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Regulatory Volatility and Economic Growth in Europe: Heterogeneous Effects Across Institutional Development Stages

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Abstract

Institutions are widely recognized as a key determinant of long-run economic growth, yet empirical research has predominantly focused on institutional levels rather than institutional stability over time. This study examines whether regulatory volatility—conceptualized as a dynamic dimension of institutional stability—is associated with economic growth across 32 European economies over the period 2004–2023. Regulatory volatility is measured using rolling five-year standard deviations of the Regulatory Quality indicator from the Worldwide Governance Indicators, allowing institutional stability to vary within countries over time while avoiding forward-looking bias. The empirical strategy relies on fixed-effects panel models with Driscoll–Kraay standard errors to account for unobserved heterogeneity and cross-sectional dependence. The results indicate that regulatory volatility is negatively associated with economic growth within European Union economies, while the relationship appears weaker and heterogeneous in Western Balkan transition countries. A one standard deviation increase in regulatory volatility is associated with an economically meaningful reduction in annual per capita growth. These findings suggest that sustainable economic performance may depend not only on the level of institutional quality but also on the stability and predictability of regulatory frameworks over time.

Keywords: regulatory volatility; institutional stability; economic growth; European integration; panel data; governance quality

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1. Introduction

Institutions are widely recognized as a fundamental determinant of long-run economic growth and development. A substantial body of the theoretical and empirical literature demonstrates that governance effectiveness, regulatory quality, rule of law, and secure property rights shape incentives, reduce uncertainty, and foster productive investment [1–3]. In the European context, institutional frameworks have played a central role in supporting post-war reconstruction, economic integration, and income convergence among heterogeneous economies [4].

While most empirical research has focused on institutional levels, considerably less attention has been devoted to institutional stability over time. Countries with similar average governance scores may experience different economic trajectories depending on whether regulatory frameworks remain predictable and coherent or are subject to

frequent policy reversals and regulatory shifts. Political and policy instability has long been associated with investment uncertainty and lower growth performance [5,6], yet the growth implications of sustained regulatory volatility in Europe remain insufficiently explored.

This issue is particularly relevant in the European Union following the 2004 enlargement and subsequent integration waves. The expansion incorporated economies with diverse institutional legacies and reform capacities. Although EU accession has often been associated with improvements in institutional quality, the durability and consistency of these improvements have varied across countries and over time [7,8]. In transition contexts such as the Western Balkans, institutional transformation remains incomplete, and convergence toward EU standards is uneven [9], raising the question of whether regulatory volatility affects growth differently across institutional development stages.

Recent research on European convergence emphasizes that growth processes are conditional and mediated by institutional characteristics [4]. However, most empirical studies focus primarily on average governance levels and implicitly treat institutions as relatively stable over time. As a result, the role of institutional volatility—particularly regulatory volatility—as an independent factor associated with growth remains underexplored in European panel analyses.

This paper examines the relationship between regulatory volatility and economic growth across 32 European economies over the period 2004–2023. Regulatory volatility is measured using rolling five-year standard deviations of the Regulatory Quality indicator from the Worldwide Governance Indicators [10], allowing institutional stability to vary within countries over time while avoiding forward-looking bias.

The empirical strategy relies on fixed-effects panel models to exploit within-country variation while controlling for time-invariant heterogeneity. Given the strong economic interdependence among European economies, cross-sectional dependence is explicitly tested and addressed using Driscoll–Kraay standard errors. Regional heterogeneity is incorporated by allowing the growth effects of regulatory volatility to differ between EU economies and Western Balkan countries.

The analysis yields three main contributions. First, it operationalizes regulatory volatility using rolling dispersion measures rather than static cross-country averages, thereby introducing a dynamic dimension of institutional stability into growth analysis. Second, it addresses methodological concerns related to cross-sectional dependence and model specification in European panel data. Third, it provides evidence that the growth implications of regulatory volatility are heterogeneous across institutional development stages, with stronger associations observed in mature EU economies than in Western Balkan transition contexts.

Overall, the findings suggest that sustainable economic performance depends not only on the level of institutional quality but also on the stability and predictability of regulatory frameworks over time.

