



## Beyond Institutional Quality: The Role of Public Governance Heterogeneity in the Economic Growth of Transition Economies

Xhemazie Ibraimi<sup>1</sup>, Besime Ziberi<sup>2\*</sup>, Donat Rexha<sup>3</sup>, Adelina Gashi<sup>2</sup>

<sup>1</sup> Faculty of Public Administration, AAB College, Pristina 10000, Kosovo

<sup>2</sup> Faculty of Economics, AAB College, Pristina 10000, Kosovo

<sup>3</sup> Faculty of International Business Management, International Business College Mitrovica (IBCM), Mitrovica 40000, Kosovo

Corresponding Author Email: [besime.ziberi@aab-edu.net](mailto:besime.ziberi@aab-edu.net)

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### ABSTRACT

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*institutional quality, public governance heterogeneity, economic growth, transition economies, fixed effects model, corruption control, regulatory quality, macroeconomic stability, renewable energy, green growth*

This study investigates the association among institutional quality, governance heterogeneity, macroeconomic variables and environmental determinants with economic growth across a panel of transition economies, including Kosovo, Albania, Bosnia and Herzegovina, North Macedonia, Serbia, Montenegro, Moldova, Ukraine, Georgia, Armenia, and Azerbaijan for the period 2000 to 2024. The study uses an empirical approach where panel data methods are used. These methods include pooled Ordinary Least Squares (OLS), fixed-effect (FE), random effect (RE), and correlated random effects (Mundlak). Moreover, a dynamic panel data method with the system Generalized Method of Moments (GMM) estimator is used as a robustness test. The regression analysis demonstrates that inflation significantly affects economic growth in a negative manner, regardless of the specification chosen. Of all the institutional indicators analyzed, regulatory quality proves to be the most influential and consistent indicator; it has a positive impact on economic growth. On the contrary, other measures of governance display considerable instability due to high multicollinearity. Foreign direct investment (FDI) impacts the dependent variable positively, yet not significantly enough, and trade openness plays a role only in within-country estimation. Furthermore, the high level of specification sensitivity is demonstrated by renewable energy consumption. This measure displays a significant yet negative correlation with economic growth in OLS and RE models, but turns out positive in FE and Mundlak models. According to the study, there is a positive relationship of the indicator under consideration with economic growth when the country in question is concerned, but a negative relationship between countries. The results emphasize the need for separating within-country effects from across-country comparisons and the model's specification sensitivity. The GMM findings generally confirm the primary results; however, the findings should be cautiously treated due to the small cross-sectional size of the data set. This means that the policy outcome may depend on the reason behind the change—a difference between nations or a change within one country. From a policy standpoint, the renewable energy consumption policies may result in differential economic growth among countries and need to be adapted according to their development stages. Overall, the study confirms that the quality of institutions plays an important role in economic growth, although its effect varies across different aspects of governance. Consequently, policy actions should focus on institutional reforms in areas such as the quality of regulation and corruption control. The findings suggest that economic growth in transition economies is not explained by aggregate institutional averages and capital inflows but rather by targeted institutional policy actions in governance, macroeconomic stability, and structural change towards renewable energy sources. The study also stresses the need to account for institutional quality aggregates and unobservable heterogeneity in assessing the institutional foundation of sustainable economic growth.

## 1. INTRODUCTION

Institutional quality is seen as one of the most important factors in the determination of economic growth and development [1]. Good systems of governance assist in the development of a stable environment, making it easier for the economy to allocate resources in the most efficient manner [2].

Evidence of the positive effects of good systems of governance has been provided by various researchers, who have indicated that nations with good systems of governance achieve higher rates of economic growth [3]. However, recent research has indicated the importance of going beyond the measurement of overall institutional quality, as the effects of individual dimensions of good systems of governance vary [4].

Moreover, macroeconomic stability, including low inflation, is important in sustaining economic growth [5]. The importance of renewable energy also indicates the development of more sustainable patterns of development and green [6]. The need to shift toward a green economy has become one of the most important topics in policy-making today, especially concerning developing nations where the environmental challenge is growing. It should be noted that, based on the Environmental Kuznets Curve approach, the impact of economic growth on environmental performance is nonlinear; thus, green policies must be adapted to different development levels [7]. Additionally, the institutional quality is considered to be beneficial to the effectiveness of the application of macroeconomic policies, particularly when the economy is faced with conditions of uncertainty [8, 9]. In addition, Ibraimi et al. [10] found that institutional quality is essential in determining the economy's performance, especially in emerging economies. Poor governance and political intervention in government-owned corporations lead to market distortion and hinder investments, hence inhibiting economic growth. High levels of corruption in the critical public agencies hinder the rule of law and constitute a significant hindrance to sustainable economic growth [11].

Bayar [4] analysed the influence of openness and economic freedom on economic growth in the European Union transition countries from 1996 through 2012 through panel data modelling. In this case, the dependent variable is growth in per capita GDP, while explanatory variables consist of economic freedom, trade openness (exports and imports as a proportion of GDP), and financial openness (Chinn-Ito index). From the obtained empirical results, it is possible to conclude that economic freedom and trade openness have a significant effect on the increase in economic growth in the long term, while financial openness has a negative impact. Thus, it turns out that economic freedom and trade openness positively influence economic growth, but financial openness can lead to negative effects due to the underdeveloped financial sector.

