag (CS-ARDL) estimator in case of the top ten renewable energy consuming states and revealed that nations curbs carbon emissions by using REC to meet the energy demand and to achieve their economic growth goals. Based on this literature, we postulate that: H_3 Renewable energy reduces the ecological footprint in OSCE and European nations.

2.2.4 Population and Ecological Footprint

The link that exists between population and environment is complex and multifaced. For instance, (Ali & Seraj, 2022; Dong et al., 2018; Mendonca et al., 2020; Yeh & Liao, 2017; Zhang & Tan, 2016) showed that population has a causal effect on environmental degradation. Additionally, (Wood & Garnett, 2009) stated that the EF of the urban population is much higher than that of the rural community. In contrast, (Toth & Szigeti, 2016) stated that population is not a reason for environmental degradation. (Begum et al., 2015) investigated the influence of population on CO2 emissions and discovered that population did not have any major impacts on environmental quality. However, they anticipated that population could have a negative impact on CO2 emissions in the Malaysian economy in the long term. Therefore, there is insufficient comprehension of the connection between population and environmental issues, although it is generally acknowledged that the expansion of the human population has a substantial influence on the environment. Based on this,

we propose that: H_4 Population accelerates the ecological footprint in OSCE and European nations.

2.3 Methodology

2.3.1 Data

This research paper investigates the effect of rule of law on the ecological footprint, as well as the effect of renewable energy consumption, economic growth, and population on the ecological footprint of 38 selected "Organization for Security and Co-operation in Europe (OSCE)" participating nations and European states. In this research, from the total amount of 57 participating states, 19 countries were removed due to the lack of data in the of Rule of Law index database[17].

Also, this research will be implemented on the base of two models to better understanding which of the legal system types, monist or dualist, has a better response to the rule of law. The basic econometric model equation is presented below:

$$EF_{it} = \lambda_0 + \lambda_1 RRL_{it} + \lambda_2 REC_{it} + \lambda_3 EG_{it} + \lambda_4 POP_{it} + \mathcal{E}_{it} \quad (1)$$

Where EF_{it} is ecological footprint. The Ecological Footprint measures how much demand human consumption places on the biosphere and is measured in standard units called global hectares.

The definition of the ecological footprint is: "a measure of the exclusive total amount of carbon dioxide emissions that is directly and indirectly caused by an activity or is accumulated over the life stages of a product" (Wiedmann, T. and J. Minx, 2008).

[17] List of the participating States in Appendix A

RRL_{it} refers to rule of law, measured as the "WJP Rule of Law Index" based on the present information on 9 composite factors and 47 sub-factors, which were created by conceptualization and measurement, in consultation with academics, practitioners and community leaders from around the world.

REC_{it} refers to "renewable energy measured as renewable energy consumption (% of total final energy consumption)," EG_{it} denotes "economic growth measured as GDP per capita (constant 2015 US$)," POP_{it} denotes "population measured as total population."

Moreover, λ_0 and λ_1 to λ_4 refer to the intercept, and coefficients of RRL, REC, EG, and POP variables, respectively *t,* and $\mathcal{E}$ stand for time period (2012-2021) and the error term.

However, *i* refers to the countries in this research study such as OSCE (Albania, Austria, Belarus, Belgium, Bosnia, Bulgaria, Canada, Croatia, Czechia, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Italy, Kazakhstan, Kyrgyzstan, Moldova, Mongolia, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Russian, Serbia, Slovenia, Spain, Sweden, Turkey, Ukraine, United Kingdom, United States and Uzbekistan).

Table 1 presents a summary of the data. Additionally, a graphical representation of the variables is shown in Figure 1.

Table 1: Data Summary

Variables	Abs.	Measurement Unit	Source
Ecological Footprint	EF	Ecological footprint per person	GFN
Rule of Law	RRL	WJP Rule of Law Index	
Renewable Energy	REC	Renewable energy consumption (% of total final energy consumption)	WB
Economic Growth	EG	GDP per capita (constant 2015 US$)	WB
Population	POP	Total population	WB

Source: Author's compilation, Source: RRL index data are retrieved from World Justice Project's Rule of Law Index on 23-01-2024: https://worldjusticeproject.org/rule-of-law-index/, Ecological Footprint data are retrieved from Global Footprint Network (GFN) on 23-01-2024: https://data.footprintnetwork.org/?_ga=2.189010210.88993239.1706042296-1575493245.1705580536#/ Renewable energy, economic growth, and population data are retrieved from World Bank Development Indicators (WB) on 23-01-2024: "https://databank.worldbank.org/source/world-development-indicators"

2.3.2 Model Estimation Procedure

2.3.2.1 Cross Sectional Dependence

First, we utilize the Pesaran (2004) CSD test to conduct an analysis of the "Cross-sectional Dependence (CSD)" concerns that are present in the data. In the event that this test is not carried out, the results of the study will be lacking in consistency, dependability, correctness, impartiality, and overall practicability (Pesaran 2007, Begum et al. 2022).

2.3.2.2 Unit Root Estimation

The estimated evidence of CSD shows inefficiencies in the original stationarity technique. If there is no cross-sectional dependence, then we could use the first-generation panel unit root test. However, if there is a cross-sectional dependence in the data, then the first-generation panel unit root test cannot be applied. In the latter case,

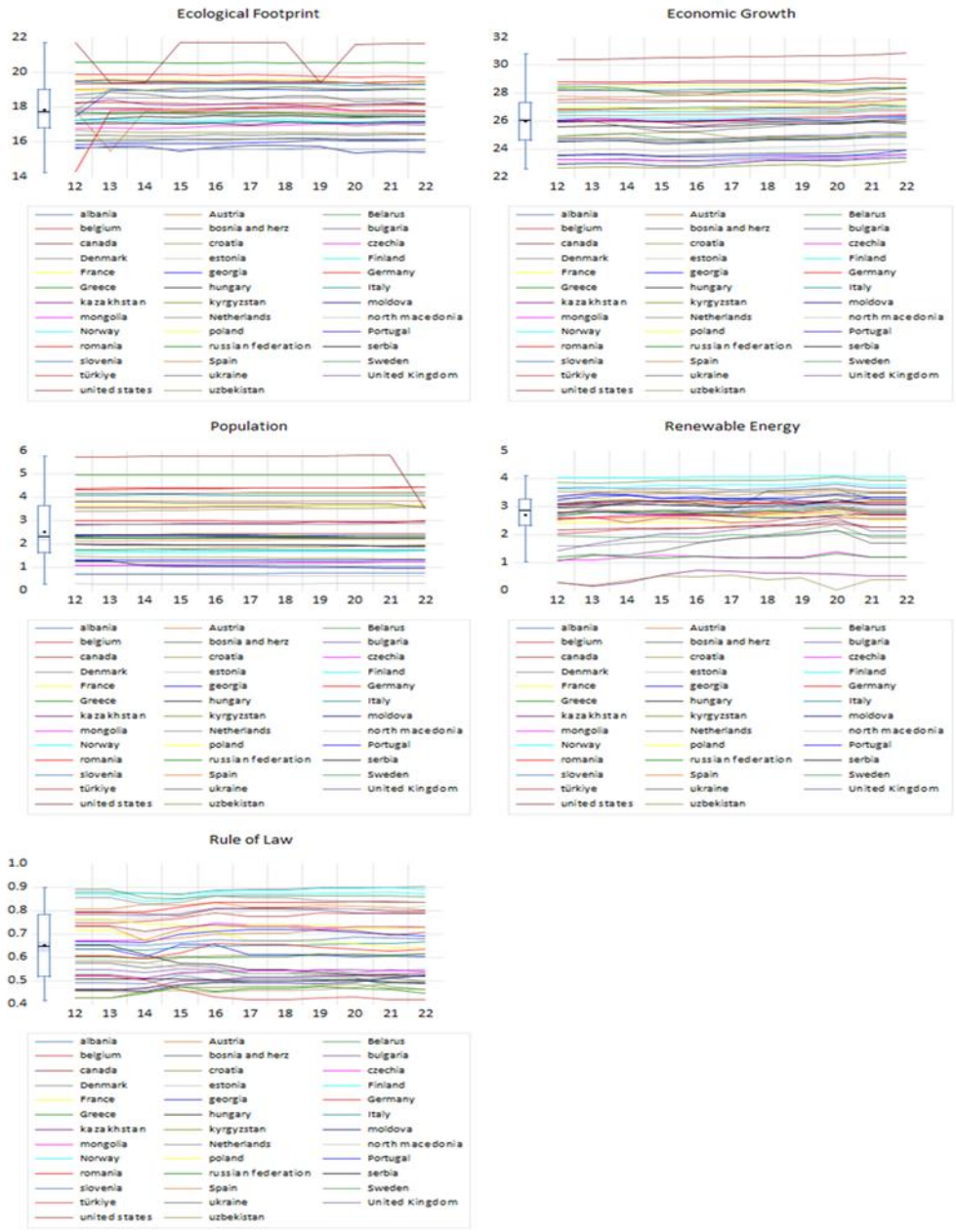

Figure 1: Graphical Representation of Variables

the second-generation panel Cross-sectional Augmented Dickey-Fuller (CADF) and Cross-sectional Im, Pesaran, and Shin (CIPS) unit root tests can be used, which take into account cross-sectional dependence (Pesaran, 2007). Cross-sectional dependence can be explained in econometric terms as the integration of residuals between the

model units of panel data. Because of this, the CIPS-2007, which is a second-generation unit root test, was applied in this research in order to address the issue of inefficiencies in estimating. Because of the dependability of the results that they provide, the study makes use of the CADF and CIPS unit root tests.

2.3.2.3 Cointegration Estimations

The RALS co-integration econometric approach, which was developed and presented by Im and Schmidt (2008), is implies with a purpose to use more precise, robust and comprehensive information. This information may be found in the abnormal errors that are associated with the linear model. In addition, the RALS co-integration test generates a new term by combining the 2nd and 3rd moments of the residuals.

Moreover, the results of the RALS cointegration were validated by the use of the Westerlund cointegration in this study (Westerlund, 2007). This test calculates four different statistics based on the error of the correction model, which can appear between the unit panel and the whole panel.

2.3.2.4 Slope Heterogeneity

This research employed the Slope Heterogeneity test developed by Swamy (1970) to assess whether "slope coefficients of the cointegration equation are homogeneous." Pesaran and Yamagata (2008) improved Swamy's slope homogeneity test and formed two test statistics.

2.3.2.5 MMQR Model

This research made use of the Method of Moments Quantile Regression (MMQR) methodology that developed by Machado and Santos Silva (2019) as the main method for capturing the conditional heterogeneity of the aspect that was described. According to Afshan et al. (2022), this strategy offers benefits in terms of controlling the influence of individual effects and endogeneity within the parameters. In accordance with the

findings of Anwar et al. (2021), the MMQR is a statistical tool that may be used to investigate the effects of heterogeneity occurring across several quantiles. Another advantage of this estimator is that it permits individual effects to have an impact on the overall distribution represented by the integration of fixed effects. This method become more popular because it makes possible to get the more adaptable modeling of the conditional quantiles and so it increases the robustness of our estimates against possible misspecification of the underlying distribution. Also, this method concentrates on estimating conditional quantiles instead of long-run relationships (Safi, A et al., 2023).

Finally, we used Dumitrescu Hurlin Panel Causality Tests (Dumitrescu, E.I., Hurlin, C., 2012) to determine the causal relationship between the different aspects of the research.

2.4 Results and Discussion

The outcomes of the descriptive statistics are presented in Table 2. The average value of the EF, RRL, EG, REC, and POP in terms of mean values are 17.866, 0.651, 26.024, 2.725, and 2.554, respectively and the median values are 17.758, 0.646, 26.072, 2.878, and 2.337, respectively. However, volatility or dispersion mean values of EF, RRL, EG, REC, and POP in terms standard deviation are 1.432, 0.142, 1.895, 0.870, and 1.297, respectively.

Since this study employs two separate models (one for all OSCE participating states and another for European countries) the results are presented separately for clarity.

The following section reports the outcomes for the OSCE countries, while the subsequent section will focus on European states. This distinction allows us to capture potential institutional differences arising from legal traditions (monist vs. dualist

systems) and to assess how these affect the explanatory power of the variables under consideration.

Moreover, the outcomes of the CSD test for the OSCE countries are presented in Table 3. The outcomes affirmed the cross-sectional dependence among the units of the study. Hence, we employed the 2nd generation unit root estimators CADF and CIPS. The outcomes in Table 3 show that RRL, REC, and POP are stationary at 1st difference; however, EF is stationary at level in CADF and CIPS, EG is stationary at level in CADF and at 1st difference in the CIPS estimator.

Table 2: Descriptive Statistics

	EF	RRL	EG	REC	POP
Mean	17.866	0.651	26.024	2.725	2.554
Median	17.758	0.646	26.072	2.878	2.337
Maximum	21.712	0.902	30.868	4.116	5.805
Minimum	14.274	0.417	22.611	0.030	0.270
Std. Dev.	1.432	0.142	1.895	0.870	1.297
Skewness	0.221	0.158	0.130	-1.045	0.411
Kurtosis	2.541	1.701	2.390	3.765	2.423
Jarque-Bera	7.060	31.142	7.661	86.308	17.582
Probability	0.029	0.000	0.022	0.000	0.000
Observations	418	418	418	418	418

Source: "Authors compilation outcomes retrieved from EViews 13. Note: EF= Ecological Footprint, RRL=Rule of Law, EG=Economic Growth, REC=Renewable Energy, and POP=Population"

Additionally, we estimated the Slope Heterogeneity (SH) tests of Pesaran and Yamagata (2008) and Blomquist and Westerlund (2013).

The outcomes of the Slope Heterogeneity tests for the OSCE countries are presented in Table 4. The tests affirmed that the slope coefficients are not homogeneous.

Table 3: CSD, CADF, & CIPS Outcomes (OSCE Countries)

CSD		CADF		CIPS	
		Level	1st difference	Level	1st difference
Variable	test	T-statistics	T-statistics	T-statistics	T-statistics
EF	.1*	-2.305*	-	-2.305*	-
RRL	3*	-1.504	-2.590*	-1.244	-2.590*
REC	08*	-1.739	-2.906*	-1.361	-2.906*
EG	31*	-2.314*	-	-2.220	-2.313*
POP	40*	-1.869	-2.812*	-1.869	-2.812*

Source: "Authors' compilation outcomes retrieved from Stata 17 Software. Note: EF= Ecological Footprint, RRL=Rule of Law, EG=Economic Growth, REC=Renewable Energy, and POP=Population; *, **, and *** refers to significance level at 1%, 5%, and 10%, respectively."

Table 4: Slope Heterogeneity (OSCE Countries)

	(Pesaran, Yamagata. 2008)		(Blomquist, Westerlund. 2013)	
	Delta	P-Value	Delta	P-Value
	3.298	0.001	2.728	0.006
adj.	4.892	0.000	4.046	0.000

Source: Authors' compilation outcomes retrieved from Stata 17.

Furthermore, Table 5 presents the outcomes of the RALS-EG and Westerlund cointegration estimators. The RALS-EG outcomes reject the null hypothesis at the 1% significance level as the value of the t-statistics (-9.211) is less than the critical value (-4.80), thus confirming cointegration.

The Westerlund cointegration estimators affirmed the outcomes of the RALS-EG estimator.

Hence, over the course of time, the variables (EF, RRL, REC, EG, POP) move in tandem with one another.

Table 5: Cointegration estimations (OSCE countries)

Methods			
RALS-EG	0^{k} -	$-9.211^{t-Statistic}$	0.109^{Rho}
Westerlund		$7.353^{t-statistic}$	$0.000^{P-value}$

Source: "Authors' estimations retrieved from EViews 13. Note: ***, ** and * indicate the significance at 1%, 5% and 10% respectively; K shows the optimum lag length found using recursive statistics; the 1%, 5% and 10% critical values for the EG test are -5.02, -4.32 and -3.98, respectively; the 1%, 5%, and 10% critical values for the RALS-EG test are -4.80, -4.19 and -3.88, respectively."

Next section will focus on European states outcomes. the outcomes of the CSD test are presented in Table 6. The outcomes affirmed the cross-sectional dependence among the units of the study. Hence, we employed the 2nd generation unit root estimators CADF and CIPS. The outcomes in Table 6 for the European states show that RRL, POP, and EG are stationary at 1st difference, while EF and REC is stationary at level in both CADF and CIPS estimators. Additionally, we estimated the Slope Heterogeneity (SH) tests of Pesaran and Yamagata (2008) and Blomquist and Westerlund (2013). The outcomes of the Slope Heterogeneity tests for the European states are presented in Table 7. The tests affirmed that the slope coefficients are not homogeneous. Furthermore, Table 8 presents the outcomes of the RALS-EG and Westerlund cointegration estimators. The RALS-EG outcomes reject the null hypothesis at the 1% significance level as the value of the t-statistics (-10.412) is less than the critical value (-4.80), thus confirming cointegration. The Westerlund cointegration estimators affirmed the outcomes of the RALS-EG estimator. Both tests confirm the existence of a long-run cointegration relationship among EF, RRL, REC, EG, and POP in the European model. These outcomes are consistent with OSCE states.

Table 6: CSD, CADF, & CIPS Outcomes (European States)

CSD		CADF		CIPS	
Variable	CD-test	Level	1st difference	Level	1st difference
		T statistics	T statistics	T statistics	T statistics
EF	8.54*	-3.149*	-	-3.149*	-
RRL	4.77*	-1,079	-2.588*	-1,079	-2.588*
REC	27.73*	-2.331*	-	-2.331*	-
EG	50.78*	-1,246	-2.993*	-1,246	-2.993*
POP	-1,570	-0,715	-2.121 **	-0,715	-2.121 **

Source: "Authors' compilation outcomes retrieved from Stata 17 Software. Note: EF= Ecological Footprint, RRL=Rule of Law, EG=Economic Growth, REC=Renewable Energy, and POP=Population; *, **, and *** refers to significance level at 1%, 5%, and 10%, respectively."

Table 7: Slope Heterogeneity (European States)

(Pesaran, Yamagata. 2008)			(Blomquist, Westerlund. 2013)	
	Delta	P-Value	Delta	P-Value
	2.615	0.009	23.950	0.000
adj.	3.879	0.000	5.523	0.000

Source: Authors' compilation outcomes retrieved from Stata 17.

Table 8: Cointegration Estimations (European States)

Methods	k	T-statistics	rho
RALS-EG	0,000	-10,412	0,932
Westerlund		4,307	0,000

Source: "Authors' estimations retrieved from EViews 13. Note: ***, ** and * indicate the significance at 1%, 5% and 10% respectively; K shows the optimum lag length found using recursive statistics; the 1%, 5% and 10% critical values for the EG test are -5.02, -4.32 and -3.98, respectively; the 1%, 5%, and 10% critical values for the RALS-EG test are -4.80, -4.19 and -3.88, respectively."

Moreover, the outcomes of the MMQR are presented in Table 9 for the OSCE countries with all types law systems and Table 10 is for European monist law system nations only. The model's (1) (at the Table 6) outcomes show that rule of law is negatively associated with ecological footprint in the lower (q1 to q3) quantiles (-0.001, -0.007, -0.013), middle (q4 to q6) quantiles (-0.016, -0.020, -0.026) and upper (q7 to q9) quantiles (-0.035, -0.042, -0.054). It is important to note that this adverse

effect of rule of law on the ecological footprint complies with theory that a strong rule of law helps the OSCE nations to reduce their ecological footprint and improve environmental quality. The outcomes are aligned with (Abid, 2016).