2. Literature Review

The importance of institutions for long-run economic growth is firmly established in both theoretical and empirical research. Institutional economics emphasizes that institutions structure incentives by defining property rights, enforcement mechanisms, and the rules governing economic exchange, thereby reducing uncertainty and transaction costs [2]. Subsequent work highlights the central role of inclusive political and economic institutions in fostering sustained growth, innovation, and investment, while extractive institutional arrangements tend to generate persistent stagnation [1]. Complementary perspectives stress that institutional frameworks operate through multiple transmission channels, including

policy credibility, macroeconomic stability, human capital accumulation, and technological diffusion [3].

Empirical growth research broadly confirms that institutional quality is associated with cross-country income differences and long-run performance [11,12]. In the European context, institutional quality has been identified as a key determinant of convergence dynamics, particularly following the 2004 enlargement of the European Union and subsequent integration waves. While neoclassical growth theory predicts unconditional convergence driven by diminishing returns [13,14], empirical evidence suggests that convergence in Europe is conditional and mediated by structural and institutional characteristics [4]. Panel analyses further document that governance effectiveness and regulatory quality are closely linked to income differentials across EU member states [15].

At the same time, European economies display substantial institutional heterogeneity. Improvements in governance contributed to accelerated convergence in several post-2004 EU member states [16,17], whereas Western Balkan economies continue to face institutional constraints related to regulatory quality, rule of law, and corruption control [7–9]. Broader regional research also emphasizes the importance of institutional coordination and policy consistency in sustaining integration processes and cross-border cooperation [18]. Complementary evidence highlights that macroeconomic stability, fiscal sustainability, and competitiveness dynamics remain intertwined with institutional credibility in Southeast Europe [19–21].

Recent empirical contributions further demonstrate that institutional quality influences economic outcomes across diverse domains, including environmental resilience [22], climate vulnerability [23], ESG performance [24], and economic resilience in reform contexts [25]. These studies reinforce the broader relevance of institutional frameworks for economic performance but predominantly focus on governance levels rather than their temporal stability.

A parallel strand of political economy literature highlights the role of instability and policy reversals in shaping economic outcomes. Seminal studies show that political instability and distributional conflict are associated with weaker investment and growth [5,26]. Discretionary and unstable fiscal and regulatory policies have been linked to macroeconomic volatility and lower long-run growth [6,27]. More recent panel evidence indicates that political institutions can reduce growth volatility and stabilize macroeconomic performance [28], while broader growth–volatility research suggests that macroeconomic volatility may constrain long-run growth trajectories [29]. Emerging work also explores how regulatory quality interacts with economic volatility dynamics [30]. Recent work by Moradi and Jahanbakht [31] further emphasizes that different branches of governance—legislative, executive, and judicial—jointly shape economic outcomes under conditions of institutional volatility. Their multi-branch perspective highlights how institutional alignment and policy coherence influence entrepreneurial dynamics in uncertain regulatory environments, reinforcing the importance of stability as a structural characteristic of governance systems.

Despite these advances, most empirical studies treat institutions as relatively stable or focus primarily on their average levels. While political instability and policy uncertainty have been widely examined, the sustained dispersion of governance quality indicators over time—particularly regulatory quality—as a structural and dynamic characteristic of countries remains comparatively underexplored in European panel analyses. Fluctuations in regulatory frameworks may influence growth through heightened investment uncertainty, credibility loss, and increased adjustment costs for firms, yet systematic evidence within a unified European panel setting remains limited.

By focusing explicitly on regulatory volatility, measured through rolling dispersion in governance indicators, this study integrates the dynamic dimension of institutions into empirical growth analysis. Rather than equating institutional change with fragility, the analysis examines whether sustained regulatory volatility is systematically associated with growth outcomes and whether this relationship differs across institutional development stages within Europe.

3. Data and Variables

The empirical analysis is based on an unbalanced panel dataset covering 32 European economies over the period 2004–2023. The sample is structured into three regionally coherent groups reflecting different stages of European integration and institutional development.

The EU Core group includes Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, and Sweden. These countries represent long-standing EU members characterized by relatively mature institutional frameworks, consolidated regulatory systems, and high levels of economic development.

The EU New group comprises Poland, the Czech Republic, the Slovak Republic, Slovenia, Hungary, Romania, Bulgaria, Croatia, Lithuania, Latvia, Estonia, Cyprus, Malta, Portugal, Spain, and Greece. This group captures post-2004 EU member states from Central and Eastern Europe, together with Southern European economies that underwent later institutional consolidation and structural adjustment within the EU framework.