Beck and Laeven [12] investigated the link between institutional development and economic growth in transitional countries, following the institutional economics approach, where institutions are regarded as critical forces for determining the economic performance of firms and states, arguing that the formation of institutional development depends on structural and historical variables. The empirical model analyzes transition countries from Central and Eastern Europe and the former USSR during the period of 1992-2004. The development of institutions is calculated via composite measures of governance, such as rule of law, control of corruption, government effectiveness, and regulatory quality. Moreover, the study takes into account structural variables, such as natural resources dependence and socialism inheritance, applying them to solve endogenous issues. The results indicate a significant positive relationship between institutional development and economic growth, as well as a negative effect of natural resources dependence and socialism inheritance on institutional development. In addition, Makreshanska-Mladenovska and Petrevski [13] studied the decentralization and government size in the case of Europe countries. The author uses a sample of 30 countries for the period 2005 to 2011. The measures of regulation were calculated based on the World Bank Doing Business indicators, which include firm establishment, construction licensing, financial access, investor rights, taxation, trade, contracts, and insolvency. The measure of institutional quality

was computed using governance indicators based on Freedom House data. The other control variables are growth rate of GDP per capita, inflation, trade openness, government spending, and the size of the informal sector. It turns out that regulation in itself does not have any significant effect on economic performance unless it is complemented by high-quality institutional governance. In combination with good institutions, business-oriented regulation has a positive effect on economic growth and decreases the size of the informal sector. This influence takes place through two channels: a direct effect via firm formation and production growth and an indirect effect via the process of informal economic activity legalization.

Beyond the literature evidence, this study builds upon existing research by using an additional empirical methodology that relies on an unbiased panel database for 11 transition countries in South-Eastern Europe and post-Soviet states during the years between 2000 and 2024, including Kosovo, Albania, Bosnia and Herzegovina, North Macedonia, Serbia, Montenegro, Moldova, Ukraine, Georgia, Armenia, and Azerbaijan. The study addresses variables such as the rule of law, control of corruption, government effectiveness, and regulatory quality among other macroeconomic variables such as inflation, gross capital formation (GCF), foreign direct investment (FDI), trade openness, and also includes a variable representative of the green economy, specifically renewable energy, as a proxy for the green transition. This study accounts for these factors in a country-by-country assessment of the relationship between institutions and economic growth.

However, existing studies highlight the significance of institutional quality, openness, and regulation in affecting the economic growth of transitional countries [4, 12, 13], yet most of these works are based on aggregate measures and use data from older periods with wider samples. On the other hand, this study contributes to the body of knowledge in several aspects. This study considers a relatively recent sample consisting of 11 transition countries during 2000 to 2024. Furthermore, it includes renewable energy in the institutional-growth relationship. The study further utilizes disaggregated measures by investigating governance aspects like rule of law, control of corruption, government effectiveness, and regulatory quality instead of aggregated indices. Such an approach provides new insights into the structural factors that affect economic growth in transitional countries.

Although the significance of institutional quality to economic growth is no longer controversial, the current literature faces a few limitations. Most of the existing research is based on aggregate governance indicators, which may not allow the identification of the possibly heterogeneous impact of each dimension of institutional quality on economic outcomes. In fact, the contribution of some of the most relevant dimensions of governance, such as the rule of law, control of corruption, government effectiveness, and regulatory quality, to economic outcomes in the context of transition economies is still little explored. Furthermore, the significance of macroeconomic stability to economic growth is no longer controversial; the interaction between institutional quality and macroeconomic stability is usually simplified without taking into account the dynamic nature of such relationships. Moreover, with the increasing focus on sustainable development, new dimensions to economic growth have been added, like the role of renewable energy and structural transformation. However, their integration with institutional factors is still limited, particularly in empirical

studies on transition economies. Another significant shortcoming of existing literature lies in methodological approaches, where the impact of country-specific heterogeneity is not properly controlled in many studies. In light of the above, it should be mentioned that the specific study makes the following important contributions to the existing literature: This study goes beyond the aggregated analysis of the effects of various indicators by focusing on the disaggregated results of the governance indicators, thereby offering a more nuanced analysis of the heterogeneity of institutions. The study includes important macroeconomic and structural factors, including inflation and renewable energy, in order to account for the stability and sustainability aspects of economic growth. Furthermore, employing panel data analysis, accounting for specific country effects, adds robustness to the results of the analysis.

The relationship between economic growth and the quality/structure of institutional frameworks still remains strong in transition economies. Although most of the literature on this issue has extensively discussed the role of the quality of institutions in economic development, it should be noticed that most of these findings are derived from data on aggregate indices of institutional quality, which generally refer to a composite indicator of various dimensions of governance. This does not allow us to consider the various transmission mechanisms of individual dimensions of governance, which could influence economic performance. The emphasis of the transition economies, with their structural reforms, changing regulatory environment, and institutional restructuring, may be placed on the heterogeneity of the dimensions of governance rather than the averages. This study moves beyond the general issue of institutional quality to address the issue of whether aspects of governance have differential impacts on economic growth in a sustainable manner. The transition economies represent a fascinating context for testing this issue, especially in the context of the uneven reforms that have often been undertaken in these economies in terms of their impacts on regulatory quality, control of corruption, rule of law, and government effectiveness. The research uses a panel data approach for ten transition economies over the period from 2000 to 2024. The research uses a range of approaches, which include a pooled Ordinary Least Squares (OLS), random effects (RE), and a fixed effect (FE) approach with clustered standard errors. The FE model indicates the role of institutional heterogeneity. The research establishes significant and positive relationships between improvements in controlling corruption and economic growth. The research establishes significant and positive relationships between improvements in regulatory quality and economic growth. The research indicates that the use of aggregated indicators to measure the role of institutions does not find these channels. The research indicates that macroeconomic stability, as represented by inflation rates, is significant and negative in determining economic growth.