The coefficients are not significant, all types of law systems react to the changes into domestic law's hierarchy differently and this variable does not explain the dependent variable of the model. Monist law systems immediately obey the international agreements, whereas dualist law system states prioritize their own domestic rules of law and do not obey the international agreements. In dualist systems require a separate act of incorporation by the national legislature before international treaties acquire domestic legal force. Even if a state has ratified environmental conventions, they remain non-binding internally until formally adopted into national law. Thus, the effectiveness of the rule of law in such jurisdictions depends more heavily on the political will to transpose and implement these standards. Enforcement can be slower or fragmented, potentially weakening the legal response to environmental threats and delaying progress in reducing ecological footprint. This may have an effect on the explanatory power of the variables.

However, the Model (2) MMQR outcomes in Table 10 for European nations therefore only for monist law systems show that rule of law is negatively and significantly associated with ecological footprint from lower (q1 to q3) quantiles (-0.588, -1.063, -1.256), middle (q4 to q6) quantiles (-1.427, -1.611, -1.754) and upper (q7 to q9) quantiles (-1.999, -2.432, -3.428). In monist systems, international environmental treaties and norms become part of domestic law automatically or with minimal legislative action. This means that once a country ratifies an international agreement (such as the Paris Agreement), its provisions can be invoked directly by courts,

regulators, and citizens. In such systems, a strong rule of law ensures not only domestic compliance but also direct enforcement of international environmental obligations, leading to more immediate and coordinated responses to global ecological challenges.

This confirms the powerful law system in the European states, which belongs to the monist law system due to the Europe Union's standardized legal framework and legislation, which ensures that all member states agree to act as one and immediately obey the international law directives regarding environment protection: therefore, this reduces the ecological footprint and accelerates the environmental quality in lower, medium, and upper quantiles.[18]

The strength of the rule of law is correlated negatively with an ecological footprint. In institutional settings where rules of law and legality are clear and stable and are also widely known to be enforced, environmental regulation is easier to enforce. Strong rule-of-law environments enable enforcement agencies to police and punish environmental misconduct. This results in increased adherence to environmental norms, lower emissions and greener use of resources. Thus, countries with higher rule-of-law scores generally tend to have lower ecological footprints and better environmental performance indicators overall.

Moreover, it is interesting to observe that the magnitude of the effect increases from the lower quantiles to the upper quantiles in Model (1) and Model (2), suggesting that as the legal system of the states becomes stronger over time, the environmental laws will be implemented, followed, and practiced more effectively. This will in turn affect

[18] Retrieved on 11-04-2024, for more details refer to https://eur-lex.europa.eu/EN/legal-content/summary/treaty-on-the-functioning-of-the-european-union.html

the environment positively and an environmental balance will be observed in the long run. The results of this research are in line with (Eskander & Fankhauser, 2020; Haini, 2021; Muhammad & Long, 2021; Shahbaz et al., 2023; Wu et al., 2020). In nations with robust adherence to the rule of law, there is a higher probability that environmental legislation will be efficiently enforced. Consequently, both companies and people are required to take responsibility for their environmental influence, resulting in a reduced ecological footprint. Moreover, robust adherence to the rule of law often leads to increased openness and accountability in both governmental and business activities.

This may result in increased adherence to environmentally-friendly practices, since both governmental and non-governmental entities recognize that unlawful or detrimental actions are more prone to being identified and sanctioned.

The results of MMQR for Model (1) shows that renewable energy coefficients are negative and significant at the 1% significance level at the lower (q1to q3) quantiles (-0.193, -0.186, -0.180), middle (q4 to q6) quantiles (-0.176, -0.171, -0.165), and upper (q7 to q8) quantiles (-0.154, -0.147, -0.133). The outcomes suggest that increasing renewable energy improves the environmental quality of OSCE states by reducing the ecological footprint. Moreover, the Model (2) estimates that renewable energy has a negative effect on the ecological footprint from lower to middle quantiles (q1 -0.018, q2 -0.013, q3 -0.011, q4 -0.010, q5 -0.008, q6 -0.006).

However, in the case of the upper quantiles in Model (2), the renewable energy coefficients are significant until the long run quantiles. Hence, renewable energy consumption plays a vital role in boosting the environmental quality of OSCE and

European states. The results of this research are in line with (Ali et al., 2023; A. Jahanger et al., 2022; Jahanger et al., 2023; Joof et al., 2023; Raza et al., 2024; Samour et al., 2023). Therefore, it is demonstrated that the renewable energy sources (such as solar, wind, and hydroelectric power) are providing electricity without harming the environment. Renewable energy relies on natural processes that are capable of being restored, but by contrast, fossil fuels significantly contribute to both global warming and ecological destruction.

Additionally, economic growth adversely affects the environment balance in Models (1) and (2), as shown in Table 9 and 10. The coefficients of economic growth for OSCE nations are positive and significant at the 1% significance level from the lower quantiles (q1 0.372, q2 0.383, q3 0.392) to the upper quantiles (q7 0.431, q8 0.443, q9 0.464) through the medium quantiles (q4 0.398, q5 0.405, q6 0.415). Similar outcomes have been obtained for Model (2) as the coefficients for the lower quantiles (q1 0.596, q2 0.656, q3 0.679), middle quantiles (q4 .701, q5 0.724, q6 0.741) and upper quantiles (q7 0.772, q8 0.826, q9 0.950) are significant at the 1% significance level. The results affirm that the acceleration of economic growth in the case of the OSCE and European states can be observed at the cost of environmental quality. The outcomes are consistent with (Ali & Seraj, 2022; Atif Jahanger et al., 2023; F. Joof et al., 2023; Samour et al.). Hence, it is revealed that economic growth is achieved through increased production and consumption, industrial expansion, and infrastructure development. Which leads to increased demand for energy that is expected to be met by fossil fuel consumption. Additionally, economic growth results in more waste generation, thus, causing environmental degradation in the OSCE and European states.

Furthermore, population has a significant and positive effect on ecological footprint in the case of Model (1) and Model (2). For the OSCE states, the coefficients of population are positive and significant at the 1% significance level from lower quantiles (q10,469, q2 0.464, q3 0.460) to the upper quantiles (q7 0.442, q8 0.437, q9 0.424) through the medium quantiles (q4 0.457, q5 0.454, q6 0.450). Similar outcomes have been obtained for Model (2) except in the upper quantiles and q6 of the middle quantile, whereas the coefficients are insignificant but the coefficients for lower quantiles (q1 0.009, q2 0.007, q3 0.006), and middle quantiles (q4 0.005, q5 0.003) are significant at the 1% significance level.

It is interesting to note that the magnitude of coefficients of population decrease over time from the lower to upper quantiles in the case of OSCE states and a similar pattern is observed in the case of European states from lower to middle quantiles. Hence, this suggests that the effects of population decrease over time in both panel states. The condition of the environment will become more important to people, and they will be more inclined to safeguard it, even if it means incurring significant expenditures for themselves in the long term.

The outcomes are consistent with (Ali & Seraj, 2022; Yeh & Liao, 2017; Zhang & Tan, 2016). The findings indicate the increasing of the population growth rate directly correlates with a rise in the demand for energy consumption. Consequently, this leads to a decline in environmental quality. Additionally, the surge in population also results in an increased demand for water, housing, transportation, food, commercial buildings, electric appliances, public utilities, and other resources. This heightened demand contributes to a rise in pollution levels and exacerbates climate change.

Moreover, the FGLS outcomes shown in the Table 11 for OSCE Nations and Table 12 for European States affirmed the robustness of the MMQR outcomes. The FGLS outcomes at Table 11 affirmed the robustness of MMQR outcomes. The FGLS outcomes shows that RRL and REC have a negative coefficient with EF, suggesting that these factors decrease the ecological footprints. And EG with POP have a positive coefficient with EF suggesting that these factors enhance the EF. The FGLS outcomes in Table 12 shows that REC has a negative coefficient with EF, suggesting that this factor decreases the ecological footprints. And EG with POP have a positive coefficient with EF suggesting that these factors enhance the EF. However, RRL has a positive coefficient for this group of countries.

Table 11: FGLS Outcomes (OSCE Nations)

EF (DV)	Coefficient	Std. err.	P-value
RRL	-1,777	0,192	0,000
REC	-0,013	0,001	0,000
EG	0,724	0,014	0,000
POP	0,000	0,000	0,100
C	0,452	0,273	0,098

Note: EF= Ecological Footprint, RRL=Rule of Law, EG=Economic Growth, REC=Renewable Energy, and POP=Population.

Table 9. MMQR Outcomes (Model-1 OSCE States)

EF	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
	q1		q2		q3		q4		q5	
RRL	-0.001	0.996	-0.007	0.973	-0.013	0.950	-0.016	0.936	-0.020	0.920
REC	-0.193	0.000	-0.186	0.000	-0.180	0.000	-0.176	0.000	-0.171	0.000
EG	0.372	0.000	0.383	0.000	0.392	0.000	0.398	0.000	0.405	0.000
POP	0.469	0.000	0.464	0.000	0.460	0.000	0.457	0.000	0.454	0.000

EF	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
	q6		q7		q8		q9	
RRL	-0.026	0.902	-0.035	0.885	-0.042	0.880	-0.054	0.879
REC	-0.165	0.000	-0.154	0.000	-0.147	0.000	-0.133	0.006
EG	0.415	0.000	0.431	0.000	0.443	0.000	0.464	0.000
POP	0.450	0.000	0.442	0.000	0.437	0.000	0.428	0.000

Source: “Authors compilation outcomes retrieved from Stata 17 Software. Note: EF= Ecological Footprint, RRL=Rule of Law, EG=Economic Growth, REC=Renewable Energy, and POP=Population”

Table 10. MMQR Outcomes (Model-2 European States)

EF	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
	q1		q2		q3		q4		q5	
RRL	-0.588	0.115	-1.063	0.000	-1.256	0.000	-1.427	0.000	-1.611	0.000
REC	-0.018	0.000	-0.013	0.000	-0.011	0.000	-0.010	0.001	-0.008	0.010
EG	0.596	0.000	0.656	0.000	0.679	0.000	0.701	0.000	0.724	0.000
POP	0.009	0.000	0.007	0.000	0.006	0.001	0.005	0.006	0.003	0.044

EF	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
	q6		q7		q8		q9	
RRL	-1.754	0.000	-1.999	0.000	-2.432	0.000	-3.428	0.000
REC	-0.006	0.045	-0.004	0.270	0.000	0.985	0.010	0.219
EG	0.741	0.000	0.772	0.000	0.826	0.000	0.950	0.000
POP	0.003	0.150	0.001	0.563	-0.001	0.647	-0.007	0.113

Table 12: FGLS Outcomes (European States)

EF (DV)	Coefficient	Std. err.	P-Value
RRL	4,293	0,138	0,000
REC	-0,015	0,001	0,000
EG	0,000	0,000	0,000
POP	0,053	0,001	0,000
C	14,353	0,058	0,000

Note: EF= Ecological Footprint, RRL=Rule of Law, EG=Economic Growth, REC=Renewable Energy, and POP=Population.

Finally, the Dumitrescu-Hurlin (DH) test provides a causality analysis that allows the slope heterogeneity among each variable to be captured and causality in panel data to be detected. Table 13 and 14 presents the outcomes of the DH causality estimators for OSCE States and European States.

Table 13: Dumitrescu-Hurlin Panel Causality Tests (OSCE States)

Null Hypothesis:	W-Stat.	Zbar-Stat.	P-value
RRL ≠ EF	2.820	3.127	0.002
EF ≠ RRL	2.212	1.788	0.074
EG ≠ EF	1.421	0.046	0.963
EF ≠ EG	3.754	5.183	0.000
REC ≠ EF	1.649	0.547	0.584
EF ≠ REC	1.674	0.603	0.547
POP ≠ EF	2.860	3.215	0.001
EF ≠ POP	1.861	1.015	0.310

Source: "Authors compilation outcomes retrieved from Stata 17 Software. Note: EF= Ecological Footprint, RRL=Rule of Law, EG=Economic Growth, REC=Renewable Energy, and POP=Population"

The outcomes for OSCE States suggest that there is bidirectional link between the rule of law and ecological footprint, whereas economic growth, population, ecological footprint and economic growth have a unidirectional link between them. Nevertheless,

the renewable energy and ecological foot print do not have any directional link between them.

Table 14: Dumitrescu-Hurlin Panel Causality Tests (European States)

Null Hypothesis:	F-Statistic	P-value
RRL ≠ EF	0,8183	0,4422
EF ≠ RRL	3,0892	0,0471
REC ≠ EF	1,1578	0,3157
EF ≠ REC	0,4179	0,6588
EG ≠ EF	3,5169	0,0310
EF ≠ EG	1,5068	0,2234
POP ≠ EF	2,7893	0,0632
EF ≠ POP	2,7934	0,0630

Source: "Authors compilation outcomes retrieved from Stata 17 Software. Note: EF= Ecological Footprint, RRL=Rule of Law, EG=Economic Growth, REC=Renewable Energy, and POP=Population"

The outcomes in Table 14 for the European states indicate that there is a unidirectional causal relationship running from ecological footprint to the rule of law, suggesting that environmental pressures may influence institutional quality rather than the reverse. Furthermore, economic growth is found to cause ecological footprint, confirming that expansion of economic activity in European states tends to increase environmental degradation. By contrast, no significant causal link is observed between renewable energy and ecological footprint, implying that renewable energy adoption in the European context does not yet play a decisive role in shaping ecological outcomes. Similarly, population shows no significant directional relationship with ecological footprint, although the p-values are close to the 10% threshold, hinting at a potential but weak influence.

2.5 Conclusions

The principle of the rule of law is essential for achieving sustainable development and serves as the foundation for enhancing environmental governance. It emphasizes the importance of environmental sustainability by linking it to essential rights and responsibilities. It embodies the fundamental principles of morality and ethical standards of conduct, serving as a basis for environmental-social-economical rights and responsibilities. Based on this, we investigated the effect of the rule of law, renewable energy, economic growth, and population on ecological footprint in OSCE and European states for the period from 2012 to 2022. We employed the newly developed RALS-EG cointegration estimator along with Westerlund to assess the long- run link among the variables of study. Moreover, this study used the MMQR and FGLS estimators to assess the estimations in lower, middle, and upper quantiles.

The outcomes of the MMQR estimator suggest that rule of law is a significant contributor to environmental quality. This signifies that the strong rule of law plays a crucial role in curbing the ecological footprint and enhancing the environmental standards. Moreover, MMQR shows that renewable energy boosts environmental quality throughout the quantiles in the OSCE states and in the 1st to 6th quantiles in European nations. Hence, production and utilization of the renewable energy must be prime objectives of these nations. On the other hand, economic growth and population factors are found to be positively related with ecological footprint. Based on these findings from the MMQR estimator the following policy recommendations and suggestions can be made to the OSCE and European states.

The OSCE and European states must ensure that they prepare a strict rule of law system regarding environment protection. In this regard, all the countries must apply these types of international agreements immediately and place them in the highest position in their legal systems' hierarchy. Additionally, courts must directly apply and so enforce international law without needs for explicating by domestic legal measures. This will enhance the quality of institutions through political stability, legal stability, and economic stability. In turn, this will encourage the states to formulate, implement, and regulate environmental laws to ensure environmental quality by reducing pollutants. Secondly, the transformation of obsolete fossil fuel consuming industrial sectors must be initiated and they should be encouraged to become green industries to make the environment free of pollution. This can be achieved by encouraging the industrial sector to invest financial resources in R&D (research and development) to produce more innovative, clean, sustainable, and green energy producing technologies such as renewable energy. Additionally, public-private partnerships should be encouraged to meet green energy technologies objectives. Furthermore, it is essential for governments to execute educational and awareness initiatives aimed at enlightening consumers and companies about the significance of sustainable practices and their capacity to mitigate ecological harm. Ultimately, reliable observation and reporting mechanisms should be established to assess the impact of policies on the ecological footprint. The obtained data can be utilized to make well-informed revisions to policy in the future.

Moreover, this research study has some limitations. First, we used data for the period from 2012 to 2022. Secondly, OSCE and European states were taken as the sample to investigate the link between the rule of law, renewable energy, economic growth, and population and ecological footprint. Finally, we employed the MMQR estimator for

the study. Hence, we suggest that future research can use the Cross-Sectionally Augmented Autoregressive Distributed Lag (CS-ARDL) model to investigate the link by using longer period depending on the availability of data. Moreover, other nations such as the ASEAN states, Asian nations, and BRICS nations can be taken as a sample states to investigate the link to increase the generalizability by incorporating additional variables such as R&D, education, and technology innovation in this research model.

The evidence demonstrates that legal quality and environmental governance are inseparable, as effective institutions determine how nations manage ecological sustainability. Yet, sustainability does not depend solely on environmental policies: international trade also plays a decisive role by influencing resource use, competitiveness, and cross-border policy diffusion. The next chapter therefore examines how the rule of law interacts with trade openness, highlighting its importance for economic integration and sustainable growth.

Chapter 3

DOES STRENGTHENING THE RULE OF LAW FOSTER TRADE OPENNESS IN THE ORGANIZATION FOR SECURITY AND CO-OPERATION IN EUROPE AND OTHER EUROPEAN COUNTRIES?

3.1 Introduction

Trade openness and globalization have consistently been important themes of economic policy and development in the last several decades. In the progressive world, everyone must ensure that the free movement of goods, services, capital, and ideas without obstacles continues to be an important engine of economic growth, innovation, and prosperity. For countries that are open to trade, have low trade barriers, efficient and transparent customs procedures, and solid legal protections for international transactions, trade openness supports faster growth, wider access to resources, and enhanced competitiveness. The rise of globalization, driven by technological advancements, reduced transportation costs, and the liberalization of trade policies, has significantly reshaped the global economic landscape. This was supported by the study of Demiral et al,. which demonstrated that in recent decades, globalization has gained incredible momentum, with trade openness deepening (Demiral et al., 2022). As a consequence, the volume of international trade has increased considerably, rising by 75% between 2000 and 2020 (Wang et al., 2023). Also, in general, trade openness has various advantages, including the ability to

accelerate development (Zhong et al., 2021). It can provide more opportunities for easy export and import, while also creating employment opportunities (Raghutla, 2020). Neoclassical economists argued that trade growth is the main driver of economic growth, as well as that there is a strong significant relationship between trade and economic growth. Recently, both OSCE and European economies have shifted their focus towards increasing trade openness across the world.

Moreover, OSCE and European market economies are highest among the leading countries in the world in terms of foreign trade, production, and economic development. The emerging market economies have been able to fulfill their nation's developmental objectives, which has contributed to a positive growth rate within those nations. Hence, with the aim of ensuring that such high growth rates are maintained, those economies predominantly focus on increasing their share of output in the total world production. In addition, this has the following two advantages: introducing new technical innovation will increase productivity through the stimulus of output demand, which is a long-term driver of economic growth. In this respect, classical and neoclassical economists believe that international trade makes a significant contribution to economic development, often referred to as the "engine of growth." Other than that, policies aimed to promoting openness to trade would ultimately result in more output. An open economy is generally considered to be more conducive to achieving faster economic development compared to a closed economy. In addition, the OSCE and European market economies have begun to prioritize international commerce and make their goods more appealing to the global market. The establishment of open markets and their integration based on compatible or harmonized norms, together with more liberalization in the OSCE area, may provide substantial economic and other advantages for all participating states. These markets

can provide the opportunity for the OSCE region to expand economic cooperation and integration. The EU is a driving force of world trade, representing the most significant trading partner for 80 countries. Openness to trade is usually calculated as the sum of exports plus imports, as a percentage of a country's GDP. The average of the trade openness of the year 2018, taken collectively for all European countries, was about 125.95%. In terms of individual countries, the openness was highest in Luxembourg at 362.42% and the lowest in Russia at 51.58%. An overview of the trade in OSCE countries is illustrated graphically in Figure 2.