The Western Balkans group consists of Serbia, Montenegro, North Macedonia, Albania, and Bosnia and Herzegovina. These countries are non-EU members or accession candidates characterized by ongoing institutional transformation, heterogeneous governance structures, and incomplete convergence toward EU regulatory standards.

This regional classification enables structured comparison across relatively homogeneous institutional environments while preserving sufficient cross-sectional variation for empirical analysis.

Countries are included in the sample if consistent WDI and WGI data are available for the 2004–2023 period and if the time coverage allows construction of rolling five-year volatility measures. Economies with insufficient governance continuity or incomplete macroeconomic data are excluded to preserve internal consistency of the panel structure.

Macroeconomic data are obtained from the World Bank's World Development Indicators (WDI), ensuring full coverage and methodological consistency across EU and non-EU economies. Institutional data are sourced from the Worldwide Governance Indicators (WGI), which provide annual assessments of governance performance across six dimensions: Voice and Accountability, Political Stability, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption.

The primary dependent variable is the annual growth rate of real GDP per capita. In line with standard convergence literature, the lagged logarithm of real GDP per capita is included to capture initial income effects and conditional convergence dynamics.

The central explanatory variable is regulatory volatility, constructed as a rolling five-year standard deviation of the Regulatory Quality indicator from the WGI database. This rolling-window approach allows volatility to vary within countries over time while avoiding forward-looking bias. Higher values indicate greater instability in regulatory performance.

The WGI Regulatory Quality indicator is used in its original standardized scale, ranging from -2.5 to 2.5. No additional normalization is applied prior to the construction of the rolling volatility measure. Missing values are not imputed; observations with incomplete macroeconomic or governance data are excluded from estimation, resulting in an unbalanced panel structure.

In addition to regulatory volatility, the empirical model includes standard macroeconomic controls commonly used in growth regressions. Gross capital formation (percentage of GDP) captures investment intensity. Tertiary education attainment serves as a proxy for human capital accumulation. Trade openness, measured as the sum of exports and imports as a percentage of GDP, reflects external integration and exposure to international markets. All macroeconomic variables are drawn from the WDI to ensure comparability across the full sample.

Regional dummy variables identifying EU Core, EU New, and Western Balkan economies are used in selected specifications to assess heterogeneity in the growth–volatility relationship. This structure enables systematic comparison of institutional stability and economic performance across European regions over a two-decade horizon.

4. Methodology

The empirical strategy is designed to examine whether regulatory volatility—conceptualized as a time-varying dimension of institutional stability—affects economic growth across European economies. The analysis builds on a standard growth regression framework in which economic growth depends on initial income levels and institutional characteristics, while explicitly distinguishing between the effects of institutional quality and institutional stability.

The baseline specification takes the following form:

$$GDP\_growth_{it} = \alpha_i + \beta_1 \ln(GDP_{i,t-1}) + \beta_2 Volatility_{it}^{RQ} + \gamma X_{it} + \varepsilon_{it} \quad (1)$$

where GDP_growth_{it} denotes the annual growth rate of real GDP per capita in country i at time t, $\ln(GDP_{i,t-1})$ captures the initial level of economic development, $Volatility_{it}^{RQ}$ represents regulatory volatility, and X_{it} denotes a vector of control variables including gross capital formation, tertiary education attainment, and trade openness. The term α_i captures unobserved country-specific heterogeneity, and ε_{it} is the idiosyncratic error term.

Equation (1) corresponds to the standard conditional convergence framework in the growth literature. The coefficient β_1 captures conditional convergence dynamics. A negative estimate of β_1 would indicate convergence, implying that countries with lower initial income levels grow faster, conditional on institutional and structural characteristics. Conversely, a positive coefficient suggests divergence within the sample period.

Because the dependent variable is defined as the annual growth rate of real GDP per capita, concerns related to non-stationarity typically associated with level variables are substantially mitigated. Growth rates are generally treated as stationary in empirical macroeconomic analysis. The specification therefore focuses on medium-term growth dynamics rather than long-run cointegration relationships in levels.