The study reveals that there is a significant positive link between the supply of renewable energy and economic performance. The emphasis placed by the research on the heterogeneity rather than the averages of institutions is considered to have contributed to the literature on the growth of institutions in three ways. These include the empirical evidence regarding the asymmetric effects of the disaggregated components of governance on growth paths, the necessity to take into account the country-specific heterogeneity in the analysis of institutions, and the integration

of institutional reforms and structural green transformation into the growth pattern in transition economies.

The research framework provided in Table 1 illustrates the objectives, research questions, and hypotheses of the study. The primary objective of the study is to offer a holistic approach in understanding the interrelationship between the quality of governance, macroeconomic environment, and sustainable economic growth in transitional economies. Further, the study attempts to transcend the commonly adopted macro-level approach of measuring the quality of institutions by employing disaggregated measures of good governance, thereby allowing researchers to establish heterogeneous effects, including non-linear effects, of various aspects of good governance.

**Table 1.** Research objectives, research questions and hypotheses

Component	Description
Objective 1	To test the hypothesis that the effect of disaggregated governance indicators on economic growth may be non-linear in transition economies.
Objective 2	To examine whether macroeconomic stability and structural factors, particularly inflation and renewable energy expansion, significantly influence sustainable economic growth dynamics.
Objective 3	To assess whether the fixed-effects model provides more reliable estimates compared to pooled OLS and random-effects models.
RQ1	Do individual dimensions of governance affect economic growth differently in transition economies?
RQ2	How do macroeconomic stability and renewable energy transformation influence economic growth over time across countries?
RQ3	Does controlling for unobserved country-specific heterogeneity alter the estimated effects of institutional variables on economic growth?
H1	Disaggregated governance dimensions have heterogeneous effects on economic growth, with control of corruption exerting a positive and statistically significant impact.
H2	Macroeconomic instability, proxied by inflation, negatively affects economic growth in transition economies.
H3	Renewable energy expansion positively contributes to economic growth in transition economies when country-specific heterogeneity is controlled for.

The first objective of the study attempts to address the extent to which individual aspects of good governance have differential effects on economic growth, thereby capturing the complex nature of institutional effectiveness in transitional economies. This is further extended by the first research question, which attempts to explore the extent to which individual aspects of good governance, including controlling corruption, rule of law, and government effectiveness, influence economic growth in a differential manner. The second objective focuses on the importance of macroeconomic stability and structural change, especially the impact of inflation and the expansion of renewable energy, on the path of sustained economic growth. This is in line with the second research question, which investigates the contribution of these variables to economic performance over time and across countries. By incorporating the expansion of renewable energy

into the model, the study extends the traditional growth model to include the dimension of sustainability.

The third objective is methodologically oriented, seeking to test whether controlling for unobserved country-specific heterogeneity enhances the robustness of the findings. This is achieved by the third research question, which compares the relative significance of the FE model to the pooled and random-effects models. Based on the formulated objectives and research questions, the study derives three hypotheses. The study hypothesizes that the disaggregated indicators of economic governance would have heterogeneous impacts on economic growth, with the control of corruption having a particularly significant impact. In addition, the study hypothesizes that macroeconomic instability, as captured by inflation, would negatively impact economic growth. The study hypothesizes that the expansion of renewable energy would positively contribute to economic growth, subject to the control for heterogeneity. The hypotheses provide a coherent framework for empirically investigating the multifaceted determinants of sustainable economic growth in transition economies.

## 2. LITERATURE REVIEW

The impact of institutional quality on the overall economic performance of a nation has been a key area of study under the broader framework of growth theory. While the traditional neoclassical models have largely focused on capital accumulation and labor as the driving forces of economic growth, the modern theories have placed a strong emphasis on the quality of institutions in the overall framework of economic growth. In their study, Acemoglu et al. [14] have pointed out that the quality of institutions, especially in the context of property rights and the regulation of rent-seeking behavior, is a fundamental factor in the context of economic growth. The empirical literature has attempted to measure institutional quality through composite indicators; the most prominent one is the Worldwide Governance Indicators (WGI) proposed by Kaufmann et al. [15]. This indicator, which covers dimensions like rule of law, control of corruption, government effectiveness, and regulatory quality, has become a widely accepted practice in cross-country growth regressions. The literature has established a positive relationship between institutional quality and economic growth. For example, Cooray [16] established that better governance leads to higher productivity of expenditure, while Méndez-Picazo et al. [17] highlighted that development in institutional quality contributes significantly to economic performance.