The relationship between legal systems and trade openness is an important aspect of international economics. Two contrasting approaches to integrating international law into national law namely monism and dualism, can significantly influence the ability of countries to engage in international trade. In a monist legal system, international law automatically becomes a part of the national legal framework once it is ratified. This means that treaties, conventions, and international agreements, including trade agreements, are directly enforceable without the need for separate domestic legislation. According to general convention, countries that are members of the EU or another form of common unity will apply monism, and thus, EU laws will become binding immediately upon issuance in member states. The incorporation of regulations such as the EU Single Market's regulations or those of the customs union allows free trade flow within the EU territory. Monism is asserted to ensure that these EU regulations are applied uniformly, thus creating the tendency toward liberalized trade among EU members. In this way, monism basically advocates for trade openness as described below.

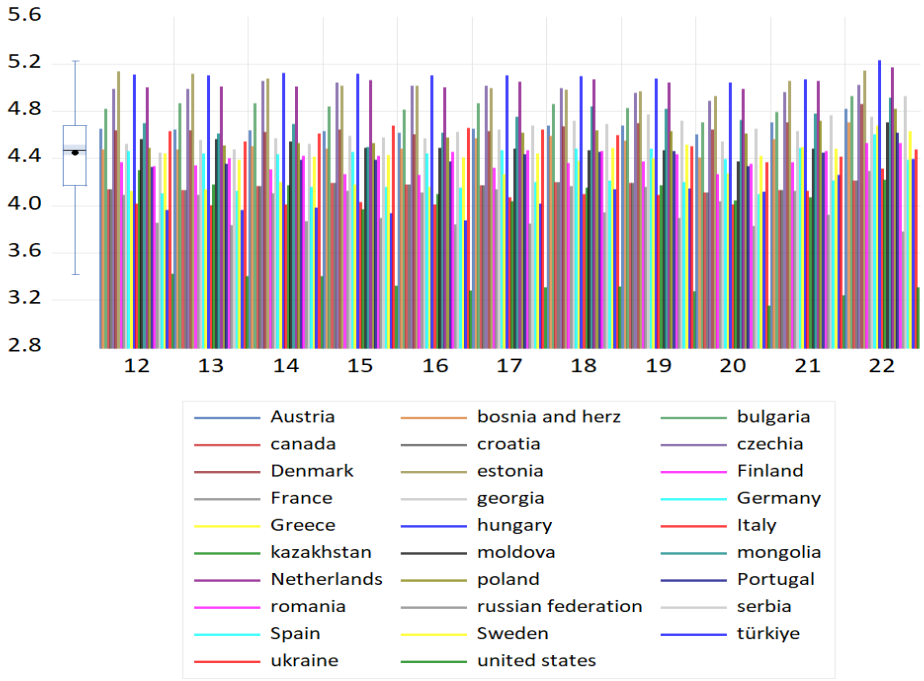

Figure 2: Trade in OSCE Nations

Firstly, the principles of monism support and immediate establishment of the International Agreements, because in a monist system, once a nation state signs an international trade agreement, such as a Free Trade agreement (FTA) or joins an international organization such as the World Trade Organization (WTO), the provisions of the agreement are immediately incorporated into national law. This prevents a delay in the imposition of trade measures, and allows the economy to adjust to the realities of international trade over a longer period of time. Secondly, the principles of monism are affecting the consistency and certainty of a country. Since the rules of international trade are included in the realization of laws within the country, both businesses and investors would have a clear and consistent framework. This reduces uncertainty pertaining to trade laws, providing a more predictable environment for international trade. This is especially crucial for international business activities, where a clear legal environment lowers the unexpected risks of legal

challenges. Third, monism lowers transaction costs through international business. Additionally, it facilitates increased trade as companies would be able to trade more seamlessly — removing the need to wait for national laws to be passed and implemented in order for international agreements to take effect, creating fewer trade barriers between countries.

A dualistic system, on the other hand, engages international law separately from domestic law. International treaties and agreements must first be incorporated into domestic legislative - so that they can have legal force in the country. This means that after a country signs a trade agreement on the international stage, it is still required to enact specific laws in order to bring its domestic policies into line with the international rules. The following are the anticipated effects of dualism on trade openness. Firstly, it leads to trade policies being embraced at a slower pace: in dualism, the lag time between the ratification of an agreement and its actionable implementation in the state may restrict timely legal adherence. If the government does not pass necessary laws, businesses could see disruptions to trade, as they will not be able to take part in the trade agreement until legislation in the domestic legal framework keeps pace. Secondly, dualism often creates fragmentation between domestic and international legal frameworks. National laws are not standardized and, in the absence of a uniform legal framework, businesses may be confused about the applicability of laws to their transactions and contracts. This may create uncertainties in trade relations and heighten the legal and operational risks of businesses. Third, from the perspective of higher transaction costs, international agreements must be translated into domestic law, and compliance may lead to higher transaction costs being incurred by companies. These costs result from the need to keep up with shifting domestic laws or for business to navigate a murky legal quagmire to ensure they are complying with national and

international laws. An example of this is dualism in the United Kingdom. A dualistic system was in place in pre-Brexit UK, and while it was required to respect EU laws as a member, trade deals with third-party countries — perhaps most prominently those done under the World Trade Organization framework — would require parliamentary approval and the passage of domestic laws. The introduction of barriers to trade following the UK's decision to diverge from EU regulations post-Brexit serves as a practical application of dualism and a complexation of international trade law only showcasing how international trends can sometimes mean what is legal in one jurisdiction can become illegal in another. This is one of the main reasons why post-Brexit trade difficulties require separate legislation on regulatory alignment with the EU. This system has various different impacts on trade openness: firstly, it enhances speed and efficiency, because monism makes the implementation of international trade laws easier, faster and more efficient resulting in a reduction in the time need to adjust to the trade environment. In contrast, the dualism model causes delays, as domestic law must be amended or passed to reflect international agreements, creating temporary barriers to trade. The second difference relates to legal certainty and consistency: monism creates a cohesive legal framework where international laws immediately become a part of the national legal landscape. In this context, dualism here adds a further layer of complexity, as businesses will have to comply with international treaties, as well as pre-existing national laws that may, or may not, be in harmony with each other. The third point relates to the cost of compliance: monist systems enable international companies to avoid compliance costs they would incur if they were required to undergo additional national legislative processes. On the other hand, in dualistic systems, compliance costs may be higher as businesses and governments must ensure consistency between domestic and international trade laws.

In summary, monism tends to create a more open and efficient trade environment because international agreements are automatically incorporated into domestic law, leading to smoother, quicker, and more predictable trade practices. On the other hand, dualism can slow down trade integration and create legal complexities, increasing the barriers to trade until domestic law is updated to reflect international norms. Understanding how these legal systems function helps to explain why some countries may experience greater trade openness and ease of international commerce than others. In this regard, this article examines the different ways in which trade openness is impacted by legal system in the European countries that have adopted a monism approach and the OSCE nation that have implemented a dualism approach.

The Organization for Security and Co-operation in Europe (OSCE) places great importance on the concept of rule of law. It goes beyond formal legal frameworks and aims to ensure justice based on the full acceptance of human dignity and activities include supporting judicial and legislative reforms, monitoring trials, and promoting compliance with human rights and rule of law standards. The OSCE participating states adhere to the notion that all entities, including states themselves, should be accountable to equally enforced laws that align with international human rights norms and standards. In this context, the rule of law has proved to be both a key explanatory factor of trade openness and a necessary condition for it, providing a better environment for international trade. As globalization continues to expand, the threat of firms losing contracts, intellectual property, and treaty obligations is a significant concern that must be addressed. In order to maintain an open and stable economic environment in the long term, it is imperative to analyze how the rule of law promotes trade openness in Europe and the rest of the world. In this article, we explore the interplay between the principles of monism and dualism and how together they can

contribute to a more interconnected global economy that is universally beneficial. Figure 3 presents the graphical illustration of the rule of law in OSCE states.

Due to its importance, contemporary research has begun to investigate the factors surrounding trade openness. In this framework, Sampath (2018) analyzed the impact of trade openness and financial development on India's economic growth. The authors explicitly highlighted that trade openness has a substantial and favorable impact on economic development. Similarly, Fetahi-Vehapi et al. (2015) attempted to investigate the impact of trade openness on economic growth in the case of 10 South East European countries. According to the findings, the authors reported that trade openness has a significant positive influence on economic growth. Trejos and Barboza (2015) examined the linkages between economic growth and trade openness in a panel of 23 Asian economies. The authors argued that a higher level of trade openness results in greater economic growth.

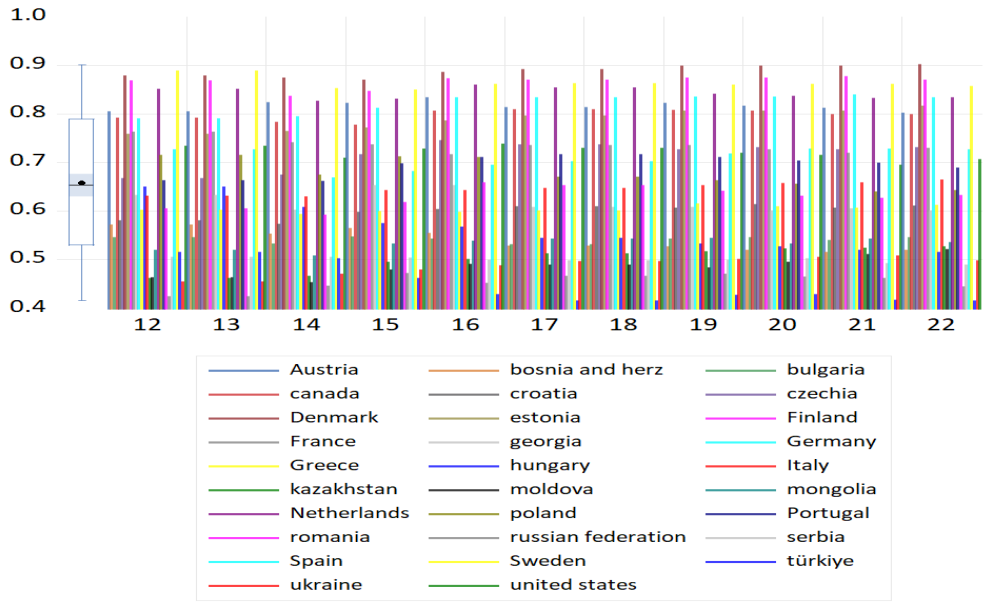

Figure 3: Rule of Law in OSCE Nations

In conclusion, their findings indicated that trade openness has played a significant role in promoting economic growth in those countries. The authors also proposed that financial development, technology, and labor force in different countries have significantly contributed to the growth of economic production. Consequently, the researcher included these factors in their study. However, the literature failed to consider how rule of law, financial institutions, and economic growth influence trade openness in OSCE and European nations.

One of the main contributions of this research is that, in contrast to the conventional approach in which openness explains economic growth, in this paper openness is taken as the dependent variable. This decision is motivated by both theoretical intuition and empirical justification. Institutionally, the rule of law, banking and financial sector development and macroeconomic stability (low inflation) are the structural conditions generating more openness in openness in an economy to trade in global goods and services. Legal institutions make contractual enforcement reliable, financial systems lower the cost of trade finance; macroeconomic stability provides transparent pricing environments—all of these serve to lower the transaction costs that otherwise hinder trade.

Of course, growth can also influence trade openness, but the reverse causality and the theoretically consistent time structure as model assumptions in case of institutions and macroeconomic fundamentals that provide the basis for openness are directly used. This approach is consistent with that of institutional economics, which argues that trade is not simply an exogenous force but a policy outcome determined by domestic institutions and financial capability. Through modelling trade openness as a function of these domestic determinants, the model reveals a dimension that has received

limited attention but is important, especially for economies that are in the process of transformation or policy change. Finally, this framework supplements the traditional growth literature by providing a multidimensional characterization of how countries become open, but not simply why openness is important for growth.

This approach enables us to explore how structural and institutional underpinnings determine trade openness, a line of inquiry that has clear implications for policy-level design and reform in developing and transition economies. By recasting trade openness as an outcome as opposed to a determinant, we hope to shed new light on the facilitating conditions for world trade, as a complement (not substitute) to literature on growth led by trade.

To this end, this study seeks to empirically examine the influence of rule of law, economic growth, financial institutions, and inflation on trade openness in the case of OSCE and European countries.

This research contributes to the existing literature from three perspectives: first, it investigates the effect of rule of law, economic growth, financial institutions, and inflation on trade openness for the time period from 2012 to 2022 by conducting comparative analysis of the OSCE and European nations. It will provide a sound basis to strengthen the existing literature on trade openness. Secondly, this research study employs the advanced Method of Moments Quantile Regression (MMQR) model to estimate the outcomes in quantile forms. This econometric approach produces more sound, effective, and robust results in the presence of cross-sectional dependence, slope heterogeneity in the data, and cointegration in the variables. Additionally, Pooled Mean Group Autoregressive Distributed Lag (PMG-ARDL) analysis will be employed

to check the robustness of the outcomes. Third, this research will provide effective policy recommendations and suggestions to the studied nations that will inform the development of trade openness policies to boost global trade and pursue economic development.

The structure of this research paper is as follows: Sections two, three, four, and five present details on the literature, methodology employed, discussion of the outcomes, and conclusion, respectively.

3.2 Literature Review

Since classical economists' writings were first published, international commerce has been discussed as a growth engine in the field of economics. These economists supported trade liberalization. For example, Smith (1776) argued that trade between nations fosters prosperity through enlargement of the marketplace and creation of opportunities, where each nation will benefit from increasing returns to scale through specialization and division of labor. For international trade to benefit every country, each nation should specialize in producing goods in which it has an absolute advantage.

The relationship between the rule of law and trade openness is a fundamental topic in the field of international economics, particularly within the context of Europe. As trade increasingly becomes the backbone of economic growth, understanding the factors that facilitate or hinder its expansion is crucial. One such factor is the rule of law, which encompasses the protection of property rights, the enforcement of contracts, and the consistent application of legal principles. In Europe, the integration of strong legal frameworks, at both national and supranational levels, plays a pivotal role in fostering a transparent and predictable environment for cross-border trade.

In this regard, the rule of law is viewed as one of the main drivers for international trade since it enables stability and predictability of fair contract enforcement. According to Rodrik et al. (2004), sound legal arrangements have a positive relationship with trade openness since nations with dependable legal systems will tend to attract more trade activities with reduced risk and uncertainty. Huchet-Bourdon et al. (2018) further suggested that for countries with effective legal institutions, there is increased trade openness as a result of reduced transaction costs and reduced cases of corruption.

However, Ibrahim and Abdulmalik (2023), recently alluded to the fact that while the rule of law enhances trade, its impact differs contingent upon a country's specific legal and institutional context. Moreover, well-developed institutions ensure the proper facilitation of trade through credit, risk management, and transaction services. Ojeaga et al. (2014) explored the relationship between institutions and trade across regions for the period spanning from 1980 to 2010. According to their result, it was found that institutions have significant effects on trade. Although this varied depending upon the type of institutions used. International institutions promote trade, while domestic institutions impede it. A recent research on Pakistan by (Ali & Mingque, 2018) showed that institutions have a positive effect on trade, as evidenced using multiple regression analysis. Furthermore, it was also shown in this study that exchange rates and monetary independence have a negative impact on commerce. Álvarez et al. (2018) used data for 86 countries for the period from 1996 to 2012 to probe into the role that national institutions play in shaping bilateral trade flows. Their analysis, found out the new trade theory and the gravity model with the Poisson pseudo-maximum likelihood estimation technique, found that both the institutional environment at the destination and institutional distance are relevant in explaining bilateral trade.

Moreover, Bi et al. (2019) used the panel approach to analyze the determinants of trade in services for a sample of 46 countries for the period from 2004 to 2015. Their analysis depicted a fuzzy pattern of institutional quality influence on trade in services, with overwhelming evidence regarding the importance of product trade to service trade. More specifically, (Aghion et al., 2006) described how financial institutions ease trade by facilitating the investments of firms in new markets and technologies. Empirical evidence reveals that the efficiency and stability of financial institutions are very important in enhancing trade openness, while some studies have even reported that financial crises cause a deceleration in trade growth (Silajdzic & Mehic, 2018).

The principles of monism and dualism discussed in the literature (Strong, 2012) focus on the effect of public international law on international commercial arbitration. It addresses issues and approaches to the incorporation of international law into domestic legal systems that underpin trade practices and dispute settlement systems. In their article (Maniruzzaman, 2001) discussed the theoretical arguments of state contracts also in the context of internationalization of state contracts through the lens of monism and dualism as it relates to contract in states. They illustrated the practical significance of the two legal theories on the international treaty of commercial agreements and enforcement of commercial contracts.

Moreover, in their research (Bodenstein et al., 2003) analyzes the economic openness of transition countries, distinguishing between non-tariff barriers to trade and capital controls. While not directly focused on monism and dualism, the study provided context on how legal frameworks and economic policies can influence trade openness during periods of transition.

Openness to trade results in and causes growth in the economy. Many studies, including that of (Edwards, 1998), have documented that higher growth in the economy leads countries to be open to trade, which encourages them to expand markets and seek new opportunities (Ibrahim & Abdulmalik, 2023). On the other hand, trade openness can spur growth due to increased competition, innovation, and technology and knowledge transfer. According to Huchet-Bourdon et al. (2018) the relationship between economic growth and trade openness is fluid. The above authors argue that the effect of trade openness on growth depends on the level of development and industrial diversification of countries.

While the available literature provides very valuable insights into how the rule of law, financial institutions, and economic growth separately impact trade openness, studies that examine these factors together in one paper are noticeably absent in the context of OSCE and European nations. Hence, there is a clear need for an inclusive investigation of the OSCE countries considering the interactions among these variables due to their unique political, economic, and institutional features.

From a more fundamental perspective, very few studies in the literature have assessed how recent trends in geopolitics and shifts in global trade dynamics shape the nature of inter-relationships between these variables and openness to trade amongst OSCE and European countries. The primary contribution of this research will be that it addresses these gaps to further understand how the rule of law, financial institutions, and economic growth jointly shape openness to trade.