4.1. Measurement of Regulatory Volatility

Regulatory volatility is measured using rolling five-year standard deviations of the Regulatory Quality indicator from the Worldwide Governance Indicators. Formally:

$$Volatility_{it}^{RQ} = SD\left(RQ_{i,t-4}, \ldots, RQ_{i,t}\right) \quad (2)$$

where RQ denotes the Regulatory Quality score from the WGI database.

As defined in Equation (2), the rolling-window construction ensures that volatility varies within countries over time and avoids forward-looking bias. Unlike full-sample dispersion measures, this approach preserves within-country variation and allows identification through fixed-effects estimation.

It is important to clarify that the volatility measure captures dispersion in regulatory quality irrespective of direction. The standard deviation does not distinguish between positive reform-driven adjustments and destabilizing policy reversals; rather, it reflects the overall variability of regulatory performance over time. Consequently, regulatory volatility should be interpreted as a proxy for instability in policy predictability and institutional consistency rather than as a normative measure of institutional deterioration. In transition contexts, volatility may partly reflect reform dynamics, whereas in mature institutional environments it may signal regulatory uncertainty. This distinction is explicitly considered in the interpretation of the results. Regulatory volatility should therefore be interpreted as instability in regulatory predictability rather than as institutional weakness per se.

4.2. Modeling Regional Heterogeneity

To assess whether the growth effects of regulatory volatility differ across institutional development stages, the baseline model is augmented with an interaction term:

$$GDP\_growth_{it} = \alpha_i + \beta_1 \ln(GDP_{i,t-1}) + \beta_2 Volatility_{it}^{RQ} + \beta_3 \left(Volatility_{it}^{RQ} \times Balkans_i \right) + \gamma X_{it} + \varepsilon_{it} \quad (3)$$

In Equation (3):

$Balkans_i$ is a dummy variable equal to one for Western Balkan economies and zero otherwise. This specification allows the association between regulatory volatility and growth to differ between mature EU economies and transition economies.

4.3. Estimation Strategy

Because regulatory volatility is time-varying by construction, the primary estimation approach relies on fixed-effects (within) estimators. The fixed-effects specification controls for unobserved, time-invariant country characteristics that may be correlated with institutional variables, such as historical legacies, geographic factors, or deep structural features.

The appropriateness of fixed effects over random effects is formally evaluated using the Hausman test, which strongly rejects the random-effects specification. Consequently, fixed-effects models are treated as the baseline.

Given the high degree of economic integration across European economies, cross-sectional dependence is explicitly tested using Pesaran's CD test. The null hypothesis of cross-sectional independence is rejected, indicating the presence of common shocks or spillover effects. To address this issue, statistical inference is conducted using Driscoll–Kraay standard errors, which are robust to heteroskedasticity, serial correlation, and cross-sectional dependence.

This estimation strategy allows identification to rely on within-country temporal variation while accounting for regional interdependence.

4.4. Interpretation and Economic Magnitude

The coefficient on regulatory volatility captures the association between changes in institutional stability and economic growth within countries over time. A negative estimate implies that increases in regulatory volatility are associated with lower subsequent growth.

To assess economic magnitude, the effect of a one standard deviation increase in regulatory volatility is calculated. The estimates indicate that such an increase is associated with a reduction of approximately 0.5 percentage points in annual per capita growth within the broader European sample.

4.5. Endogeneity Considerations

While fixed effects mitigate bias arising from time-invariant omitted variables, potential reverse causality cannot be entirely ruled out. Regulatory volatility may partly reflect

responses to economic shocks or reform cycles. Accordingly, the results are interpreted as conditional associations rather than definitive causal effects.

5. Results

5.1. Descriptive Overview of Variables

Table 1 reports summary statistics for the main variables included in the empirical analysis. The average annual real GDP per capita growth rate in the sample is 2.16 percent, with a standard deviation of 4.04 percent, indicating substantial cross-country and temporal variation. The minimum value (−16.6 percent) corresponds to severe contraction episodes during crisis years, reflecting the macroeconomic volatility experienced in Europe over the sample period.

Table 1. Descriptive statistics.