Kida et al. [18] found that foreign imports and domestic consumption significantly influence the GDP growth rate of Kosovo. Nevertheless, recent literature suggests that the reliance on aggregated institutional measures may conceal the underlying heterogeneity of the dimensions of governance. In this respect, the analysis of individual components allows for a more nuanced comprehension of the impact of particular institutional mechanisms on growth. In a study of the European transition economies, Bayar [4] conducted a panel analysis, which revealed that the majority of the governance measures have a significant impact on GDP growth; however, the significance of the measures differs. In particular, the rule of law and control of corruption have the most significant impact, whereas the impact of regulatory quality is less

significant. This heterogeneity is further supported by more recent empirical contributions. In fact, in her recent contribution, Azimi [19] showed the presence of a long-run relationship between governance and economic growth, but she stresses the complexity of the interaction between the various components of good governance. Moreover, it has also been found that the effects of good governance could vary according to the degree of development of the economy, the level of institutional development, and macroeconomic stability. Among the different aspects of governance, the issue of corruption has attracted much attention in the literature. In this context, the study of Mauro [20] proves the adverse impact of corruption on investment and economic growth. In particular, it is argued that the adverse impact of corruption on the economy stems from the distortion of the allocation of resources and the resulting uncertainty. In a subsequent study, Mo [21] quantified the impact of corruption on the economy, proving that it affects economic growth both directly and indirectly through political instability. In a more recent study, Gründler and Potrafke [9] verified the consistency of the above results using different datasets. In the meantime, the role of government effectiveness and quality of regulation has also been recognized as important mechanisms through which institutions affect the economy. Government effectiveness refers to the quality of public services, whereas the quality of regulation refers to the capacity of governments to formulate sound policies conducive to private sector development. Gani [22] and Fayissa and Nsiah [23] have established the significance of effective governance in boosting economic growth, especially in developing economies. Nevertheless, the empirical evidence regarding the impact of RQ is inconclusive, especially in the context of transition economies. This implies that the impact of institutional reforms may be lagging. Thus, the need for a separate analysis of each component of governance, rather than a composite index, becomes evident. Besides the institutional factors, the broader macroeconomic environment is also of great importance in the analysis of growth dynamics. In this context, the following macroeconomic factors have been recognized as important determinants of economic growth: FDI, GCF, trade openness, and inflation. Among these factors, it is evident that the effectiveness of the above factors depends on the quality of governance. In this context, the study conducted by Njangang and Nawo [24] clearly proves that good governance augments the effectiveness of FDI in promoting economic growth. Thus, FDI plays an important role in economic growth of transition economies, provided that there is a strong framework in place to support this process. According to Ibraimi et al. [25], Western Balkan economies have been able to decrease corruption and enhance the environment for FDI due to efficient FDI legislation and the rule of law. In addition, empirical research conducted on the Western Balkan states shows that macroeconomic variables like remittances, FDI, and corruption significantly influence economic growth. Particularly, combating corruption and efficient management of foreign funds are crucial for ensuring economic growth in developing economies [26].

According to Fetai et al. [27], FDI, domestic credit, and savings increase economic growth, while corruption, unemployment, and government consumption reduce economic growth in the Western Balkans. Moreover, Kida et al. [28] established that market size and lower cost of conducting business have strong influences on FDI.

More recently, the literature has expanded to include

sustainability aspects, which have linked governance with environmental and energy-related outcomes. Effective institutions are critical in implementing environmental policies, encouraging the use of renewable energy, and fostering sustainable resource use. Emerging literature shows that effective governance has a positive effect on sustainable and inclusive growth, while macroeconomic volatility and environmental damage have negative effects. This approach is of particular interest in the context of transition economies, as they are characterized by institutional weakness, reform processes, and substantial structural changes.

However, there are still some gaps in the literature. Firstly, the majority of the literature focuses on aggregated measures of governance, and there is a possibility that the individual impacts of different dimensions of institutions might be neglected. Secondly, there is a scarcity of literature that focuses on the group of economies in transition, especially in the context of sustainability and energy transitions. Thirdly, the relationship between the heterogeneity of governance and macroeconomic variables has not been explored extensively in the literature. In the context of the above, the present study contributes to the literature by moving beyond aggregated measures of institutional quality and exploring the heterogeneous impacts of different dimensions of governance on economic growth. In addition, the study focuses on the economies in transition and includes variables related to sustainability, such as renewable energy.

In the recent literature, there has been a growing emphasis on the significance of the quality of institutions in bolstering the efficacy of macroeconomic policies and promoting sustained economic growth. In a comprehensive study on the case of Thailand, Pastpipatkul and Ko [8] empirically investigated the moderating effect of the quality of institutions on the interrelation between fiscal and monetary policies and economic growth, covering the period from 2003 to 2023. By employing state-of-the-art econometric techniques, such as BART and time-varying SUR models, the authors reveal the crucial role played by certain dimensions of governance, such as voice and accountability and control of corruption, in the macroeconomic process. The study indicates that not only do robust institutions amplify the impact of macroeconomic policies, such as interest rates and export growth, but they also neutralize the adverse impacts of variables like household debt and energy. In addition, the study reveals that the efficacy of monetary policies is heavily contingent upon the quality of institutions, although the same does not hold true for fiscal policies, whose impact is neutral in the absence of robust institutions.

At the firm level, the relationship between institutional quality and growth dynamics seems to be more complex and nonlinear. In their recent research on the impact of institutional quality on sustainable firm growth in the context of North African countries, Abozeid et al. [29] used a system Generalized Method of Moments (GMM) estimator to analyze the effect of institutional quality on firm growth using panel data from non-financial firms in Egypt, Morocco, and Tunisia. The results of the study indicate the existence of a nonlinear relationship between institutional quality and firm growth, which can be described as a U-shaped curve. In other words, the authors show that institutional environments with low or very high institutional quality can be detrimental to firm growth. On the contrary, the study finds that the optimal institutional quality is beneficial to firm growth as it creates transparency and reduces uncertainty, which can promote

sustainable firm growth.