3.3 Methodology

3.3.1 Data

Open, stable, and transparent trade policies are key for economic growth and resilience as well as for addressing key global challenges, including climate change, food security, and underdevelopment. Therefore, this study explores the link between rule of law, economic growth, financial institutions, inflation and trade of 38 selected "Organization for Security and Co-operation in Europe (OSCE)" participating nations and European states. In this research, from the total amount of 57 participating states, 19 countries were removed due to the lack of data in the of Rule of Law index database, the list of the participating States is in Appendix 1. The econometric model is shown below:

$$TR_{it} = \Omega_0 + \Omega_1 RRL_{it} + \Omega_2 EG_{it} + \Omega_3 FI_{it} + \Omega_4 INF_{it} + \Psi_{it} \quad (2)$$

Where TR_{it} denotes trade openness, which plays a crucial role in economic development (Wang et al., 2023) by providing opportunities for workers, reducing poverty, fostering growth, facilitating innovation, improving productivity, and enhancing income. Second, RRL_{it} refers to rule of law. Nations with effective, a sound and robust rule of law provide better governance system, protect human rights, and ensure justice (Ibrahim & Abdulmalik, 2023). Third, EG_{it} denotes the economic growth. Sound economic growth produces opportunities for national firms to produce more and accelerate innovation, while also providing better opportunities for the international trade (Silajdzic & Mehic, 2018). Fourth, FI_{it} refers to financial institutions. According to Ngouhouo et al. (2021), the development of financial institutions is important for trade openness. Finally, INF_{it} is an abbreviation that denotes the inflation variable, which is used as control variable. Moreover, Ω_0 Ω_1 to Ω_4, and Ψ_{it} denote the intercept of model, coefficients of

$RRL_{it}, EG_{it}, FI_{it},$ and INF_{it} and margin of error, respectively. The *i* refers to the sample countries (OSCE and European) and *t* refers to the time period of the study (2012-2022). Information for the variables is summarized in Table 15.

Table 15: Variables Information

Variables	Ab.	Definitions	Sources
Trade	TR	Trade openness Trade (% of GDP)	WB
Economic growth	EG	GDP per capita growth (annual %)	WB
Rule of Law	RRL	WJP Rule of Law Index	WJP
Financial Institutions	FI	Depth, access, and efficiency of their financial institutions	IMF
Inflation	INF	Inflation	WB

Source: Authors' compilation, data for the variables have been extracted from the World Bank, International Monetary Fund, and World Justice Project's Rule of Law Index

3.3.2 Econometric Estimations

When deciding on which econometric model to employ for estimation purpose, authors need to conduct the preliminary tests. In this study, the authors employed the cross-sectional dependence (CSD) test to estimate the cross-sectional dependence in the data of the sample nations.

The results confirmed the presence of CSD in the data, and therefore, we decided to employ the second-generation unit root tests, namely Dickey–Fuller Cross-sectional Augmented Dickey-Fuller (CADF) and Cross-sectional Augmented Im, Pesaran, and Shin (CIPS). Both CADF and CIPS produce the robust and reliable results in the presence of CSD (Raza et al., 2024).

Moreover, the authors employed slope heterogeneity (SH) test to estimate the slope in the coefficients of variables. Failure to assess heterogeneity in the slope of coefficients can produce inefficient, inaccurate, and unreliable outcomes of the coefficients of the variables (Shang et al., 2024). Hence, the SH test helps the authors to select the appropriate econometric model to predict the efficient, accurate, and reliable outcomes of the coefficients.

Moreover, the authors have employed the adjusted SH test to check the rigorousness of the SH test. Likewise, the authors employed the Westerlund cointegration (WC) estimator to assess the long- run association among the variables of the study.

Finally, based on the outcomes of the above preliminary test, the authors decided to employ the Method of Moments Quantile Regression (MMQR) model. The advantages of using MMQR are; (1) it considers the heterogeneity of coefficients and solves this problem; (2) due to the presence of a long-run association, MMQR presents the long-run results in the form of quantiles; (3) it produces reliable outcomes in the presence of CSD. Moreover, to check the robustness of MMQR, we employed the PMG-ARDL estimator. The methodological flow is shown in Figure 4.

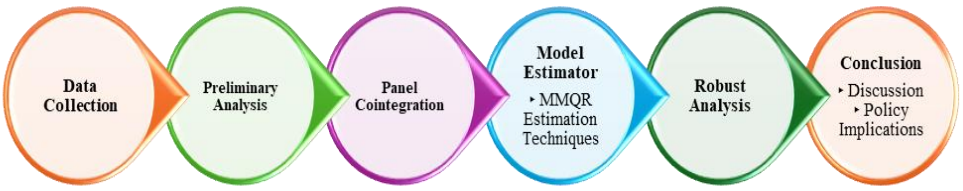

Figure 4: Methodological Flow

3.4 Results and Discussion

The descriptive characteristics of the data are presented in Table 16. The outcomes show that TR, RRL, FI, EG, and INF have mean values of 92.100, 0.659, 28.214, 2.037, and 4.549, respectively. Additionally, the spread of a variable from the mean is shown in terms of std. deviation. The std. deviation values for TR, RRL, FI, EG, and INF are 34.020, 0.137, 16.325, 4.070, and 7.337, respectively.

Moreover, the outcomes of CSD for OSCE countries are shown in Table 17. The outcomes affirm the presence of the cross-sectional dependence in the data as the CD test values for TR (32.720), RRL (5.90), EG (43.260), and INF (48.710) are significant at 1% and only the CD test value for FI (2.180) is significant at the 5% level of significance. The outcomes of CSD for European States are shown in Table 18. The outcomes affirm the presence of the cross-sectional dependence in the data as the CD test values for TR (33.780), RRL (2.80), EG (42.470), INF (42.320) and FI (2.180) are significant at 1% level of significance. Therefore, we employed the second-generation unit root test, the outcomes of which are presented in Table 17 and Table 18, and Quantile ADF test as illustrated in Figure 5. The outcomes show that the all variables are stationary at level.

The CADF and CIPS results shows that the t-statistics for TR, RRL, FI, and EG are significant at first difference; however, only the t-statistic value for INF is significant at the level. Hence, the findings show a mixed order of stationarity in the data at level I(0) and I(1).

The CADF and CIPS results shows that TR, RRL are significant at first difference; however, EG, FI and INF are significant at the level. Hence, the findings also show a mixed order of stationarity in the data at level I(0) and I(1).

Table 16: Descriptive Statistics

	TR	RRL	FI	EG	INF
Mean	92.100	0.659	28.214	2.037	4.549
Median	87.707	0.654	27.920	2.350	2.404
Maximum	186.724	0.902	83.890	13.930	96.036
Minimum	23.393	0.417	0.390	-29.100	-2.046
Std. Dev.	34.020	0.137	16.325	4.070	7.337
Skewness	0.561	0.086	0.790	-1.756	7.073
Kurtosis	2.824	1.776	3.587	14.190	79.762
Jarque-Bera	17.154	20.289	37.748	1828.461	80979.804
Probability	0.000	0.000	0.000	0.000	0.000
Sum	29379.995	210.291	9000.169	649.737	1451.101
Sum Sq. Dev.	368034.859	5.977	84750.887	5267.475	17118.265
Observations	319	319	319	319	319

Sources: Authors' compilation outcomes retrieved from EViews 13. Note: TR = Trade; RRL = Rule of Law; FI = Financial Institutions; EG = Economic Growth; INF; Inflation

Table 17: CD and Unit Root Outcomes (OSCE Countries)

Variable	CD		CIPS		Order	CADF		Order
	CD-test	P-value	Level	1st Diff.		Level	1st Diff.	
TR	32.720	0.000	-1.370	-2.329*	I(1)	-1.370	-2.329*	I(1)
RRL	5.900	0.000	-1.161	-2.687*	I(1)	-1.161	-2.687*	I(1)
FI	2.180	0.029	-1.979	-2.887*	I(1)	-1.979	-2.887*	I(1)
EG	43.260	0.000	-2.074**	-2.777*	I(1)	-2.074**	-2.777*	I(1)
INF	48.710	0.000	-2.353***	-	I(0)	-2.353***	-	I(0)

Sources: Authors' compilation, outcomes retrieved from Stata 17 Software. Note:TR = Trade; RRL = Rule of Law; FI = Financial Institutions; EG = Economic Growth; INF; Inflation

Moreover, the findings of the SH and adjusted SH tests for OSCE countries are shown in the Table 19. The outcomes of the Pesaran and Yamagata (2008) SH test show delta and adjusted values of 5.791, and 8.590 and for the Blomquist and Westerlund (2013) SH test they are 7.904, and 11.723, significant at 1% level of significance.

Table 18: CD and Unit Root Outcomes (European States)

Variable	CD		CIPS		Order	CADF		Order
	CD-test	P-value	Level	1st Diff.		Level	1st Diff.	
TR	33.78*	0.000	-1,302	-2.073***	I(1)	-1,302	-2.073***	I(1)
EG	42.47 *	0.000	-2.212**	-	I(0)	-2.212**	-	I(0)
RRL	2.80*	0.029	-1,069	-2.447*	I(1)	-1,069	-2.447*	I(1)
FI	5.81*	0.000	-2.096**	-	I(0)	-2.096**	-	I(0)
INF	42.32*	0.000	-2.022***	-	I(0)	-2.022***	-	I(0)

Sources: Authors' compilation, outcomes retrieved from Stata 17 Software. Note:TR = Trade; RRL = Rule of Law; FI = Financial Institutions; EG = Economic Growth; INF; Inflation

The outcomes confirm the presence of heterogeneity in the slope of the coefficients of variables. SH and adjusted SH tests for European States are shown in the Table 20. The outcomes of the Pesaran and Yamagata (2008) SH test show delta and adjusted values of 5.557, and 8.243 and for the Blomquist and Westerlund (2013) SH test they are 4.874, and 7.229 are also significant at 1% level of significance. The outcomes again confirm the presence of heterogeneity in the slope of the coefficients of

variables. Moreover, Table 21, shows the outcomes of the Westerlund cointegration for OSCE countries. revealing that the P-value of the variance ratio (2.114) statistics is less than 0.05, suggesting the existence of a long-run link among the variables.

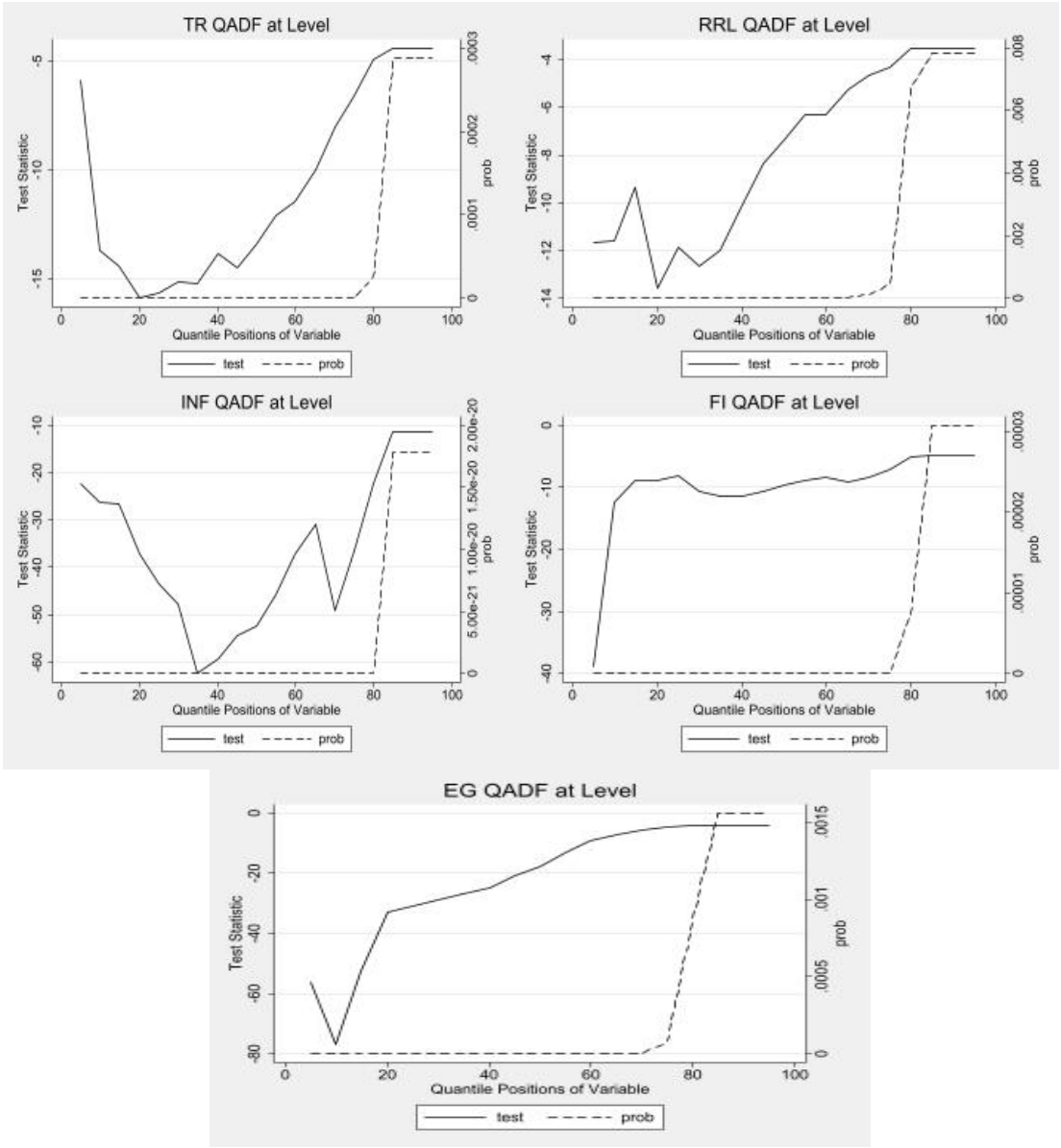

Figure 5: Quantile ADF Unit Root Test

Table 22, shows the outcomes of the Westerlund cointegration For European states, revealing that the P-value of the variance ratio (2.008) statistics is less than 0.05, suggesting the existence of a long-run link among the variables.

Moreover, the Tables 23 and 24 presents the outcomes of the coefficients of the MMQR estimator for the variables of the study in quantile form for the OSCE nations and European nations respectively. The MMQR coefficients of RRL are significantly positive throughout the quantile1 to quantile 7 with trade openness in the case of OSCE and European nations. This suggests that an increase in the rule of law increases the trade openness in both group of nations in lower, middle, and upper quantiles apart from q8 and q9. The outcomes are in line with (Anderson & Marcouiller, 2002; Dollar & Kraay, 2003; Levchenko, 2007).

Table 19: Slope Heterogeneity (OSCE Countries)

Pesaran & Yamagata. 2008.		
	Delta	value
	5.791	0.000
adj.	8.590	0.000
Blomquist & Westerlund. 2013.		
	7.904	0.000
adj.	11.723	0.000

Source: Authors' compilation, outcomes retrieved from Stata 17.

Table 20: Slope Heterogeneity (European States)

Pesaran & Yamagata. 2008.		
	Delta	value
	5.557	0.000
adj.	8.243	0.000
Blomquist & Westerlund. 2013.		
	4.874	0.000
adj.	7.229	0.000

Source: Authors' compilation, outcomes retrieved from Stata 17.

Table 21: Westerlund Test for Cointegration (OSCE Countries)

	Statistic	p-value
Variance ratio	2.114	0.0173

Source: Authors' compilation, outcomes retrieved from EViews 13.

Table 22. Westerlund Test for Cointegration (European States)

	Statistic	p-value
Variance ratio	2.008	0.0220

Source: Authors' compilation, outcomes retrieved from EViews 13.

A strengthened rule of law in OSCE and European countries allows more scope for trade openness. The findings suggest that both monist and dualist legal systems have a positive impact on trade openness. This effect can be attributed to the role of global organizations such as the World Trade Organization (WTO), which facilitate cooperation and safeguard the international rights of their members. The WTO provides a structured mechanism for resolving trade disputes, ensuring that all member states comply with its rulings. By promoting a stable and predictable trading environment, the organization enhances trust among countries, encouraging them to adhere to established trade regulations and engage more freely in international commerce. The rule of law ensures the presence of a stable legal setting in which contracts can be enforced, corruption levels are low, and property rights guaranteed. In this manner, predictability will enhance investor confidence, reduce business risks, and build trust among trading partners — the very ingredient critical to cross-border transactions. It is also how strong legal frameworks, in so far as they are consistent with international standards, ensure that effective dispute resolution mechanisms are in place, further facilitating trade. Empirical evidence and case studies — including those in the European Union — attest to the fact that an effective rule of law goes

hand-in-glove with a higher volume of trade. In this respect, stronger legal systems become important policy objectives in order to achieve greater economic integration and prosperity.

Furthermore, the MMQR findings shows that effect of economic growth on the trade openness substitutional as the coefficients are positive and significant throughout q1 and q9 for the group of sample nations. This suggests that an increase in economic growth in the OSCE and European nations causes an upsurge in trade openness. However, it is interesting to note that the magnitude of the effect of the economic growth on the trade openness increases in the case of European nations as compared to the OSCE nations as evidenced from the estimated MMQR coefficients. The outcomes are in line with those of (Baliamoune-Lutz, 2011; Chang et al., 2009; Wacziarg & Welch, 2008). An increase in economic growth in the OSCE and European countries is normally accompanied by a rise in trade openness, caused by several interrelated factors. First, economic growth improves the production capacities and diversifies the kind of goods and services offered for export, hence increasing the competitive advantage in the global market for a country. Second, economic growth is bound to raise domestic demand for a wide variety of imported goods, stimulate trade, and generally improve living standards. Third, economic growth usually entails infrastructure improvement and more efficient logistics, thus decreasing the cost of trading and encouraging businesses to engage in international markets. Moreover, successful economies would attract more foreign direct investment, which besides capital input also entails the transfer of technology and innovation, thus enhancing trade capabilities. Finally, with increased economic growth, improved institutional quality and governance are associated, specifically the governance which concerned with open trade policies. The empirical evidence is overwhelmingly consistent with

the view that a growing economy engages more in international trade because it has more at its disposal to devote to export-oriented industries and has the capability to import a greater range of products for domestic demand.

Additionally, the MMQR outcomes shows that the coefficients of financial institutions are negative with trade openness in OSCE, and European nation but FI have a significantly negative effect in throughout the q1 to q9 in the case of the OSCE nations, however, there is a significant negative effect on the trade openness in case of European nations is significant from q4 to q9. Moreover, it is interesting to note that the degree of the negative effect in terms of magnitude is scale down in the case of OSCE nations and scale up in the case of the European nations. The outcomes are in line with (Aghion et al., 2009; Kaminsky & Reinhart, 1999; Levine, 1997; Rajan & Zingales, 1996). Several factors may contribute to the negative impact of financial development on trade openness in OSCE and European countries. First, developed financial markets can facilitate an increase in domestic investments that divert resources from export-oriented industries to serve more of the domestic market. This can reduce the relative emphasis on international trade. Second, financial development can contribute to the strengthening of domestic currencies. If this raises the prices of exports and makes them less competitive in the international market, it may lower the degree of openness to trade. Further, in countries with developed financial systems, foreign capital might well be attracted to investments in non-tradable industries, like real estate or consumer services, thus diverting attention from trade even more. Another consideration is that financial development at times fuels the volatility in the economy and causes risk-taking behavior, thus resulting in financial crises that disrupt trade. Empirical studies have shown that while supporting economic growth, financial development does not always translate to increased trade openness if this growth is

channelized into sectors with relatively low export potential or generates currency appreciation that harms export competitiveness.

Moreover, the MMQR estimates shows that inflation has a positive effect on the trade openness but it is insignificant in both cases i.e., OSCE and European nations. Finally, the PMG-ARDL is employed to check the robustness of the outcomes. The outcomes of PMG-ARDL are shown in the Table 25 which indicate that RRL, EG, and FI have substantial and positive links with trade openness in short and long run in case of OSCE and European nations. The PMG-ARDL outcomes are in line with MMQR except for FI as it shows a positive effect in PMG-ARDL.