Variable	Mean	Std. Dev.	Min	Max
GDP_growth_rate	0.0216	0.0404	−0.166	0.158
ln_GDP_lag	9.872	0.578	7.851	11.630
sd5_RQ	0.045	0.044	0.000	0.210
CapitalFormation	22.9	4.8	11.0	35.0
Edu_Tertiary	22.1	8.7	8.0	52.0
TradeOpen	119.2	39.5	41.6	412.2

Notes: The table reports summary statistics for the main variables used in the empirical analysis. GDP_growth_rate denotes the annual real GDP per capita growth rate. ln_GDP_lag represents the natural logarithm of lagged real GDP per capita. sd5_RQ is the rolling five-year standard deviation of the Regulatory Quality indicator from the Worldwide Governance Indicators (WGI). CapitalFormation is gross capital formation as a percentage of GDP. Edu_Tertiary measures tertiary education attainment. TradeOpen is defined as the sum of exports and imports as a percentage of GDP. The final sample consists of 359 country-year observations in an unbalanced panel.

The rolling five-year measure of regulatory volatility (sd5_RQ) exhibits moderate dispersion across country-year observations. This variation reflects persistent differences in regulatory stability across European economies rather than short-term fluctuations.

Lagged income displays substantial cross-country heterogeneity, consistent with the coexistence of highly developed EU core economies and lower-income transition and accession countries. Variation in trade openness and tertiary education attainment further highlights structural differences across institutional development stages.

The final estimation sample consists of 359 country-year observations in an unbalanced panel structure. The reduction from the theoretical maximum reflects the rolling volatility construction and missing values in selected macroeconomic indicators.

Additional descriptive statistics by regional group are reported in Appendix A (Table A1), highlighting systematic differences in income levels, regulatory volatility, and structural characteristics across EU Core, EU New, and Western Balkan economies.

5.2. Correlation Analysis

The correlation between lagged income and growth (−0.239, $p < 0.01$) is negative and statistically significant, consistent with unconditional convergence patterns in the raw data. Importantly, regulatory volatility exhibits a weak and statistically insignificant bivariate correlation with growth (−0.035), suggesting that its effect does not emerge mechanically from simple cross-sectional association but rather conditionally within the multivariate framework.

As reported in Table 2, the correlation matrix shows lagged income is strongly correlated with tertiary education (0.662, $p < 0.01$) and moderately correlated with trade openness (0.357, $p < 0.01$), reflecting structural differences between advanced and catching-up economies. However, variance inflation factor diagnostics indicate that multicollinearity

does not pose a severe concern in the regression analysis. Variance inflation factor (VIF) diagnostics were additionally computed for the full regression specification. All VIF values remain below conventional thresholds (VIF < 5), indicating that multicollinearity does not pose a serious concern and that the estimated coefficients can be interpreted as reflecting independent conditional associations.

Table 2. Correlation matrix.

	GDP_growth_rate	ln_GDP_lag	sd5_RQ	CapitalFormation	Edu_Tertiary	TradeOpen
GDP_growth_rate	1.000	−0.239 ***	−0.035	0.235 ***	−0.085	0.064
ln_GDP_lag	−0.239 ***	1.000	−0.013	−0.193 ***	0.662 ***	0.357 ***
sd5_RQ	−0.035	−0.013	1.000	−0.103 **	−0.051	0.008
CapitalFormation	0.235 ***	−0.193 ***	−0.103 **	1.000	0.004	−0.038
Edu_Tertiary	−0.085	0.662 ***	−0.051	0.004	1.000	0.533 ***
TradeOpen	0.064	0.357 ***	0.008	−0.038	0.533 ***	1.000

Notes: The table presents pairwise Pearson correlation coefficients. Statistical significance is indicated as follows: *** $p < 0.01$, ** $p < 0.05$. All variables are defined as in Table 1. The correlation matrix is based on the estimation sample.

5.3. Baseline Fixed-Effects Estimates

Table 3 reports the baseline fixed-effects estimates for the full sample of 32 European economies, including EU Core, EU New member states, and Western Balkan countries. The specification corresponds to Equation (1) and includes regulatory volatility and standard macroeconomic controls. All models incorporate country fixed effects and Driscoll–Kraay standard errors to account for cross-sectional dependence, heteroskedasticity, and serial correlation.

Table 3. Baseline Fixed-Effects Estimates (Full Sample: EU Core, EU New, and Western Balkans).