The interrelation between the quality of institutions and the development of the financial sector has been seen to be a very crucial factor for the attainment of sustainable economic growth, especially for emerging economies. In their study on the South Asian economies, Ahmed et al. [6] examined the long-run interrelation between the quality of institutions, the development of the financial sector, and green growth for the period from 2000 to 2018. The authors, by applying panel cointegration tests like the Pedroni, Kao, and Westerlund tests, along with the estimation of the FMOLS and DOLS methods, confirmed the strong interrelation among the variables. The findings of the study confirmed the crucial role played by the quality of institutions and the development of the financial sector in the attainment of economic growth, especially the sustainable type. The study further confirmed the crucial role played by the quality of institutions in the attainment of the efficiency of the financial sector, thus promoting the attainment of green growth.

Moreover, the evidence from the advanced and emerging economies supports the long-run significance of the quality of governance in determining the economic growth path. In a recent study, Küçükçolak et al. [30] investigated the impact of the quality of governance on economic growth in G7 and E7 economies during the period from 2002 to 2023. Applying advanced panel econometric methods, namely VECM, AMG, and CCEMG estimators, the study finds the existence of a long-run stable relationship between the quality of governance and economic growth in the G7 and E7 economies. However, the rate of adjustment towards the long-run equilibrium is much faster in the G7 economies than in the E7 economies. Among the dimensions of the quality of governance, the rule of law and regulatory quality play a crucial role in determining the economic growth path. In contrast, the lack of accountability acts as a barrier to economic growth, especially in the emerging markets. The empirical evidence from the transition economies clearly underscores the significance of governance quality as a major factor for economic growth. Bayar [4] explored the role of six indicators of governance, using a panel study design, with a specific focus on the transition economies from the European Union. The empirical analysis is conducted over the period 2002–2013. The results clearly reveal that all aspects of governance, except for regulatory quality, have a statistically significant positive influence on economic growth. Moreover, control of corruption and rule of law emerge as the most significant factors, suggesting that institutional mechanisms to curb rent-seeking behaviour and provide a rule of law, respectively, play a vital role in economic growth. On the other hand, political stability, though positive, is found to have a relatively weaker influence. The empirical analysis thus underscores the heterogeneous role of governance indicators, which can provide more precise findings regarding the governance and growth linkages, particularly for transition economies, which face structural and institutional change. The role of institutional quality in resource-rich economies also adds further layers of complexity, especially in relation to economic diversification beyond resource-based sectors. In their research on the case of Azerbaijan, Seyfullayev and Cak [31] investigated the role of institutional quality on economic growth in non-oil sectors using an ARDL bounds testing model over the period 1996 to 2022. The results show that regulatory quality has a strong and significant impact on economic growth in non-oil sectors in both short and long run

horizons, underscoring the need for effective regulatory environments to foster economic diversification in resource-dependent economies. However, government effectiveness does not show a statistically significant relationship with economic growth, underscoring that not all dimensions of institutional quality may equally contribute to economic performance. The relationship between institutional quality and economic growth is particularly evident in countries in the process of structural transformations and integration. Such countries include those involved in the European Neighbourhood Policy (ENP). Bartlett et al. [32] focused on assessing the role of institutional reforms and convergence towards European Union norms on economic growth in ENP countries. The study revealed that institutional reforms have a positive effect on economic growth, but the level of convergence towards European Union norms is lower compared to candidate countries. Of particular interest is the study's revelation on the need to focus on critical aspects of governance in achieving economic growth. Political stability, government accountability, media freedom, and control of corruption are critical aspects of institutional quality that need attention in implementing economic policies. However, the study revealed an interesting aspect on the need to understand that institutional reforms alone cannot achieve the intended results. For instance, institutional reforms need to be complemented by societal institutional changes. Situations where institutional changes occur faster than societal institutional changes may result in corruption and political instability.

### 3. RESEARCH METHODOLOGY

This study uses a quantitative empirical method to investigate the relationship between macroeconomic, institutional, and environmental determinants and economic growth in a panel of transition economies for period 2000 to 2024. The research relies on a balanced panel data set and uses various regression methods in order to achieve robust and reliable outcomes. Namely, it employs pooled OLS, FE, RE, and correlated RE (Mundlak model) specifications, controlling for time FE. The Mundlak model is applied in order to control for possible correlation between regressors and country-specific effects by decomposing the total effect into within-country and between-country parts. Besides, several tests are run to ensure robustness, such as checking multicollinearity through VIFs, alternative specifications of the model, and even dynamic panel regression (system GMM), which is presented in the Appendix.

#### 3.1 Research design and data structure

The empirical model is specified to capture heterogeneous effects across governance variables rather than nonlinear relationships. Because of missing data for some variables, the FE estimation utilizes a smaller sample with 10 countries. The entire data set and missing values are provided in Table A1. By employing a panel data method, we take advantage of cross-sectional as well as time-series variation in the data, thus increasing the efficiency of the estimation. This study analyzes the eleven economies from Southeast Europe and the post-Soviet territory from 2000 to 2024 including Kosovo, Albania, Bosnia and Herzegovina, North Macedonia, Serbia, Montenegro, Moldova, Ukraine, Georgia, Armenia, and Azerbaijan. The sample of the paper is neither accidental nor

geographically random; it is theoretically and empirically selected by the shared history of the sample economies. The selected countries under investigation sign economic development from a centrally planned system of economy and moved towards a market-oriented structure during the post-socialist transformation period. Although all of them share a similar starting point, the extent, pace, and order of institutional reform implementation have varied significantly among them. This makes it a highly suitable empirical environment for analyzing the heterogeneous effects of institutional quality on sustainable economic growth.