Besides, the outcomes of the DH causality for OSCE countires are shown in Table 26. The results confirmed the uniderectional link between EG and TR, but also between TR and FI. There is no assosiantion between RRL and TR, INF and TR. The outcomes for the European states are present in the Table 27, the results show that there is unidirectional association between INF and FD, however, there is no association between all other variables.

Table 23: MMQR (OSCE Nations)

Variables		location	Scale	q1	q2	q3	q4	q5	q6	q7	q8	q9
RRL	Coeff.	0.451	-0.123	0.619	0.566	0.536	0.478	0.441	0.407	0.375	0.317	0.237
	SE	(0.192)	(0.122)	(0.283)	(0.245)	(0.227)	(0.200)	(0.190)	(0.186)	(0.188)	(0.205)	(0.247)
	PV	0.019	0.311	0.028	0.021	0.018	0.017	0.020	0.029	0.046	0.122	0.337
EG	Coeff.	0.085	-0.003	0.089	0.088	0.087	0.086	0.085	0.084	0.083	0.082	0.080
	SE	(0.030)	(0.019)	(0.044)	(0.038)	(0.036)	(0.031)	(0.030)	(0.029)	(0.029)	(0.032)	(0.039)
	PV	0.004	0.886	0.044	0.022	0.014	0.006	0.004	0.004	0.004	0.010	0.038
FI	Coeff.	-0.049	0.012	-0.065	-0.060	-0.057	-0.051	-0.048	-0.045	-0.042	-0.036	-0.028
	SE	(0.027)	(0.017)	(0.040)	(0.035)	(0.032)	(0.029)	(0.027)	(0.026)	(0.027)	(0.029)	(0.035)
	PV	0.074	0.495	0.107	0.087	0.079	0.071	0.076	0.093	0.121	0.218	0.422
INF	Coeff.	0.001	-0.001	0.002	0.001	0.001	0.001	0.001	0.000	0.000	0.000	-0.001
	SE	(0.003)	(0.002)	(0.005)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
	PV	0.854	0.750	0.755	0.772	0.785	0.827	0.865	0.909	0.951	0.974	0.898

Source: Authors' compilation, outcomes retrieved from Stata 17 Software. Note: RRL=Rule of Law, EG=Economic Growth, FI= Financial Institutions and INF=Inflation.

Table 24: MMQR (EUROPE Nations)

Variables		location	Scale	q1	q2	q3	q4	q5	q6	q7	q8	q9
RRL	Coeff.	0.401	-0.152	0.648	0.589	0.504	0.467	0.413	0.370	0.322	0.222	0.120
	SE	(0.168)	(0.097)	(0.204)	(0.185)	(0.168)	(0.165)	(0.167)	(0.174)	(0.187)	(0.223)	(0.268)
	PV	0.017	0.115	0.002	0.002	0.003	0.005	0.013	0.033	0.084	0.320	0.654
EG	Coeff.	0.070	0.007	0.058	0.061	0.065	0.067	0.069	0.071	0.074	0.079	0.084
	SE	(0.024)	(0.014)	(0.029)	(0.026)	(0.024)	(0.024)	(0.024)	(0.025)	(0.026)	(0.032)	(0.038)
	PV	0.004	0.588	0.049	0.022	0.007	0.005	0.004	0.004	0.005	0.013	0.029
FI	Coeff.	-0.068	-0.016	-0.042	-0.048	-0.057	-0.061	-0.066	-0.071	-0.076	-0.087	-0.097
	SE	(0.028)	(0.016)	(0.034)	(0.031)	(0.028)	(0.027)	(0.028)	(0.029)	(0.031)	(0.037)	(0.045)
	PV	0.015	0.318	0.219	0.118	0.041	0.026	0.016	0.014	0.014	0.019	0.029
INF	Coeff.	-0.001	-0.002	0.002	0.001	0.000	0.000	-0.001	-0.001	-0.002	-0.003	-0.004
	SE	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
	PV	0.738	0.136	0.387	0.514	0.808	0.973	0.786	0.620	0.482	0.311	0.229

Source: Authors' compilation, outcomes retrieved from Stata 17 Software. Note: RRL=Rule of Law, EG=Economic Growth, FI= Financial Institutions and INF=Inflation.

Table 25: Robustness Estimations (PMG-ARDL)

Variable	OSCE Nations				EUROPIAN Nations			
	Coefficient	Std. Error	t-Statistic	P-value	Coefficient	Std. Error	t-Statistic	P-value
Long-run (Pooled) Coefficients								
RRL	3.123	0.634	4.928	0.000	2.602	0.634	4.101	0.000
FI	0.313	0.092	3.403	0.001	0.261	0.078	3.366	0.001
EG	0.306	0.052	5.903	0.000	0.236	0.045	5.232	0.000
INF	-0.017	0.018	-0.938	0.349	0.013	0.020	0.678	0.498
C	0.790	0.752	1.050	0.294	1.407	0.716	1.965	0.051
Short-run (Mean-Group) Coefficients								
ECT(-1)	-0.032	0.005	-6.988	0.000	-0.042	0.006	-6.757	0.000
D(RRL)	-1.028	0.672	-1.530	0.127	-1.021	0.786	-1.299	0.195
D(FI)	0.075	0.073	1.038	0.300	0.072	0.075	0.959	0.338
D(INF)	0.018	0.003	5.854	0.000	0.017	0.003	5.246	0.000

Source: Authors' compilation, outcomes retrieved from Stata 17 Software. Note: RRL=Rule of Law, EG=Economic Growth, FI= Financial Institutions and INF=Inflation.

Table 26: DH Causality (OSCE Countries)

Null Hypothesis:	F-Statistic	P-Value
RRL ≠ TR	0,047	0,954
TR ≠ RRL	0,807	0,447
EG ≠ TR	23,709	0,000
TR ≠ EG	0,737	0,479
FI ≠ TR	0,843	0,432
TR ≠ FI	7,359	0,001
INF ≠ TR	0,153	0,859
TR ≠ INF	0,732	0,482

Note: EF= Ecological Footprint, RRL=Rule of Law, EG=Economic Growth, REC=Renewable Energy, and POP=Population.

Table 27: DH Causality (European States)

Null Hypothesis:	F-Statistic	P-value
EG ≠ TR	18,2591	4,86E-08
TR ≠ EG	0,8148	0,444124
RRL ≠ TR	0,3276	0,721031
TR ≠ RRL	0,7802	0,459637
FI ≠ TR	1,4875	0,228293
TR ≠ FI	10,1217	6,35E-05
INF ≠ TR	0,214093	0,807448
TR ≠ INF	2,458123	0,088044

Note: EF= Ecological Footprint, RRL=Rule of Law, EG=Economic Growth, REC=Renewable Energy, and POP=Population.

Moreover, the FGLS outcomes shown at Table 28 for OSCE countries affirmed the robustness of the MMQR outcomes. The FGLS outcomes shows that RRL, EG and INF have positive coefficients, however FI diminishes the trade openness. FGLS results for European States are present in Table 29 and also affirmes the robustness of the MMQR results for the Model 2.

It also states, that RRL, EG and INF have positive coefficients, however FI diminishes the trade openness.

Table 28. FGLS Outcomes (OSCE Countries)

TR (DV)	Coefficient	Std. err.	P-Value
RRL	0,875	0,069	0,000
EG	0,005	0,001	0,000
FI	-0,677	0,072	0,000
INF	0,005	0,000	0,000
Constant	4,270	0,051	0,000

Note: EF= Ecological Footprint, RRL=Rule of Law, EG=Economic Growth, REC=Renewable Energy, and POP=Population.

Table 29. FGLS Outcomes (European States)

TR (DV)	Coefficient	Std. err.	P-Value
EG	16,027	0,934	0,000
RRL	0,987	0,069	0,000
FI	-0,544	0,015	0,000
INF	0,141	0,020	0,000
C	117,751	0,610	0,000

Note: EF= Ecological Footprint, RRL=Rule of Law, EG=Economic Growth, REC=Renewable Energy, and POP=Population.

3.5 Conclusions and Policy Recommendations

Openness is a crucial factor that facilitates development, the creation of jobs, and the alleviation of poverty. Trade offers domestic enterprises with fresh market prospects, enhanced productivity, and innovation by fostering competitiveness. Based on this, we have investigated the effect of the rule of law, economic growth, and financial institutions on the trade openness while taking inflation as a control variable in the model in the case of OSCE and European nations. The newly developed MMQR model has been employed based on the outcomes of CSD, unit root, slope heterogeneity, and cointegration.

The MMQR outcomes affirmed that the rule of law has a positive effect on the trade openness in both groups of nations which means that strengthened, sound and effective rule of law boosts the trade liberalization in both set of nations. Additionally, the

outcomes confirmed that the economic growth of OSCE and European nations accelerates the trade openness suggesting that an acceleration in the economic growth in terms of productivity catalyzes the trade openness. On the contrary, financial institutions were found to have a negative effect on the trade openness in the case of OSCE and European nations. Based on the outcomes, the authors make the following policy recommendations and suggestion.

Based on the outcomes of our study we make the following policy recommendations in four key areas: first, a major strategy to improve openness to trade adopted by the OSCE and European countries must be strengthening the rule of law through comprehensive judicial reforms, seeking to enhance judicial independence, efficiency, and transparency. Reforms of that nature would secure equal application of laws without any arbitrary discrimination, hence giving investors' confidence and contributing to both domestic and international trade. Additionally, stiff anti-corruption measures are important to reduce corruption for better predictability and stability in business. In particular, improving of mechanisms for contract enforcement and dispute resolution will enhance the confidence of businesses in terms of the protection of their rights and in the fair and swift resolution of legal disputes, which will contribute towards an enabling environment for trade. Secondly, in that direction, trade openness needs to be enhanced by its ability for economic growth. It is being promoted by modern and efficient investments in infrastructure for transport and digital networks that can help reduce of trade costs and improve in supply chain efficiency. Advanced support for technological innovation and improvements in education will boost productivity, thus increasing economic competitiveness and thereby further raising the capacity for trade. Simplifying trade procedures, cutting tariffs, and eliminating non-tariff barriers will make it easier for businesses to trade

internationally, thus promoting economic growth alongside openness to trade. Third, the regulatory framework and the institutions should be constructed so as to reduce these negative impacts of financial institutions on open trade. Also, excessive risk-taking in financial institutions and too much financial speculation should be prevented, as this can result in financial instability. Important is a balanced financial development that can facilitate productive investment in export-related activities, rather than in speculative sectors. Moreover, there should be policies aimed at giving SMEs access to trade finance to assist in increasing their participation in international trade. Additionally, the development and actualization of effective frameworks for managing and resolving crises will ensure prompt resolution of financial crises and reduce the negative impact on trade and economic stability. Finally, an integrated approach to policy formulation remains critical to maximize the positive effect of openness on trade. This will ensure that there is coordination between different policy areas — trade, finance, and judicial reforms —and a clear strategy is laid out. Consultation with a wide variety of stakeholders — particularly, businesses, financial institutions, and representatives of civil society — will ensure that policies are well-informed and consider the needs of parties concerned. It is also important to develop robust monitoring and evaluation systems that enable the effect of policies in terms of openness to trade to be continually reviewed. By using data and feedback, it will be possible to make necessary adjustments and improvements, hence creating a dynamic and responsive policy environment in support of openness to trade.

3.6 Limitations and future research

The study has some limitations including that the data were limited to the period from 2012-2022 due to availability. Second, the OSCE and European nations were used as the sample for this study. Third, this research only used a quantitative approach

ignoring the qualitative side. Finally, this study employed both MMQR model and PMG ARDL models. Therefore, this presents the opportunity for researchers such that in the future, this model can be employed for other geographical setting that have different economic, political, and financial situations. The model can also be extended by adding other variables such as research and development, technological innovation, and regulations depending on the availability of data. The qualitative method can be used along with the quantitative method and CS-ARDL econometric model can be used for future endeavor.

The findings confirm that strong legal institutions and economic growth reinforce trade openness, while weaknesses in financial structures may act as barriers. Since finance underpins trade by facilitating investment, credit, and global transactions, understanding the institutional foundations of financial development becomes the next logical step. The following chapter explores how the rule of law, economic growth, innovation, and Foreign Direct Investment shape financial systems in OSCE and European countries.

Chapter 4

THE RULE OF LAW AND THE ARCHITECTURE OF FINANCE: EXPLORING THE DRIVERS OF FINANCIAL DEVELOPMENT IN OSCE COUNTRIES

4.1 Introduction

The Rule of Law (RRL) is a fundamental notion that ensures the constant, fair, and transparent obedience to laws. This encompasses safeguarding of property rights, the capacity to enforce contracts, and the maintenance of legal institutions essential for fostering a conducive climate for financial development (Muhammad & Long, 2021; Law et al., 2021). The RRL has a significant effect on investor trust, market efficiency, and overall economic stability in a country's financial landscape (Tomizawa et al., 2020). The regulation of the financial industry would be crucial in reversing the fortunes of financial development. Now, the majority of lawsuits are based on the litigants' legal responsibilities, and the validity of those responsibilities is crucial (Haini, 2020). One of the most fundamental aspects of any financial relationship—a loan—is the level of trust between the lender and the borrower. The information-based response will dictate the loan's conditions (interest rate, duration, value, their rank, safety, as well as the borrower's ability to acquire). Likewise, in more recent financial agreements such as interest rate and currency swaps, the parties involved evaluate each other to determine if the other can actually fulfill their current and future promises (Kouadio & Gakpa, 2022; Emara & El Said, 2021).

Economic growth is a significant factor as it positively affect financial development via income and savings, thereby affecting the overall demand for financial products and services. Economic growth leads to increased economic activity, resulting in a higher frequency of financial transactions and subsequently creating opportunities for the expansion of financial institutions (Medécigo, 2015; Wang et al., 2021). This results in increased capital accumulation, which is essential for the development of financial markets and, subsequently, the broader economy (Wardley, 2020). Technological innovation has emerged as a significant factor influencing the structure and functioning of financial markets, resulting in enhanced efficiency, reduced transaction costs, and increased accessibility to financial services. Advancements in digital banking, mobile payments, block chain, and artificial intelligence have enhanced access to financial services, thereby increasing inclusivity for individuals who previously faced barriers to banking, credit, and investment opportunities (Fakher & Ahmed, 2023). Technological innovation enhances the transparency and security of financial transactions, thereby increasing the stability and reliability of these systems (Cao et al., 2021; Khan et al., 2024). Furthermore, trade openness (TO) accelerates financial development (FD) through enhanced integration into the global market. Open economies typically gain access to international capital flows, new markets for goods and services, and competitive pressures, enabling them to compel financial institutions to innovate and enhance their services (Ibrahim & Ajide, 2021). Trade openness facilitates the dissemination of international financial standards, thereby enhancing the regulatory framework and drawing foreign investments (Mohamed Sghaier, 2023). Foreign direct investment (FDI) significantly contributes to the development of financial systems by providing not only capital but also access to technology, expertise, and knowledge transfer (Raza et al., 2024). Foreign investors contribute

innovative ideas and practices that improve the competitiveness of domestic financial markets, introduce advanced financial products and services, and reinforce governance structures (Rafique et al., 2020). FDI typically enhances the stability and sophistication of financial systems, allowing them to respond more effectively to global trends and meet the needs of the economy (Asamoah & Alagidede, 2023). The interplay among the variables of RRL, economic growth (EG), technological innovation (TI), trade openness (TO), and FDI is intricate and dynamic in shaping the financial development trajectory of an economy. The Organization for Security and Cooperation in Europe (OSCE) nations exhibit significant variation in institutional maturity, market development, and technology adoption, making these aspects particularly relevant (See Figure 6 & 7).

The interplay among RRL, economic growth, technological innovation, trade openness, FDI, and financial development has been extensively studied; however, there is a paucity of literature addressing the interactions of these elements across varying levels of financial development in the OSCE nations. The functioning of these elements in nations characterized by diverse institutional frameworks, levels of technological innovation, and varying degrees of trade openness constitutes a significant gap in the existing literature. The majority of the literature emphasizes aggregate effects, failing to account for the nuanced and heterogeneous aspects of financial development. Furthermore, conventional approaches often fail to account for the variability in the effects of these variables across varying levels of financial development. There is a necessity for advanced methodologies capable of capturing quantile-dependent effects, such as the MMQR and FGLS, to facilitate a more detailed analysis of the complex dynamics relevant to financial sector growth, particularly in the OSCE nations.

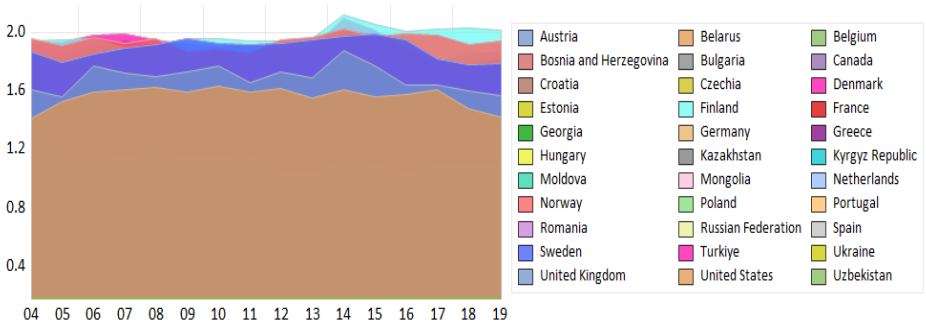

Figure 6: Rule of Law
Source: World Bank

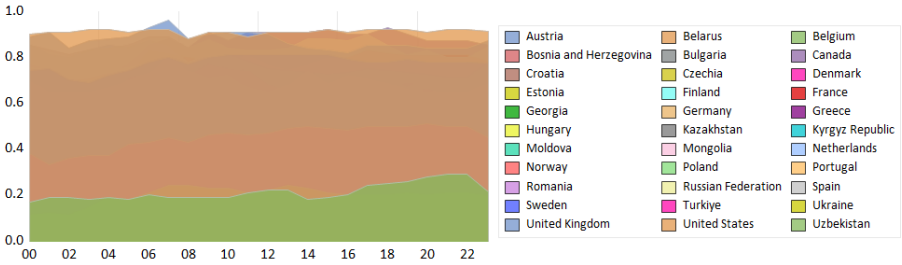

Figure 7: Financial Development
Source: International Monetary Fund

This paper aims to examine the effect of the RRL, economic growth, technological innovation, trade openness, and FDI on the financial development of OSCE nations. to examine how these effects vary in their impact at different levels in the market sophistication spectrum. The purpose of this paper is to investigate whether the impact of these factors differs across quantiles of financial development and to offer some thoughts on how these factors interact in different economic environments. The goal is to make an empirical contribution to the growing literature on the intricate dynamics of financial sector development and to shed light on the endeavors of policy makers aiming to improve the quality of financial systems in OSCE countries.

These are the research objectives that we intend to propose:

-to investigate the impact of the RRL on the financial development across countries of OSCE with MMQR,

- to investigate economic growth on financial development in OSCE countries by means of MMQR,

- to investigate technological innovation on financial development in OSCE countries by means of MMQR,

-to investigate the impact of trade openness on financial development in OSCE countries based on MMQR,

-to investigate the impact of the foreign direct investments on financial development in OSCE member countries with MMQR.

The remainder of the paper is organized as follows: in Section 1, the research topic, goals and objectives are introduced emphasizing the existing gap in research. Literature review on financial development and the variables is provided in Section 2. Additionally, the methodology based on the MMQR approach is described in Section 3. The empirical results, and discussions are presented in Section 4. Section 5 concludes and provides a summary of the findings, including the limitations as well as areas for further research.