Variable	Coefficient	Std. Error	t-Value	*p*-Value
ln_GDP_lag	0.1102	0.0506	2.1770	0.0304
sd5_RQ	−0.1241	0.0482	−2.5737	0.0106
CapitalFormation	−0.0011	0.0010	−1.0502	0.2946
Edu_Tertiary	−0.0041	0.0017	−2.3882	0.0176
TradeOpen	0.0008	0.0002	3.3999	0.0008

Notes: The table reports fixed-effects panel regression estimates for the EU sample. The dependent variable is annual real GDP per capita growth. All models include country fixed effects. Driscoll–Kraay standard errors, robust to heteroskedasticity, serial correlation, and cross-sectional dependence, are reported in parentheses.

The Hausman test strongly rejects the random-effects specification ($\chi^2 = 88.185$, $p < 0.001$), confirming that fixed effects provide consistent estimates in the presence of correlation between country-specific effects and regressors. Accordingly, the fixed-effects estimator is treated as the baseline identification strategy throughout the analysis.

Turning to the estimated coefficients, the coefficient on lagged income is positive and statistically significant, indicating divergence within the sample period when conditioning on institutional and structural characteristics.

The coefficient on lagged income is positive and statistically significant, indicating divergence within the sample period when conditioning on institutional and structural characteristics. This suggests that higher-income economies maintained relatively stronger growth performance over the observed period.

Turning to the central variable of interest, regulatory volatility (sd5_RQ) exhibits a negative and statistically significant association with economic growth ($\beta = -0.124$, $p < 0.05$). This implies that increases in regulatory instability are associated with lower subsequent growth within countries over time. The result is consistent with the interpretation that

frequent rule changes and policy uncertainty may constrain investment and productivity dynamics in mature institutional environments.

Among control variables, trade openness is positively and statistically significantly associated with growth, while tertiary education enters with a negative coefficient. Gross capital formation does not display a statistically significant independent association once country fixed effects are included.

5.4. Regional Heterogeneity

To assess whether the association between regulatory volatility and growth differs across institutional development stages, Table 4 introduces an interaction term between regulatory volatility and a Western Balkans dummy variable.

Table 4. Fixed-Effects with Regional Interaction.

Variable	Coefficient	Std. Error	t-Value	*p*-Value
ln_GDP_lag	0.1114	0.0472	2.3586	0.0189
sd5_RQ	−0.1194	0.0489	−2.4394	0.0153
sd5_RQ × Balkans	0.2323	0.0964	2.4101	0.0165
CapitalFormation	−0.0009	0.0011	−0.8711	0.3843
Edu_Tertiary	−0.0045	0.0019	−2.4113	0.0165
TradeOpen	0.0009	0.0003	3.0291	0.0027

Notes: The table extends the baseline specification by including an interaction term between regulatory volatility (sd5_RQ) and a Western Balkans dummy variable. The baseline coefficient for sd5_RQ captures the effect for EU economies, while the interaction term reflects the differential association for Western Balkan countries. All models include country fixed effects and Driscoll–Kraay standard errors.

In this specification, the baseline coefficient for regulatory volatility applies to EU Core and EU New member states, while the interaction term captures the differential effect for Western Balkan economies. This structure allows direct comparison between mature EU institutional environments and transition contexts, clarifying how the growth–volatility relationship varies across stages of institutional development.

The baseline coefficient for regulatory volatility—capturing EU Core and EU New Member States—remains negative and statistically significant. The interaction term is positive and statistically significant ($\beta = 0.232$, $p < 0.05$), indicating that the association differs in Western Balkan economies.

The combined marginal effect for Western Balkan countries suggests that regulatory volatility does not exert the same adverse association observed in more mature EU economies. This pattern is consistent with the interpretation that institutional changes in transition contexts may reflect reform dynamics rather than destabilizing policy reversals.

These findings indicate that the growth implications of regulatory instability are heterogeneous across Europe and depend on the institutional development stage.

5.5. EU-Only Subsample Robustness

As an additional robustness check, the baseline specification is re-estimated using only EU member states (EU Core and EU New). The corresponding estimates are reported in Table 5.

The coefficient on regulatory volatility remains negative and statistically significant ($\beta = -0.124$, $p < 0.05$), with a magnitude nearly identical to the full-sample baseline model. This indicates that the main finding is not driven by the inclusion of Western Balkan economies.

The persistence of the negative association within the EU-only subsample reinforces the interpretation that regulatory instability is systematically associated with lower growth performance in mature European institutional environments.