The countries under investigation are heterogeneous in terms of various aspects of institutional quality, including rule of law, control of corruption, government effectiveness, and regulatory quality. For instance, while some of them, like Georgia, show significant improvements in institutional quality as a result of reform implementation, others show more gradual or even inconsistent progress in institutional reform implementation. Economies like Azerbaijan, which are heavily reliant on natural resources, show strong growth accompanied by weak institutional development, while others, like Ukraine or Bosnia and Herzegovina, are confronted with the effects of conflict or political instability. All of these are analytically interesting aspects because they allow the analysis to move beyond institutional aggregates and explore the differential functioning of various pillars of institutional quality in different transition economies.

Furthermore, the countries under investigation have varying macro-economic characteristics. Some of the economies, like Kosovo and Moldova, have economies that rely significantly on remittance income. Some of the economies, like Azerbaijan, have economies that rely significantly on natural resources. Furthermore, the Western Balkan economies, have economies that have strong trade relationships with the European Union. In addition, the period from 2000 to 2024 includes important reforms, global financial shocks, EU integration processes, energy market changes, and geopolitical disturbances. By studying the economies over a quarter of a century, it is possible to identify the short-run cyclical effects as well as the structural relationships between the quality of governance and the economies. The selected sample offers three major empirical advantages: (i) a shared post-socialist institutional baseline, (ii) substantial cross-country heterogeneity in governance development, and (iii) diverse economic structures and reform intensities. These characteristics make the sample particularly appropriate for testing whether and how different dimensions of institutional quality contribute to sustainable growth in transition economies, rather than assuming a uniform or linear institutional-growth relationship.

The data set contains annual data organized by country and year. After removing the missing data for the chosen variables, the data set contains 154 country data points, which are used for the regression model. The panel dimension has 11 cross-sectional units ( $N = 11$ ) and time dimension ( $T = 25$ ), making the data set more appropriate for fixed and RE modelling. The data set contains the annual growth in GDP ( $gdpgrowth$ ) as the dependent variable, which is a proxy for sustainable economic growth. The growth process is crucial for transition economies, where the effect of institutional reforms on economic growth is expected.

#### 3.2 Institutional quality variables

Institutional quality is represented through four dimensions

of governance such as Rule of Law, Control of Corruption, Government Effectiveness, and Regulatory Quality. These four dimensions of governance represent different but closely related dimensions of institutional quality. From a theoretical perspective, institutions can affect growth through their contribution to reducing uncertainty, strengthening the enforcement of contracts, minimizing transaction costs, and maximizing the efficiency of regulations. To mitigate the problem of multicollinearity with the institutional variables, the analysis includes a second specification with the composite institutional variable represented as the arithmetic average of the four institutional variables. This enables us to test the joint effect of institutions or their individual effects.

### 3.3 Control variables

To mitigate omitted variable bias, the model controls for a set of macroeconomic variables commonly included in growth models:

- Inflation (macroeconomic stability)
  - GCF (macroeconomic investment dynamics)
  - FDI (macroeconomic effects of external capital flows)
  - Trade Openness (macroeconomic effects of international trade)
  - Renewable Energy Share (macroeconomic effects of structural change)
- Time effects are included to absorb global shocks such as the 2008 financial crisis and the COVID-19 pandemic.

### 3.4 Econometric modelling

In view of the panel structure of the data, the following estimation approaches have been considered:

1. Pooled OLS with year FE
2. FE estimator
3. RE estimator
4. Mundlak (Correlated RE)
5. GMM (robustness)

The core empirical model is set as follows:

$$Growth_{it} = \alpha + \beta 1 Inst_{it} + \gamma' X_{it} + \delta_t + \varepsilon_{it} \quad (1)$$

where,

- $Growth_{it}$  is annual GDP growth,
- $Inst_{it}$  represents institutional variables,
- $\gamma' X_{it}$  is the vector of control variables,
- $\delta_t$  captures year-specific effects,
- $\varepsilon_{it}$  is the error term.

Panel equation:

$$gdpgrowth_{it} = \beta 0 + \beta 1 Law_{it} + \beta 2 Corr_{it} + \beta 3 Gov_{it} + \beta 4 Reg_{it} + \beta 5 Inflation_{it} + \beta 6 GCF_{it} + \beta 7 FDI_{it} + \beta 8 Trade_{it} + \beta 9 Energyren_{it} + \gamma_t + \mu_i + \varepsilon_{it} \quad (2)$$

FE equation:

$$gdpgrowth_{it} = \beta 1 Law_{it} + \beta 2 Corr_{it} + \beta 3 Gov_{it} + \beta 4 Reg_{it} + \beta 5 Inflation_{it} + \beta 6 GCF_{it} + \beta 7 FDI_{it} + \beta 8 Trade_{it} + \beta 9 Energyren_{it} + \gamma_t + \alpha_i + \varepsilon_{it} \quad (3)$$