4.2 Literature Review

Rule of Law and Financial Development

To build upon the existing body of knowledge and fill in any gaps in understanding, it is essential to review relevant works in any area of study (Manigandan et al., 2024). Greenstein (2022) stated that a society's RRL reflects how effectively its policies and regulations are enforced. The enforcement of environmental legislation relies heavily

on the RRL, which is an important institutional component. Firms are compelled to adhere to environmental policy guidelines by a robust RRL system, which guarantees the implementation of policies. Xu et al. (2022) proposed that by making businesses follow RRL protocols, a robust legal system helps reduce carbon emissions. Also, it makes sure that accountability is being done. Celik & Kostekci (2025) utilised sophisticated panel econometric techniques to examine the influence of economic, demographic, environmental, and governance variables—including corruption, political stability, and the rule of law—on human development in Central and West Asian nations from 2002 to 2021. Corruption hinders human development, while its regulation promotes it. Political stability and compliance with the rule of law contribute positively to human development. Additionally, trade openness and CO2 emissions have a positive impact on human development, whereas inflation, unemployment, and population growth hinder it. Muhammad & Long (2021) researched that firms are made to pay when they break environmental rules, which encourages other businesses to do the same. The effects of improved structures and efficient government initiatives on capital formation, profitability, and production per employee were determined to be of statistical significance by (Asante et al., 2023). According to Emara & El Said (2021), improving government in the MENA area is essential for growth to accelerate. A statistically significant relationship between RRL and financial development is shown by Chebab et al. (2022) using a cross-sectional study of 11 rich nations in MENA region from 1987 to 2015. In their study of 41 economies spanning 2013–2018, Shevchul et al. (2020) discovered that RRL significantly affected financial development in countries across central and Eastern Europe and the former Soviet Union. Kölling (2022) stated that multiple countries backed the RRL that was partially "a geopolitical spill-over" from RRL "backsliding"

in nations like Hungary and Poland. In 2013, the German, Dutch, Finnish, Danish, and French governments had previously requested the European Union withhold funds until the RRL was promoted.

Economic Growth and Financial Development

The study on the effect of the banking industry on Gross Domestic Product (GDP) growth linked to the work of Wardley (2020), who suggested that efficient banking systems in England improved the distribution of resources towards better-performing projects. Wang et al. (2021) examined the connections between three metrics by using panel data from 1997–2017 at the national and regional levels of China. They used ARDL-PMG model to investigate the long-term and short-term effects of GDP growth and financial development on consumption of sustainable energy. According to the long-term connections, sustainable energy usage is positively affected by GDP growth in both western China and China overall, but it is negatively affected by financial development. Sustainable energy usage is positively affected by GDP growth and negatively affected by financial development, according to the short-run connections. In addition, we investigate whether there is a causal relationship between variables by using the Granger causality test. Menjago et al. (2025) analyzed the correlation between financial development and economic growth in Communauté Financière Africaine (CFA) nations from 2003 to 2018. They used FMOLS to analyses a broad dataset encompassing 13 nations. The results indicate a substantial positive correlation between financial development and economic growth, highlighting the critical role of efficient financial institutions in promoting economic expansion. Similarly, Minh & Ngoc (2025) examined the direct and indirect impacts of energy consumption and financial development on economic growth in 11 Asian economies by using geographical approaches; the spatial error approach, the spatial autoregressive

approach and the spatial Durbin approach. The study's results showed that eleven Asian nations' economies benefited from energy consumption and financial development, both directly and indirectly. As a result, both the host country and the neighboring countries benefit from country i's improved financial development, and the converse is also true. Shahbaz et al. (2023) explored how GDP growth and financial development effect ecological footprint, including non-sustainable energy use and trade openness. To do this, they examined 1992–2017 annual statistics for the top 10 ecological footprint countries. The common correlated effects coefficient estimator shows that financial development, GDP growth and non-sustainable energy consumption harm the ecosystem due to their larger ecological footprint. The panel causality test shows that GDP growth and ecological footprint are causally associated, while financial development and ecological footprint are only causally related once. Wang et al. (2024) examined in-depth analysis covers the G7 countries from 1990 to 2020 and delves into the complex relationship between financial development and GDP growth. Keeping with the worldwide trend towards environmentally friendly habits, the countries of the G7 must priorities energy conservation and migrate to sustainable sources due to the harmful effect of overall energy use on economic growth.

Technological Innovation and Financial Development

Fakher & Ahmed (2023) examines how financial development and technological innovation affected six environmental quality criteria in 25 OECD countries from 2000 to 2019. They employed a two-step dynamic generalized technique of moments suggested that ecological efficiency, carbon footprint, modified net funds, and pressure on ecology are four of six environmental metrics that technological innovation improves with financial development. Çeştepe et al. (2024) explored the

relationship between technological advancement and financial development for 21 OECD nations from 1990 to 2018. The results showed that the variables are cointegrated. Financial development is positively affected by technological innovation, GDP growth, and financial globalization, but it is proven to be negatively affected by natural resources in the long term. Cao et al. (2021) used the dynamical GMM technique to examine the effect of financial development and technological innovation on the fluctuation of sustainable expansion. They used yearly data panels from thirty regions in China from 2011 to 2018 to delve into the vital factors that contribute towards the solid and robust expansion of the sustainable economy. Khan et al. (2024) examined the state of financial institutions, and how advancements in technology between 2006 and 2017 fueled the expansion of financial services in twenty-two different developing economies. The financial sector may advance more rapidly when cutting-edge innovations connect with efficient organizations. Lv et al. (2021) used GML index to assess the effectiveness of green technology innovation in 30 Chinese provinces from 2003 to 2017. The finding revealed that financial structure promotes technological innovation, whereas size and effectiveness hinder it. Environmental regulation moderates' financial development and green technology innovation positively. Raza et al. (2024) studied the effects of technological innovation, natural resources, GDP growth, and financial development on carbon emissions in Nordic economies from 1990-2022. GDP growth and technological innovation reduces the carbon footprint. Financial development has no effect on carbon footprint in Nordic economies. Similarly, Tabash et al. (2025) suggested that Arab nations face significant environmental challenges, including substantial carbon dioxide emissions, climate change, and increasing temperatures. They aimed to fill the existing knowledge gap by controlling for various variables to assess the impact of

technological and economic changes on carbon emissions. They utilized sample data span 30 years and include 10 Arab nations. FMOLS and DOLS were employed to conduct regressions among the variables, addressing the issues of non-stationarity and cointegration. The data indicated that technological innovation and financial development negatively impact carbon emissions.

Trade Openness and Financial Development

Ibrahim & Ajide (2021) used data collected from 1996–2018, it looked at how the BRICS nations' environmental performance changed due to changes in disaggregated non sustainable energy, trade openness, financial development, and compliance with regulations. There is no evidence that trade has any negative effects on the natural environment. A rise in carbon emissions has a positive relationship with overall rents from natural resources, financial development, and compliance with regulations. Mohamed Sghaier (2023) examined the connections with the rise of banking systems, the level of trade openness, and the rate of GDP growth in a group of four North African economies (Tunisia, Morocco, Algeria, and Egypt) during a period of five years, from 1991 to 2015. Based on GMM findings trade openness acts as an additional factor to financial development, and its effect is more noticeable when combined with the financial development. Akhayere et al. (2023) investigated how Turkey's load capacity factor was affected by energy usage, trade openness, and financial development between 1965 and 2018. These findings imply that trade openness, financial development, and main consumption of energy are detrimental to ecological sustainability. Fankem & Feyom (2025) reassessed the influence of trade openness on financial development in Sub-Saharan Africa. They investigated the idea that this effect depends on heightened degrees of financial transparency. The extent of financial development was positively associated with the degree of trade openness. The

beneficial effect of trade openness on financial development depends on unusually high degrees of financial openness. Trade openness improves the depth, accessibility, and efficiency of financial institutions and markets. While, Nam et al. (2025) examined the impact of financial openness on financial development, alongside the moderating roles of institutional quality and trade openness in Eastern European countries over multiple decades. They focused on the period following the Berlin Wall's fall in 1989 and the transition from centrally planned to market-oriented economies after 1991. Financial openness promotes financial development, and this effect was amplified by institutional quality; however, trade openness reduces the positive impact of financial openness in Eastern Europe.

Foreign Direct Investment and Financial Development

Rafique et al. (2020) drew on data from 1990 to 2017 to investigate the causation relationship between greenhouse gas emission in BRICS countries and foreign direct investment, among other variable, and economic development. An et al. (2025) examined the effect of financial development on the growth effects of Foreign Direct Investment in emerging and developing Asia over the period 1996–2019. To this end, the application of panel smooth transition regression results illustrated that the evidence for excessive financial development hinders Foreign Direct Investment and in turn slows economic growth in emerging and developing Asia. The impact of the financial system on the FDI-growth nexus is stronger for financial institutions than for financial markets. Trade transparancy and urbanization increased and energy consumption and greenhouse gases decreased the significant relationship between GDP growth and greenhouse gas emissions is there. Asamoah and Alagidede (2023) studied the thresholds in the country’s financial development, where Foreign Direct Investment increases the real development of the industry. They observed that at the

unidirectional level Foreign Direct Investment and financial development complement each other in deepening the growth of real sector and its components. Sethi et al. (2023) Applied information of growing Asian countries over the period 1990–2020, they examined financial development, foreign capital influxes, the role played by aid and they considered the role of manufacturing capacity. Growth in GDP is positively correlated with financial development, foreign aid, investment and negatively correlated with social growth and quality of institutions. Yu et al. (2024) analyzed in the setting of greenhouse gas pricing (emissions trading and taxation) and investigated the impact of financial development and Foreign Direct Investment on GHGs in 57 industrial and developing countries from 2000 to 2017.

The carbon emissions in developing nations grow (decline) with the quality of Foreign Direct Investment-in (net inflows). Churchill et al. (2023), employed an autoregressive distributional lag model with structural breaks, and a single dataset for Germany from 1870 to 2016. In contrast, wavelet coherence results revealed that financial development and Foreign Direct Investment not only enhance short run but also long run tourism in Germany (Figure 8). In the literature, the area of governance system and financial development is studied, but no enough emphasis is given by previous researchers of the influence of rule of law on the OSCE members, especially by using advanced methodology like MMQR and FGLS. This study contributes to our understanding of the governance-economy nexus by examining the role of rule of law at various levels of financial development.

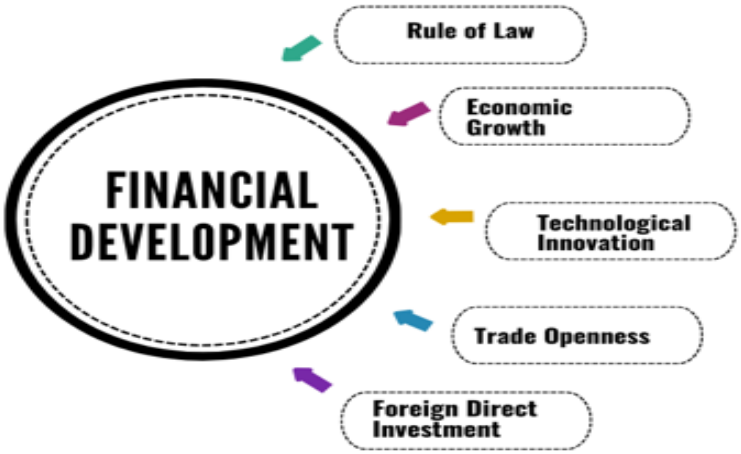

Figure 8: Theoretical Framework
Source: Author's own

4.2 Methodology

Data

This research investigates the effect of RRL, economic growth, technological innovation, trade openness, and FDI on financial development in 38 selected "Organization for Security and Co-operation in Europe (OSCE)" participating nations and European states (out of the total 57 OSCE participating states, 19 countries were excluded due to the lack of available data in the Rule of Law Index and World Development Indicators (WDI) databases). This study focusses on OSCE countries due to their diverse levels of economic development, governance standards, and economic systems. These nations have undergone significant economic and political transformations that have impacted their financial systems. The OSCE's focus on governance, economic cooperation, and transparency highlights the significance of this region in understanding the impact of regulatory quality on financial development mechanisms. The basic econometric model of this research is as under:

$$FD_{it} = ב_0 + ב_1 RRL_{it} + ב_2 EG_{it} + ב_3 TO_{it} + ב_4 TI_{it} + ב_5 FDI_{it} + \cup_{it} \quad (3)$$

In above equation, FD_{it} refers to financial development calculated while taking in account the financial institutions in terms of their depth, access, and efficiency. RRL_{it} refers to RRL defined as law by which all persons and institutions are subject and accountable under the law, which is fairly applied and honestly enforced, ensuring legal certainty and equality and justice through the observation of independence in the judiciary and human rights standard compliance.

Rational behind choosing Rule of Law as Percentile Rank is that it has broad recognition, comparability across the countries, and empirical relevance in governance related studies. It captures the effectiveness of legal institutions, contract enforcement, property right protection, judicial independence, and policy implication. Unlick other governance factors such as control of corruption and regulatory quality, it provides a holistic measure of governance effectiveness by integrating multiple dimensions of institutional strength. EG_{it} as an increase in the production of goods and services in an economy over time. Economic growth is typically measured as the percent rise in real GDP and reflects improvements in the living standards, incomes, and employability conditions of people in a country.

TO_{it} is trade openness referring to how much of its border a country is willing to open up to the free flow of goods and services. One such measure is a country's total trade in relation to its GDP. This indicates the level of integration a country has with the global economy and, thereby, the willingness to trade internationally. TI_{it} denotes to technological innovation which is the process of developing and applying new technologies to products, services, or processes to enhance efficiency, productivity,

and competitiveness. It involves the creation, adoption, and diffusion of novel ideas and inventions that foster growth and progress in society. FDI_{it} denotes FDI which is the investment made by companies or individuals into business interests located in other countries. It normally involves not only the transfer of money but also the transfer of functions related to ownership.

Moreover, $ב_1 \; to \; ב_5$ refers to coefficients of $RoL_{it}, EG_{it}, TO_{it}, TI_{it},$ and FDI_{it} respectively. Likewise, $ב_0, i, \; t,$ and ∪ denotes intercept, sample countries (38-OSCE nations), time period of study (2012-2022), and white noise. Table 30 summarizes the data information. Moreover, Figures (9 to 13) offers the graphical representation of link between explanatory $RoL_{it}, EG_{it}, TO_{it}, TI_{it},$ and FDI_{it} and explained (FD_{it}) facets.

Table 30. Variables Description

Variables	Abr.	Measurement Unit	Source
Financial Development	FD	Developed financial institutions are in terms of their depth, access, and efficiency.	IMF
Rule of Law	RRL	Rule of Law: Percentile Rank	WJP
Economic Growth	EG	GDP per capita (constant 2015 US$)	WDI
Trade	TO	Trade (% of GDP)	WDI
Technology Innovation	TI	Patent applications, (non-residents + residents)	WDI
Foreign Direct Investment	FDI	Foreign direct investment, net inflows (% of GDP)	WDI

Source: Authors compilation.

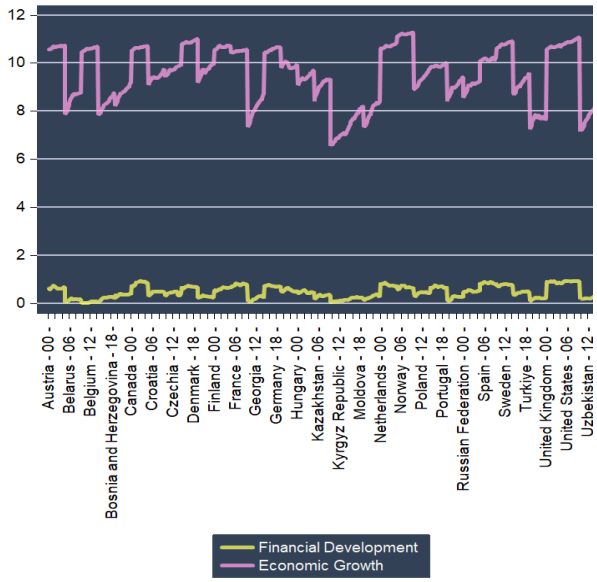

Figure 9:GE and FD

Source: Int. Monetary Fund and OECD

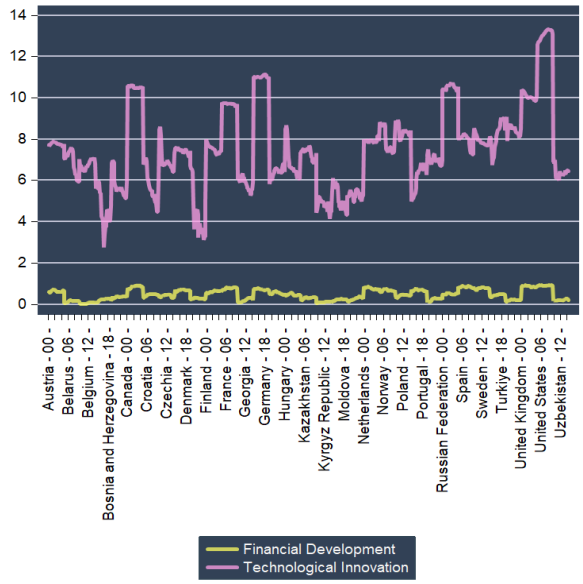

Figure 10: TI and FD

Source: Int. Monetary Fund and World Bank

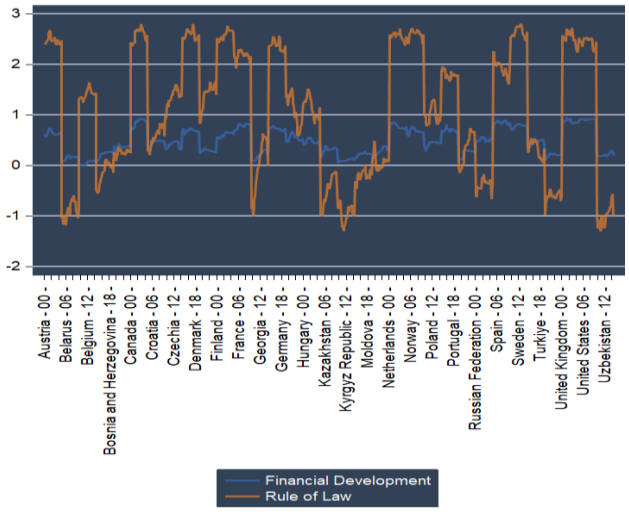

Figure 11: RRL and FD

Source: Int. Monetary Fund and World Bank

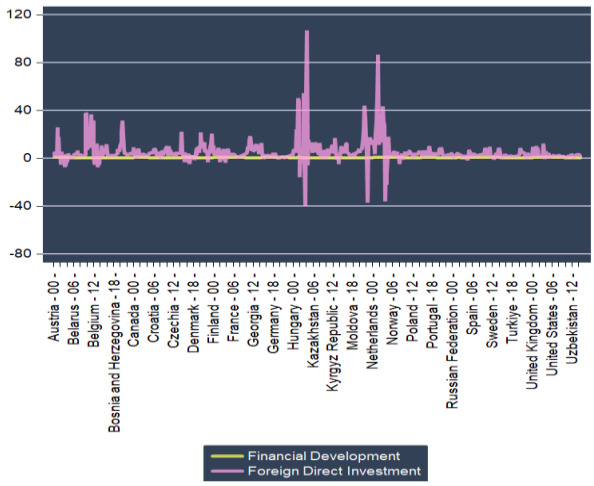

Figure 12: FDI and FD

Source: Int. Monetary Fund and World Bank

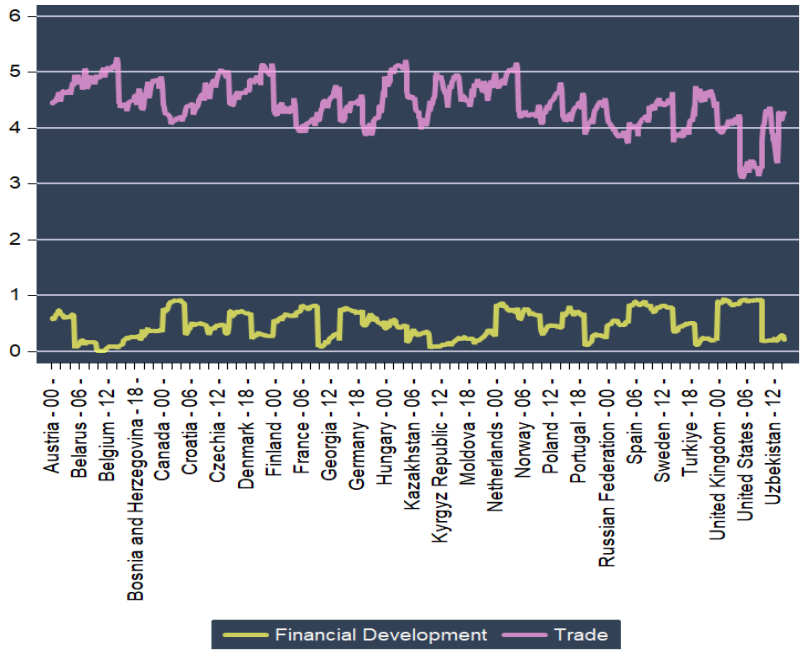

Figure 13. TO and FD

Source: International Monetary Fund and OECD

Estimation Procedure

To employ the appropriate econometric model, first we assessed the characteristics of panel data we employed preliminary tests such as cross-sectional dependence (CSD) test to assess the cross-sections. We tested the stationary characters of variable with second generation unit root test such as CIPS and RALS-ADF due to presence of CSD in the data. Moreover, we employed slope heterogeneity (SH) test to estimate the slope in tested coefficients of variables. Moreover, to assess the long run link of explanatory ($RoL_{it}, EG_{it}, TO_{it}, TI_{it},$ and FDI_{it}) variables with explained variable FD_{it} we employed the novel RALS-EG cointegration test. Moreover, The RALS co-integration, introduced by Im & Schmidt (2008), is used to have more exact, robust, and extensive outocmes. Furthermore, the RALS co-integration test produces a novel

term by amalgamating the second and third moments of the residuals. This differs from the methodology used by conventional co-integration procedures.