Table 5. EU-Only Subsample Fixed-Effects Estimates.

Variable	Coefficient	Std. Error	t-Value	*p*-Value
ln_GDP_lag	0.1102	0.0506	2.1770	0.0304
sd5_RQ	−0.1241	0.0482	−2.5737	0.0106
CapitalFormation	−0.0011	0.0010	−1.0502	0.2946
Edu_Tertiary	−0.0041	0.0017	−2.3882	0.0176
TradeOpen	0.0008	0.0002	3.3999	0.0008

Notes: The table reports fixed-effects estimates for EU Core and EU New member states only. Driscoll–Kraay standard errors are reported in parentheses.

5.6. Economic Magnitude

The economic relevance of the estimated coefficient is assessed by calculating the effect of a one standard deviation increase in regulatory volatility.

Given a standard deviation of 0.044 and a coefficient of approximately −0.124, a one standard deviation increase in regulatory volatility is associated with a reduction of approximately 0.5 percentage points in annual per capita growth.

Relative to the sample average growth rate of 2.16 percent, this magnitude represents a non-negligible share of annual performance, highlighting its potential macroeconomic relevance of regulatory stability.

5.7. Econometric Diagnostics

Pesaran's CD test strongly rejects the null hypothesis of cross-sectional independence ($z = 46.308$, $p < 0.001$), confirming the presence of cross-country interdependence in European growth dynamics. Accordingly, all inference relies on Driscoll–Kraay standard errors, which are robust to cross-sectional dependence, heteroskedasticity, and serial correlation. The results of the Hausman and Pesaran CD tests are reported in Table 6.

Table 6. Diagnostic Tests.

Test	Statistic	*p*-Value
Hausman Test	88.185	<0.001
Pesaran CD Test	46.308	<0.001

Notes: The Hausman test evaluates the consistency of the random-effects estimator relative to fixed effects. The Pesaran CD test assesses cross-sectional dependence in the panel. Rejection of the null hypothesis in both tests supports the use of fixed-effects estimation with Driscoll–Kraay standard errors.

The Hausman test strongly favors fixed effects over random effects, indicating that unobserved country-specific heterogeneity is correlated with the regressors. These diagnostics support the chosen estimation strategy and reinforce the credibility of the baseline results.

6. Discussion

The empirical results provide evidence that regulatory volatility is systematically associated with economic growth across European economies, although the strength and direction of this association vary across institutional development stages. Importantly, the findings do not suggest that institutional volatility universally constrains growth, but rather that its economic implications are dimension-specific and context-dependent.

The negative association between regulatory volatility and growth within EU economies is consistent with the political economy literature emphasizing the costs of policy instability and discretionary policy shifts [6,26]. It also aligns with recent European panel evidence highlighting the importance of institutional credibility and governance quality for medium-term growth dynamics [15]. At the same time, the heterogeneous effect observed in Western Balkan economies supports the interpretation that institutional

volatility in transition contexts may partly reflect reform-driven adjustment processes rather than destabilizing policy reversals [7,8]. This dual pattern reinforces the view that the economic implications of institutional instability depend on institutional maturity and development stage.

The most consistent result emerging from the analysis is the negative association between regulatory quality volatility and economic growth within EU economies. This finding is consistent with theoretical arguments emphasizing the importance of policy predictability and regulatory credibility for investment decisions and long-term productivity dynamics. Frequent regulatory changes, policy reversals, or inconsistent enforcement may increase uncertainty, raise transaction costs, and delay private investment. In mature institutional systems, where baseline governance quality is relatively high, instability in regulatory frameworks may therefore represent a significant source of growth friction.

By contrast, the heterogeneous effects identified for Western Balkan economies suggest a more nuanced interpretation. In transition and accession contexts, institutional volatility may reflect reform processes rather than institutional breakdown. Regulatory changes in such environments can be part of structural transformation and alignment with EU standards. Consequently, the growth implications of volatility may differ depending on whether institutional change represents destabilization or reform-driven adaptation.

An important implication of the results is that institutional levels and institutional stability should not be treated as interchangeable concepts. While institutional quality remains an important structural characteristic, the analysis indicates that volatility in specific governance dimensions may operate through distinct channels. The fact that only regulatory quality volatility emerges as statistically significant suggests that not all governance fluctuations carry equal economic weight. Regulatory frameworks directly shape business conditions, contract enforcement expectations, and investment planning horizons, which may explain their stronger association with growth relative to other institutional dimensions.