RE equation:

$$gdpgrowth_{it} = \beta 0 + \beta 1 Law_{it} + \beta 2 Corr_{it} + \beta 3 Gov_{it} + \beta 4 Reg_{it} + \beta 5 Inflation_{it} + \beta 6 GCF_{it} + \beta 7 FDI_{it} + \beta 8 Trade_{it} + \beta 9 Energyren_{it} + \gamma_t + u_i + \varepsilon_{it} \quad (4)$$

Composite Institutional Variable:

$$Inst_{it} = (Law_{it} + Corr_{it} + Gov_{it} + Reg_{it})/4 \quad (5)$$

### 3.5 Fixed vs random effects: Model selection

In order to find the appropriate estimator, a Hausman specification test was performed. The results of the test ( $\chi^2 = 36.59$ ,  $p = 0.157$ ) show that the null hypothesis of no systematic difference between the FE estimator and the RE estimator cannot be rejected. Thus, the RE estimator is statistically admissible.

However, the nature of the independent variables as institutional factors, combined with the high probability of the presence of unobservable country-specific factors (such as historical legacies, structural reforms, or governance styles), makes the choice of the FE model as the preferred approach a reasonable one.

### 3.6 Robustness and multicollinearity

Furthermore, using Variance Inflation Factor (VIF) diagnostics, we observe that there is significant multicollinearity among institutional variables, which is a common problem with institutional data. To address this problem, we employed the following techniques:

The study constructed a composite institutional index.

The study ran alternative models using individual institutional variables.

The study used robust standard errors to correct for heteroscedasticity.

These tests enable us to establish whether growth is driven by overall institutional quality or individual institutional dimensions.

The addition of year FE substantially improves the model by accounting for global macroeconomic disturbances as well as shocks shared by all transition economies. Notice that the dummy variable for 2020 picks up the contractionary effects of the COVID-19 crisis.

In all models, heteroskedasticity-robust standard errors are employed for reliable statistical inference.

### 3.7 Methodological contribution

From a methodological point of view, this research contributes to the literature by:

- Analyzing disaggregated and aggregated institutional data;
- Comparing pooled, fixed, and RE models;
- Specifically dealing with issues of multicollinearity and robustness;

Considering a long time period: 2000 to 2024, also including post-pandemic years.

The wide-ranging econometric approach will provide greater credibility and internal validity to the results.

#### 4. RESULTS

The findings from the empirical analysis, as obtained from the results of the panel regression, are presented in this section.

The baseline model (Model 1) aims to assess the influence of individual governance indicators, which include rule of law, control of corruption, government effectiveness, and regulatory quality, on economic growth in transition economies. The inclusion of individual indicators of institutional quality enables a more nuanced evaluation of the heterogeneous effects of governance indicators on economic growth performance. The model includes a set of macroeconomic control variables, which comprise inflation, GCF, FDI, trade openness, and the share of renewable energy, to account for other important determinants of economic growth, thereby reducing the scope for endogeneity bias. Yearly FE are included to control for other time-specific shocks, which might influence economic growth, such as global financial crises and the effects of the COVID-19 pandemic. The use of robust standard errors helps to account for possible issues of heteroskedasticity, thereby ensuring the accuracy of the estimated coefficients.

Table 2 presents the findings from the pooled OLS regression model, along with the year FE and heteroskedasticity robust standard errors. The model has a relatively strong explanatory power, explaining about 59.8% of the overall variation in the annual growth rates of GDP ( $R^2 = 0.5975$ ).

**Table 2.** Estimation results – model 1 (disaggregated institutional variables)

Variables	Coefficient	Std. Error	P-Value
<b>Main Variables</b>			
Law	1.467	3.023	0.628
Corruption	-4.345	2.112	0.042**
Government	-2.996	1.709	0.082*
Regulatory Quality	8.190	2.647	0.002***
Inflation	-0.159	0.065	0.015**
GCF	-0.094	0.092	0.312
FDI	0.477	0.242	0.051*
Trade	-0.010	0.020	0.604
Renewable Energy	-0.083	0.044	0.064*
Constant	3.902	3.660	0.288
<b>Year Effects</b>			
2002	4.401	2.029	0.032**
2003	2.251	3.287	0.495
2004	1.791	2.446	0.465
2005	4.831	2.598	0.065*
2006	8.281	4.329	0.058*
2007	5.078	3.929	0.199
2008	3.026	2.000	0.133
2009	-6.352	3.539	0.075*
2010	0.338	2.431	0.890
2011	-0.843	2.303	0.715
2012	-2.502	2.497	0.318
2013	0.298	2.812	0.916
2014	-2.323	2.708	0.393
2015	-1.976	2.112	0.351
2016	-1.348	2.631	0.609
2017	-0.349	2.247	0.877
2018	0.207	2.442	0.932
2019	0.136	2.491	0.957
2020	-9.192	3.351	0.007***
2021	4.969	2.663	0.064*

Notes: Robust standard errors in parentheses.  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Observations = 154. R-squared = 0.598. Root MSE = 3.866.