This study used the MMQR technique developed by Machado and Santos Silva (2019) as the primary approach for the analysis purpose. The MMQR approach has number of advantages to use such as it has ability to capture the conditional heterogeneous effects across the different quantiles of the dependent variable distribution. Unlike traditional mean-based regression techniques, MMQR allows for a more comprehensive analysis by examining how the relationship between variables vary at different points of the distribution, which is crucile when dealing with skewed or non-normally distributed data (Machado and Santos Silva, 2019). Moreover, Afshan et al. (2022) assert that the used technique provides advantages in managing individual effects and endogeneity within the parameters. According to the results of Samour et al. (2023), the MMQR is a statistical instrument used to examine the impacts of heterogeneity over several quantiles. This estimator further allows individual effects to influence the general distribution, as shown by the integration of fixed effects.

We assess the robustness of MMQR outcomes by Feasible Generalized Least Squares (FGLS) estimator and DH panel causality. The FGLS method was employed to address heteroskedasticity and autocorrelation, which are common issues in panel data analysis. Given the presence of cross-sectional dependence in our dataset, FGLS provides more efficient and reliable estimates compared to Ordinary Least Squares (OLS) or standard fixed effects models (Parks, 1967; Beck & Katz, 1995). The technique ensures that the standard errors are robust to heteroskedasticity and serial correlation, improving the precision and validity of inference in our estimations. Finally, we employed the contour plots to check the visual relationship between the variables of study.

4.4 Results and Discussion

The descriptive statistic outcomes are shown in Table 31. The outcomes show that mean values for FD (0.481), RRL (0.593), EG (9.527), TI (7.481), TO (4.431), and FDI (4.938) describe the averages that the sample had for every indicator. Moreover, the median RRL is far stronger at 0.797 than its mean at 0.593, FDI is lower at 3.113 as opposed to its mean of 4.938, showing a stronger value tilt.

Table 31: Descriptive Statistics

	FD	RRL	EG	TI	TO	FDI
Mean	0.481	0.593	9.527	7.481	4.431	4.938
Median	0.470	0.797	9.693	7.346	4.438	3.113
Maximum	0.960	2.125	11.283	13.340	5.263	106.532
Minimum	0.010	-1.479	6.577	2.773	3.104	-40.086
Std. Dev.	0.258	1.056	1.171	2.022	0.398	8.995
Skewness	0.066	-0.257	-0.501	0.604	-0.532	4.080
Kurtosis	1.765	1.666	2.195	3.365	3.561	39.419

Source: Authors compilation; Note: FD = Financial Development, RRL = Rule of Law, EG = Economic Growth, TI = Technological Innovation, TO = Trade Openness, FDI = Foreign Direct Investment.

Moreover, preliminary outcomes of CSD, CIPS, SH, and RALS-EG are shown in table 32. The outcomes affirmed the present of CSD in the panel data. Hence, we employed second generation unit root, outcomes of both tests (CIPS and RALS-ADF) provide the mixed order of the stationary of data such that FD, RRL, TI, and FDI are stationary at level I(0), whereas EG and TO are stationary at 1st difference I(1). Moreover, the outcomes of SH test show the present of slop in the coefficients of variables as t-statistics of delta (16.256) and adjusted delta (19.315) are significant at 1% level of significance. Finally, RALS-EG outcomes are shown in Table 33. The t-statistics

(17.578) of RALS-EG cointegration test is higher than critical value at 1% level of significance, suggesting the presence of the long run link among the variables of study.

Table 32. Preliminary Test Outcomes

Variables	CSD	CIPS		RALS-ADF		Slop Heterogeneity	
	CD-test	Level	1st diff.	Level	1st diff.	Delta	P-value
FD	38.4	-2.868	-	2.058	17.896	16.256	0.000
RRL	10.8	-2.64	-	-7.31	-	adj. Delta	
EG	90.75	-1.345	-3.089	-23.415	-	19.315	0.000
TO	35.33	-1.465	-4.133	7.045	-		
TI	11.71	-2.328	-	15.335	-		
FDI	20.31	-3.832	-	24.157	-		

Source: Authors compilation; Note: FD = Financial Development, RRL = Rule of Law, EG = Economic Growth, TI = Technological Innovation, TO = Trade Openness, FDI = Foreign Direct Investment.

Table 33. Cointegration Test Outcomes

RALS-EG Value	K	Rho
-17.578	1	0.964

Source: Authors compilation; Note: K shows the optimum lag length found using recursive statistics; the 1%, 5%, and 10% critical values for the RALS-EG test are -4.80, -4.19 and -3.88 respectively."

Moreover, the outcomes of the MMQR are shown in Table 34. The outcomes show that the coefficients of RRL are significant and positive at 1% level of significance throughout the quantiles (0.122, 0.113, 0.110, 0.107, 0.104, 0.100, 0.097, 0.094, and 0.090). It suggests that the RRL boosts the financial development in the OSCE nations.

Moreover, degree of association increase from quantile 1 to quantile 9 as evidenced from the coefficients of RRL, suggesting the as time passes the RRL strengthen the financial development in the OSCE nations. The outcomes are in line with (Głowacki et al., 2021; Medécigo, 2015; Tang et al., 2022).

The MMQR outcomes shows that economic growth at quantile 1 is negative and insignificant and magnitude of the coefficient is very low (-0.005). However, the coefficients of quantile 2 to quantile 9 are positive and significant (0.025, 0.037, 0.047, 0.058, 0.069, 0.082, 0.090, and 0.104). It is to note that strength of the coefficients increases from lower quantiles to upper quantiles suggesting that improved economic conditions of the OSCE nations will strengthen the financial development in long run. The outcomes are in line with (Raza et al., 2024; Nasreen et al., 2020; Braun & Deeg, 2020; Acquah & Ibrahim, 2020).

Furthermore, the technological innovation boosts the financial development as evidence from coefficients of quantile 1 to quantile 9 (0.039, 0.032, 0.029, 0.026, 0.024, 0.021, 0.018, 0.016, and 0.012). The relationship between TI and FD significant at 1% level. It suggests that technological innovation plays very important RRL to improve the financial development in the OSCE nations. The outcomes are in line with (Raza et al., 2024; Ali et al., 2023; Lin & Ma, 2022).

Likewise, the Foreign Direct Investment does not affect the financial development in lower and middle quantiles but in long run it effects financial development positively in OSCE nations (q7 to q9). It suggests that Foreign Direct Investment accelerate the financial development at later stage of inflows in terms of FDI. The outcomes are in line with (Samour et al., 2022; Rafique et al., 2020; Raza et al., 2023).

Finally, MMQR outcomes show that trade openness has negative link with financial development of OSCE nations as evidenced from the coefficients of trade openness from quantile 1 to quantile 9 (-0.210, -0.194, -0.188, -0.183, -0.178, -0.172, -0.165, -0.161, -0.154). It is important to notice that degree of magnitude of the negative trade on the financial development decreases from lower to upper quantiles, evidencing that its negative effect decreases in the long run. The outcomes are in line with (Khan & Ozturk, 2021; Kong et al., 2021; Ali et al., 2023).

Robustness Check

Moreover, the FGLS outcomes shown in Table 35 affirmed the robustness of the MMQR outcomes. The FLGS outcomes shows that RRL, EG, TI, and FDI have positive coefficients (0.05425, 0.11285, 0.01665, 0.00008) with FD, suggesting that these factors enhance the financial development however, the TO (-0.06793) diminishes the financial development. Besides, the outcomes of the DH causality are shown in Table 23.

The outcomes show that there is unidirectional association between RRL, EG, TO, FDI, and FD, however, there is bidirectional association between TI and FD (See Figure 14).

Table 34. MMQR Outcomes

DV-FD		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
RRL	Beta	0.122	0.113	0.110	0.107	0.104	0.100	0.097	0.094	0.090
	S.E	0.019	0.014	0.012	0.011	0.010	0.009	0.009	0.010	0.011
	PV	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
EG	Beta	-0.005	0.025	0.037	0.047	0.058	0.069	0.082	0.090	0.104
	S.E	0.018	0.013	0.011	0.010	0.009	0.009	0.009	0.009	0.010
	PV	0.782	0.057	0.001	0.000	0.000	0.000	0.000	0.000	0.000
TI	Beta	0.039	0.032	0.029	0.026	0.024	0.021	0.018	0.016	0.012
	S.E	0.006	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003
	PV	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TO	Beta	-0.210	-0.194	-0.188	-0.183	-0.178	-0.172	-0.165	-0.161	-0.154
	S.E	0.027	0.020	0.018	0.016	0.015	0.014	0.014	0.014	0.016
	PV	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FDI	Beta	-0.002	0.000	0.000	0.000	0.001	0.001	0.002	0.002	0.002
	S.E	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	PV	0.356	0.703	0.975	0.731	0.427	0.179	0.059	0.030	0.015

Source: Authors compilation; Note: FD = Financial Development, RRL = Rule of Law, EG = Economic Growth, TI = Technological Innovation, TO = Trade Openness, FDI = Foreign Direct Investment.

Table 35. FGLS Outcomes

DV-FD	Coefficient	Std. err.	P-value
RRL	0.05425	0.00334	0.000
EG	0.11285	0.00353	0.000
TI	0.01665	0.00113	0.000
TO	-0.06793	0.00363	0.000
FDI	0.00008	0.00004	0.018

Source: Authors compilation; Note: FD = Financial Development, RRL = Rule of Law, EG = Economic Growth, TI = Technological Innovation, TO = Trade Openness, FDI = Foreign Direct Investment.

Table 36. DH Causality Outcomes

Null Hypothesis:	W-Stat.	Zbar-Stat.	P-value
RRL ≠ FD	3.876	3.566	0.000
FD ≠ RRL	2.933	1.476	0.140
EG ≠ FD	2.192	-0.166	0.868
FD ≠ EG	3.033	1.699	0.089
TI ≠ FD	3.391	2.491	0.013
FD ≠ TI	3.883	3.582	0.000
TO ≠ FD	3.083	1.809	0.070
FD ≠ TO	2.974	1.568	0.117
FDI ≠ FD	2.593	0.724	0.468
FD ≠ FDI	3.896	3.612	0.000

Source: Authors compilation; Note: FD = Financial Development, RRL = Rule of Law, EG = Economic Growth, TI = Technological Innovation, TO = Trade Openness, FDI = Foreign Direct Investment.

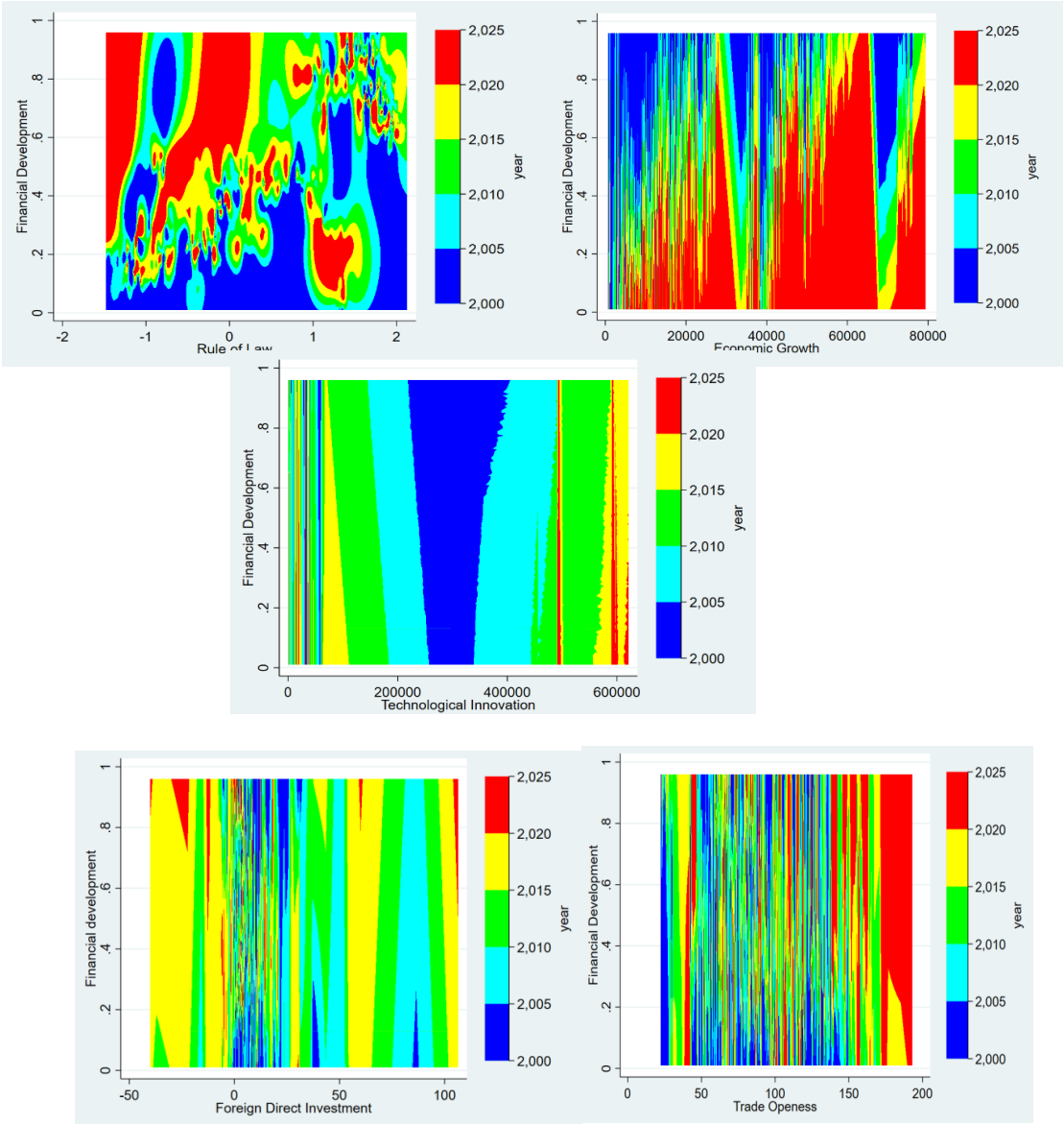

Figure 14 Counter Plots
Source: Author's own

Discussions

The RRL is the foundation of financial stability, transparency, and confidence, making it vital to financial development. A good legal environment protects property rights, contracts, and fair and effective dispute resolution for non-legal compliance. This reduces financial transaction risk and uncertainty, making domestic and overseas investments more viable. Financial institutions, investors, and enterprises participate

more in financial markets when the RRL is robust because they trust the legal system. Financial markets value well-defined property rights and contract enforcement because they protect investments and assets. Financial institutions are more confident in lending and borrowing since they know there is legal recourse for defaults (Emara & El Said, 2021). It lowers corruption, discretionary judgments, and other financial growth barriers. Fair competition may spur financial sector innovation and growth because the RRL sets equal legal and regulatory requirements and implements them consistently. Business efficiency and financial market performance improve when enterprises are treated equally. High-quality RRL promotes financial system integration into the global market and FDI inflows and interbank cross-border position taking. Integration deepens and broadens financial markets, fostering a more sophisticated and resilient financial system. The RRL establishes the legal and institutional framework for good financial development. Our results are incline with Głowacki et al. (2021) for Germany and Poland; Medécigo (2015) USA, Germany and Mexico; Tamg et al. (2022) for ASEAN economies.

Income rises with economic growth, which boosts savings and investments. Successful people and businesses are looking for strategies to invest and manage money in OECD nations (Mtar & Belazreg., 2021). As prosperity grows, demand for financial services rises, forcing banks, insurance companies, and investment firms to expand and introduce new products and services. Capital accumulation boosts financial market liquidity, fostering development and complexity. This implies that when the economy grows, firms and industries expand, requiring more funding. For growth, innovation, and daily operations, firms require credit and equity finance. Capital markets like stock exchanges and bond markets, where corporations may raise cash, are more active in Sub Saharan African countries (Aluko & Ibrahim, 2020). These markets strengthen the

financial industry by increasing capital access and financial tools for enterprises and investors. The results are supported by Raza et al. (2024) for United Arab Emirates; Nasreen et al. (2020) for European economies; Braun & Deeg (2020) for Germany; Acquah & Ibrahim (2020) for Africa.

Technological innovation has improved financial sector efficiency, access, and inclusivity, which boosts financial development. Mobile banking, blockchain, and AI would improve financial services facilitation by reducing transaction costs and speeding up and optimizing financial operations. Mobile banking and digital payment platforms have increased financial inclusion by giving underserved groups and small businesses access to banking, credit, and investment opportunities. Access to financial markets boosts liquidity, participation, and economic growth. Fintech solutions like peer-to-peer lending, digital currencies, and AI-driven risk assessments create new investment and credit channels, making financial institutions more dynamic and resilient. Technological innovation has enabled quick and continual advancements in financial services, making them efficient, transparent, and inclusive. Our results are in line with Raza et al. (2024) for Scandinavian economies; Ali et al. (2023) for USA; Lin & Ma (2022) for China.