At the same time, the results should be interpreted with caution. The identification strategy relies on within-country variation in a rolling volatility measure and does not eliminate all potential endogeneity concerns. Institutional instability may itself be influenced by economic shocks, reform cycles, or broader political dynamics. Although fixed effects and robust standard errors mitigate several econometric issues, the analysis captures conditional associations rather than definitive causal effects.

Furthermore, the magnitude of the estimated effect—approximately half a percentage point reduction in annual growth following a one standard deviation increase in regulatory volatility—should be interpreted in relative terms. While economically meaningful, this magnitude does not imply that regulatory instability alone determines growth trajectories. Rather, it represents one structural factor among many influencing long-term economic performance.

An additional consideration relates to potential measurement error in the Worldwide Governance Indicators (WGI). Governance indicators are perception-based and may contain noise or short-term fluctuations unrelated to structural institutional change. Such measurement error could attenuate coefficient estimates and contribute to selective statistical significance across governance dimensions. Moreover, the finding that regulatory volatility emerges as statistically significant while other dimensions do not may partly reflect differences in measurement precision or the stronger direct link between regulatory frameworks and investment decision-making. These factors suggest that the results should be interpreted cautiously and motivate further research using alternative institutional datasets or event-based measures of policy instability.

Overall, the findings contribute to the literature by highlighting the importance of regulatory stability as a specific dimension of institutional performance. The results suggest that sustainable convergence in Europe may depend not only on improving governance levels but also on maintaining predictable and credible regulatory environments over time.

7. Conclusions

This paper examined the relationship between institutional volatility and economic growth across 32 European economies over the period 2004–2023. By distinguishing between institutional quality and institutional stability, the analysis moved beyond conventional level-based governance indicators and focused on the dynamic dimension of institutional performance.

Using a rolling five-year measure of regulatory volatility and fixed-effects panel estimation with Driscoll–Kraay standard errors, the results indicate that volatility in regulatory quality is negatively associated with economic growth within European Union economies. In contrast, the association appears weaker and heterogeneous in Western Balkan countries, suggesting that the growth implications of institutional instability depend on the institutional development stage and reform context.

The findings suggest that not all governance fluctuations carry equal economic consequences. Among the six Worldwide Governance Indicators, regulatory volatility emerges as the only dimension consistently associated with growth outcomes. This suggests that predictability and credibility in regulatory frameworks may play a particularly important role in shaping long-term economic performance, especially in mature institutional environments.

At the same time, the results should not be interpreted as establishing definitive causal relationships. Although the empirical framework addresses cross-sectional dependence and country-specific heterogeneity, potential endogeneity and measurement limitations cannot be fully eliminated. Institutional volatility may reflect reform cycles, political transitions, or responses to economic shocks, which complicates causal interpretation.

Several limitations provide directions for future research. Firstly, alternative measures of institutional instability—such as shorter rolling windows, asymmetric volatility indicators, or event-based political instability measures—could further refine identification. Secondly, dynamic panel approaches or instrumental variable strategies may help address endogeneity more explicitly. Thirdly, future work could explore the sectoral channels through which regulatory instability affects investment, entrepreneurship, and productivity.

Overall, the analysis suggests that institutional stability—particularly in the regulatory domain—should be considered alongside governance levels when assessing long-run growth dynamics. Sustainable economic convergence in Europe may therefore depend on maintaining credible and consistent regulatory environments alongside continued improvements in institutional quality, and alongside broader structural and macroeconomic determinants of growth.

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Appendix A

Table A1. Descriptive Statistics by Regional Group.

Variable	EU Core	EU New	Western Balkan
sd5_RQ	10.80	9.67	8.53
sd5_RQ × Balkans	0.0765	0.0872	0.0848
CapitalFormation	21.9	22.3	23.9
Edu_Tertiary	27.8	22.9	13.7
TradeOpen	128.0	121.0	95.7

Notes: The table reports mean values of the main variables by regional group. EU Core includes long-standing EU members with mature institutional systems. EU New comprises post-2004 EU members and Southern European economies with later institutional consolidation. Western Balkan includes accession and candidate countries characterized by ongoing institutional transformation.

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