Potential negative consequences include greater susceptibility to worldwide financial crises and economic downturns. Greater trade openness provides a broad channel through which an economy is increasingly vulnerable to external shocks, which will most likely spill over into domestic financial institutions because of the significant growth in global commerce. For example, high-frequency changes in global commodity prices or financial crises might cause a flight to quality, currency devaluation, and increased uncertainty, harming the financial system. Furthermore,

trade openness may indicate increasing competition for financial intermediaries, particularly with foreign banks and other financial institutions entering the domestic market. While it is true that competition will eventually lead to more efficiency and a better climate for innovation, it also has a negative side in that national financial institutions may compete at a disadvantage against bigger and more established foreign institutions. As a result, local banks may be less lucrative, leading to reduced investment in financial infrastructure and services. Our results are encircled with Khan & Ozturk (2021) for 88 developing nations; Kong et al. (2021) for China; Ali et al. (2023) for South Asia.

Foreign Direct Investment facilitates the transfer of knowledge and best practices from developed to emerging financial markets, as well as the improvement of regulatory frameworks, corporate governance, and risk management systems.

These results in a more transparent and stable financial climate, which will boost investor trust in OSCE nations. Because foreign enterprises mostly function based on local financial services, their presence promotes competition in the financial sector, forcing domestic institutions to be more inventive and competitive to enhance their offerings. Foreign Direct Investment also promotes financial integration since it connects local markets to international financial networks, increasing the depth, diversity, and shock-absorbing capability of the financial system in France (Shahbaz et al., 2021). To summarize, Foreign Direct Investment contributes significantly to financial growth through capital addition, innovation drive, and the further development of a well-regulated and competitive financial sector. Our results are enclosed with Samour et al., (2022) for USA; Rafique et al. (2020) for BRICS; Raza et al. (2023) for Spain.

4.5 Conclusion

This study offers a fresh perspectives and effects of RRL, economic growth, technological innovation, trade openness and Foreign Direct Investment on financial development in OSCE nations. The study utilized panel data 2012-2022 of 38 OSCE nations. The study adopts MMQR, FGLS and counter plots. Hence, MMQR research can give solid proof about the crucial intersection of law of rule and financial growth in OSCE nations. The RRL's positive coefficients across all quantiles show how crucial it is to enhancing financial progress throughout time. Economic growth at lower quantiles is statistically insignificant, while growth at higher quantiles suggests that improved economic conditions can have a substantial beneficial effect on financial development in the long run. This finding reiterates the importance of long-term economic growth for the health of the financial development.

Because of its positive effect across quantiles and generally substantial coefficients, technological innovation seems to be one of the more important drivers of financial development. This highlights the need of fostering innovation as a policy measure that might lead to improved financial results in the OSCE nations. Actually, it works the other way around when it comes to trade openness and financial development, and it gets better with time. There may be short-term pains associated with trade, but the benefits more than make up for them.

Lastly, Foreign Direct Investment has shown a delayed beneficial reaction. This is where it turns out to be quite useful in the long run, even if it won't help with financial progress right now.

The finding that trade openness exerts a negative effect on financial development, although counterintuitive compared to much of the existing literature, can be explained through several interrelated mechanisms. First, in more developed financial markets, capital tends to be channeled toward domestic investments and non-tradable sectors such as real estate, consumer services, and infrastructure, rather than export-oriented industries. This resource reallocation reduces the extent to which financial deepening translates into greater trade activity. Second, financial development often strengthens domestic currencies, which may raise export prices and diminish international competitiveness, thereby weakening the trade–finance linkage. Third, financial sector expansion can fuel speculative behavior and economic volatility; episodes of financial crises can directly disrupt trade flows and diminish the stability of trade-related financing.

In addition, there is a structural trend, especially observable in advanced economies such as the United States and other large trading nations, where technological progress has accelerated a shift from tradable goods toward non-tradable services. Under this dynamic, improvements in financial development increasingly support service-based industries rather than manufacturing or export-oriented sectors. As this transition deepens, the traditional positive linkage between trade openness and financial development becomes weaker and may even turn negative.

Taken together, these mechanisms explain why the present study observes a consistently negative effect of trade openness on financial development across OSCE and European nations, with the impact strongest at lower quantiles but moderating at higher ones. The results highlight the importance of institutional quality and policy design to ensure that financial resources are effectively channeled into productive,

trade-supporting activities rather than speculative or domestically concentrated investments.

In order to maintain financial growth, it is necessary to attract ongoing Foreign Direct Investment inflows. For the benefit of researchers and policymakers alike, this research adds to our knowledge of the complex interplay between many factors influencing economic growth in OSCE nations.

4.6 Practical Implications

OSCE nation's robust adherence to the RRL guarantees a stable legal and regulatory framework, which in turn enables the financial markets to operate with effectiveness and efficiency. They should well-defined property rights, effective contract enforcement, and openness in the legal system decrease uncertainties associated with financial transactions. This, in turn, provides a strong argument for higher levels of investment and the expansion of credit. Policymakers should prioritize certain sectors in capital market development that have the potential to stimulate economic growth, including manufacturing, services, and technology. This has the potential to lead to a tailored financial solution that specifically caters to the requirements of developing industries. Technological advancements, especially in the field of financial technology (fintech), enhance financial inclusion by providing inexpensive and convenient access to financial services. Mobile banking, blockchain, and AI-powered solutions alleviate barriers for marginalized areas and promote a more comprehensive financial system. Trade openness empowers nations to engage more extensively in international markets and promote the movement of capital across national boundaries. The influx of money enhances the expansion of local financial markets by broadening the participation of international investors and institutions, hence enhancing liquidity and market depth.

Foreign Direct Investment not only brings in cash, but also knowledge, technology, and managerial techniques that improve the efficiency of domestic financial institutions in OSCE nations. These incoming funds strengthen the banking sector, stock markets, and other financial intermediaries, therefore improving the overall level of financial development of OSCE nations.

Theoretical Implications

This research enhances our knowledge of the complex link between institutional stability, innovation, and financial development in OSCE members. This research shows the beneficial, quantile-specific effect of the RRL on financial development, supporting institutional theory and emphasizing the need for stable legal frameworks for sustainable financial expansion. The paper shows how fintech has improved financial inclusion and market efficiency, extending ideas linking technology innovation to financial growth. Showing that economic growth mostly effects financial development at higher quantiles refines growth theories and emphasizes the cumulative effect of persistent economic circumstances on financial well-being. Trade openness and Foreign Direct Investment data support open economy and capital flow ideas. Trade openness may have delayed effects, but it develops markets and diversifies foreign investments, while Foreign Direct Investment improves long-term financial stability. By include legal stability, technological improvement, and international integration, the findings improve financial development theory.

4.7 Limitations and Future Directions

This research utilizes panel data from 38 OSCE nations spanning the years 2012 to 2022. The dataset, while comprehensive, may not equally capture the specific nuances of all OSCE countries, potentially limiting the generalizability of the findings to other regions or more recent developments. The findings derived from the MMQR, FGLS

estimations, and counter plots are significant; however, these methods may inadequately address nonlinearity and potential endogeneity of the variables, potentially compromising the accuracy of certain estimates. Future studies may explore various approaches to address these limitations. Additionally, it excludes external shocks such as global financial crises or recent geopolitical events that significantly effect financial development. Their inclusion may enhance the robustness of future analyses. A broader analysis examining additional factors that effect financial development, such as levels of digitalization, financial literacy, and regulatory quality, would enhance and strengthen research on the determinants of financial markets in OSCE countries. The application of advanced econometric models, such as nonparametric methods and machine learning techniques, can uncover nonlinear relationships and improve understanding of the complex interactions among the variables studied. Conducting case studies or analyses focused on individual countries within the OSCE member states can provide insights into the unique challenges and opportunities faced by each nation regarding financial development, thereby emphasizing tailored strategies appropriate for diverse contexts. Future research should differentiate between the short-term and long-term effects of variables such as Foreign Direct Investment and trade openness on financial development, thereby clarifying the effect of these factors on markets across varying time frames.

Chapter 5

CONCLUSION AND POLICY IMPLICATIONS

This study is the first of its kind; it brings together a multidimensional view of RRL and investigates the role of RRL in sustainable development in OSCE and European economies. In contrast to the previous literature which usually looks at them independently, this study is one of the few, to the best of our knowledge, that integrates both economic and legal perspectives. It highlights the fact, that legal institutions are not external to economic performance but core; a form of underpinning infrastructure shaping environmental governance, trade liberalization and financial development. In that sense, the study operates at the intersection of some of the 'hardest' questions in applied economics, and constitutes an important contribution to understanding of the way in which law interacts with and influences macroeconomic events.

The decision to concentrate on OSCE states was intentional and tactical. Within the OSCE area states have different legal traditions, ontology and also interpretation: a monist and dualist. Such heterogeneity offers a one-of-a-kind comparative environment to measure the institutional channels of transmission that generate the rule of law's impact on economic outcomes. Thus, in monist systems, international agreements are said to be ‘self-executing’ and translated into domestic law automatically through ratification; by contrast, in dualist systems domestic legislation is necessary in order to incorporate international obligations. This legal dichotomy is also likely to affect the speed and efficacy with which nations adopt international

environmental, trade, and financial regulations, thereby serving as a natural experiment for their developmental consequences.

A unique aspect of this model is that economic growth is considered as a stand-alone explanatory variable in all dimensions of the analysis. In so doing, the study secures the methodological consistency and insights of how legal and institutional variables interact with economic growth. This method ensures that we can map the cumulative impact of legal quality on national development pathways and account for the general macroeconomic terrain within which these are played out.

The second component analyzes the effect of rule of law, renewable energy, economic activity and population toward the ecological footprint. Using vigorous econometric methods, such as the MMQR and RALS-EG estimators, the study found a negative and significant relationship between the rule of law and the environmental degradation. In other words, countries with stronger legal systems can constrain environmental impact by implementing and enforcing environmental protection measures. In addition, the statistically significant positive impact of renewable energy at quantiles in OSCE member countries and in the lower to mid quantiles in Europe re-emphasizes the need for investment in green technologies. At the same time, however, there is a caveat that without sound legal and regulatory structures, economic growth and population growth only serve in the end to exacerbate environmental stress. These findings underscore the urgency of integrated strategies that can combine economic growth and environmental protection, by institutional changes and energy system innovations in particular.

Regarding trade, the study has shown that the rule of law and economic development act as facilitators of trade openness. The results suggest that, in the presence of a predictable, transparent, and efficient legal environment, countries are able to attract FDI, proceed to engage in both global value chains and entry to international trade regimes. Nevertheless, the rather unexpected reverse impact of financial institutions on trade openness in OSCE and European countries deserves to be studied more. He indicates that a range of financial institutions may create rigidity, risk-aversion, inefficiencies, that impede cross-border transactions. Hence, financial institutional reform, in line with the objectives of trade facilitation, is a crucial policy prescription. Trade openness, therefore, becomes not just a question of lower tariffs and improved infrastructure but also the assurance that your laws and institutions are in sync with global norms.

This section on financial development also verifies the centrality of the rule of law in influencing long-run economic resilience. Based on panel data over the period 2012–2022, and through using MMQR and FGLS models, we show that RRL is positively correlated with financial sector enlargement in all quantiles. This strengthens the argument that the rule of law, contract enforcement, and security of property rights are not metaphysical virtues, but actual economic variables, which affect investor confidence and credit expansion. It is noteworthy that growth affects financial development in the higher quantiles, which means that the positive effects of growth on the financial system are stronger in mature financial systems and institutions.

It is clear that technological change is extremely powerful in financial growth. Technological developments in fintech, mobile banking, and digital payments have promoted greater financial inclusion, lower costs of transactions, and better

functioning of financial systems. This is particularly true for OSCE participating States, to which many OSCE countries belong to at different levels of digital transformation. Secondly, foreign direct investment (FDI) is also important, bringing not just financial capital, but also knowledge, managerial skills and technical know-how that improves competitive position in the financial industry. Although the impact of FDI manifests with a lag but eventually contributes to increased financial stability and market development.

This research has several important practical implications. In the first place, policy actors must prioritize legal reform — not only for normative reasons, but as an environmental and economic prerequisite. A robust rule of law allows governments to craft and enforce efficient environmental, trade and financial rules. Second, public and private partnerships for climate-focused investment in renewable energy, digital infrastructure and green technologies should be pursued. Third, liberalization has to be accompanied by institutional restructuring in the financial sector to eliminate barriers and wastages. Lastly, I should add that FDI attraction policies should be connected to a long-term development goal where foreign capital would also contribute to sustainable and inclusive growth. There are policy implications that must to be highlighted here:

1. Strengthen the Rule of Law Across All Dimensions - To support the protection of the environment, liberalization of trade, and development of finance, a solid rule of law-based structure is indispensable. The reforms that governments should focus on are legal, judicial independence, and reducing obstacles in contract enforcement (to stop corruption, fraud and to increase investor confidence).

2. Environmental Governance and Sustainability.

- Countries must incorporate international environmental agreements into national law, as swiftly as possible (particularly in dualist systems).

- The courts must directly enforce international obligations in order to enhance institutional credibility.

- We should encourage green transformation of fossil-fuel–dependent industries by R&D, public–private partnerships, and subsidies for renewable energy.

- Education programs need to raise awareness for sustainable consumption and production and monitoring systems need to assess ecological impacts for policy adjustments.

3. Trade Openness and Competitiveness.

- There must be an anti-corruption campaign along with improvements in the dispute resolution to make trade feasible.

- Transport, digital and tech investment will then cut trade costs and increase competitive advantage.

- Trade impediments (tariffs and non-tariff barriers) need to be lowered to promote globalization.

- Regulation of banks is necessary to reduce excessive speculation and small to medium sized businesses need to have easier access to trade financing.

4. Financial Development and Stability:

- Institutional underpinnings such as property rights, contracts and regulations play an instrumental role in maintaining the development of financial markets.

- So, the priority of the policymakers should be capital market deepening in high-potential sectors (manufacturing, services, technology).

- Fintech (blockchain, AI, mobile banking) should be incentivized for the growth of inclusion of the financial services and for its efficiency.

- Attracting FDI must continue to be a priority, not only to attract capital, but also to access technology, skills and best practices in governance.

5. Integrated Policy Approach - What's needed is a coordinated system that ties together environmental law, trade policy and financial regulation. Policy silos don't work; instead, governments should take integrated approaches consistent with global sustainability and development objectives.

In terms of theory, it contributes to institutional economics by showing how legal quality has quantile-specific impacts on macroeconomic performance. In this, it contributes to the open economy macroeconomic literature, bringing rule of law into relationship with trade openness and financial integration. In addition, it enriches the financial development theory via including innovation, globalization, and rule of law stability as co-factors.

Like all empirical analyses, the study is not without limitations:

1. The dataset is ranged 2012–2022 (ecology and trade) which may not capture recent shocks such as COVID-19, geopolitical conflicts, or climate-driven crises.

2. The study focuses only on OSCE and European countries, which limits generalizability to other regions.

3. Quantitative methods (MMQR, RALS-EG, FGLS) provide robust insights but may not fully reflect qualitative governance factors or informal institutional dynamics. Although MMQR is appropriate to consider both heterogeneity and cross-sectional dependence in panel data, there is no assurance that all estimates' coefficients will be significant. The lack of significance of certain outcome variables in the present study

might be accounted for by several factors. First, there is a substantial heterogeneity across OSCE and European countries, which would likely be indicative of institutional and economic dynamics that can differ greatly; therefore, when aggregating, the average effect may lose statistical power at some particular quantiles. Second, MMQR takes into account distributional heterogeneity in which the association of a covariate can be strong at certain quantiles, while nonexistent in some others. This quantile-conditional variation is in itself informative, and indicates that the institutional and economic relationships are not uniform across the range of outcomes. Finally, the robustness of some coefficients could be hampered by the influence of external shocks, lack of data and differences in the structure of monist and dualist legal systems.

Therefore, the fact that we find null results does not imply that our methodological approach is weak, instead it suggests that the complexity of the incredibly heterogeneous and non-linear relationship between institutions and economics across various countries.

4. The heterogeneity of countries (monist vs dualist systems, developed vs developing economies) may create mixed results across indicators.

The data set ranges from 2012 to 2022 is fairly fine-grained, although it might not capture recent geopolitical shocks or structural shifts. Quantitative methods cannot capture qualitative institutional and informal governance factors enough. These findings could be further developed in future research through mixed method approaches, integrating other regional blocks (e.g. ASEAN or BRICS), analysis that includes other possible variables (i.e. education, regulatory quality or social capital). Advanced econometric methods, such as machine learning or structural models, might

also reveal nonlinear dynamics and complex interrelations between legal and economic variables. Suggestions for Future Research could be next:

1. Increase the duration of the analysis, as appropriate to the available data.
2. Utilize other econometric methods such as CS-ARDL to check the sensitivity of findings.
3. Expand the range of regions (e.g., ASEAN, Asian countries, BRICS) for greater generalizability.
4. Add more factors -education and technical innovation- into the models.
5. Consider other geographical environments with different economic, political, and financial backgrounds.
6. Combine qualitative and quantitative techniques to better capture institutional and informal governance devices.
7. Explore more advanced econometric and nonparametric methods, such as through machine learning approaches to detect nonlinear associations.
8. Examine how global financial crises and geopolitical events influence environmental, trade and financial consequences.
9. Include institutional variables such as digitalization, financial literacy (FL), and quality of regulation for a more complete picture.
10. Perform within-state studies or state-level comparative studies in OSCE and European Participating States, focusing on the state dynamics.
11. Distinguish between the short-run and long-run influences of the most significant factors, in particular foregin direct investment and trade openness, on financial development.
12. It also serves as a potential topic for future research to consider sample heterogeneity since the countries vary with respect to the trade openness and the level

of financial development. Aggregating the countries according to their degree of openness or financial development, it would be possible to re-estimate the models for each of these subgroups. This would enable testing whether the negative relationship is general or the result of structural variations at the level of the economies, thus allowing for more precise understanding of the institutional and economic channels involved.

Finally, this study shows that the rule of law is not a legal fiction, but a robust and multi-faceted force of economic, environmental and financial good. It should become an essential part of the planning and evaluation of economic policy. The study provides strong empirical evidence to the relationship between legal institutions, economic growth, technological change, openness to trade, and FDI, and thus contributes to underpinning the design of comprehensive forward-looking development strategies in the OSCE region and elsewhere.

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APPENDIX

Appendix A: List of the OSCE participating States after additions.

1	Albania
2	Austria
3	Belarus
4	Belgium
5	Bosnia and Herzegovina
6	Bulgaria
7	Canada
8	Croatia
9	Czechia
10	Denmark
11	Estonia
12	Finland
13	France
14	Georgia
15	Germany
16	Greece
17	Hungary
18	Italy
19	Kazakhstan
20	Kyrgyzstan
21	Moldova
22	Mongolia
23	Netherlands

24 North Macedonia

25 Norway

26 Poland

27 Portugal

28 Romania

29 Russian Federation

30 Serbia

31 Slovenia

32 Spain

33 Sweden

34 Turkey

35 Ukraine

36 United Kingdom

37 United States

38 Uzbekistan