The study contributes to the literature on institutional growth by breaking away from the use of aggregate indicators for institutional quality and instead emphasizing the role of heterogeneity in governance, particularly with respect to the growth of transition economies. Unlike the use of institutional quality indicators as a homogeneous concept, the findings provide evidence to support the idea that institutions influence economic growth through heterogeneous incentive systems, as argued by North [2]. The findings provide evidence to suggest that the dimension of regulatory quality is the most important factor influencing growth-enhancing factors and, as such, the major channels through which institutional reforms influence economic growth. This is supported by the idea of a multidimensional model of governance, as proposed by Kaufmann and Kraay [3], which suggests that indicators of governance reflect structurally different concepts of institutional capacity rather than a unified concept. On the other hand, the negative and marginal effects of corruption control and government effectiveness suggest that there might be some costs associated with adjustment, which could form part of the transition paths for transition economies, as suggested by the idea that institutional reforms might create some friction, as observed by Acemoglu and Robinson [1].

Based on this viewpoint, the observed heterogeneity in the process of governance may not be attributed to quality differentials but rather to the sequence of the reform path and path dependence, as observed in many transition economies. The findings appear to support the understanding of institutional reforms as non-linear processes, as observed in many transition economies, with negative effects appearing before the positive effects on economic efficiency. Furthermore, the relevance of macroeconomic stability as an additional requirement for sustainable economic growth is also recognized. The statistically significant negative coefficient on inflation is also consistent with endogenous growth models emphasizing the role of macroeconomic stability as a prerequisite for sustainable economic growth, as discussed in the study of Aghion and Howitt [33]. Although FDI is positively related to economic growth, the marginal effect of expanding renewable energy may capture the short-run structural effects of adjustment in green transition. The findings obtained in this study support Rodrik's [34] understanding that it is not the level of institutional quality but the configuration and depth of institutional reform that matters for economic development. The results from Composite Institutional Indicator (robust) – Model 2 clearly show that, whereas individual dimensions of governance have a statistically significant impact on economic growth, the aggregated index of institutions does not have a statistically significant relationship with GDP growth. This finding implies that the aggregation of individual dimensions of governance into a composite index may hide the individual and heterogeneous impacts of individual institutional dimensions.

In particular, the failure of the composite index of institutions to achieve statistical significance implies that the individual dimensions of governance do not contribute equally to the explanation of economic growth. Rather, individual institutional mechanisms play a vital role in the explanation of growth in transitional economies. This finding supports the hypothesis of heterogeneous effects of institutions.

Given the potential for multicollinearity between the individual institutional indicators, the alternative specification in Model 2 includes a composite institutional index variable calculated as the arithmetic average of the rule of law, control

of corruption, government effectiveness, and regulatory quality indicators (Table 3). From the regression results, it is evident that the composite institutional index does not have a statistically significant impact on economic growth in the sample of transition economies ( $\beta = -0.070$ ,  $p = 0.954$ ). This suggests that the quality of institutions, as a single entity, does not explain the cross-country variation in GDP growth across the sample of transition economies.

**Table 3.** Pooled regression results (composite institutional variable) – model 2

Variables	Coefficient	Std. Error	P-Value
Institutional Index	-0.070	1.208	0.954
Inflation	-0.193	0.066	0.004***
GCF	0.036	0.075	0.634
FDI	0.404	0.240	0.096*
Trade	-0.012	0.018	0.514
Renewable Energy	-0.064	0.042	0.130
Constant	5.132	3.699	0.168

Notes: Robust standard errors in parentheses.  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Observations = 154. R-squared = 0.556. Root MSE = 4.012.

This contrasts with the findings in Model 1, which identified the impact of individual institutional dimensions, namely regulatory quality and control of corruption, as statistically significant. This discrepancy between the individual and composite specification may indicate the presence of heterogeneous institutional effects, implying that not all individual institutional indicators have the same impact on economic growth. Among the control variables, inflation still shows a negative value, which is highly significant ( $\beta = -0.193$ ,  $p = 0.004$ ). This re-emphasizes the need for macroeconomic stability for sustained growth. FDI still shows a positive marginal significance ( $p = 0.096$ ), which implies that FDI is a contributor to growth, though the marginal significance is low. The year FE also validates the existence of common macro-economic shocks. In particular, the 2020 dummy still shows a strong negative value, which is statistically significant ( $\beta = -10.18$ ,  $p = 0.002$ ). This variable captures the macro-economic shock of the COVID-19 pandemic. In summary, the above analysis of Model 2 implies that institutional quality does not act as a monolithic factor in the growth of transition economies. Rather, the growth effects of institutional quality are dimension-specific.

The results of the FE estimation presented in Table 4 have given robust results on the determinants of economic growth in the transition economies. The model explains a high percentage of the variation in the growth rates of the GDP of the countries included in the study ( $R^2$  within = 0.6789). Moreover, the high value of  $\rho = 0.926$  confirms the success of the model to explain the structural differences in the growth rates of the transition economies.

Among the governance institutions, the control of corruption has a high positive coefficient on the economic growth of the transition economies ( $p = 0.008$ ). Thus, the results suggest that the anti-corruption framework is positively influencing the economic growth of the transition economies. On the other hand, the coefficient of regulatory quality is high and positive, though the results are marginally significant at 0.062. Thus, the results suggest that the positive effects of the pro-market regulatory policies on the economic growth of the transition economies are high. However, the results on the rule of law are marginally significant with a negative coefficient.

Thus, the results suggest that the effects of institutional

restructuring in the transition economies are negative in the short run. Government effectiveness does not show any statistical significance in the FE model. Macroeconomic stability appears as an essential component of growth dynamics. Inflation exerts a highly significant and negative impact on growth ( $p < 0.01$ ). This underlines the role of price stability in fostering economic growth. Trade openness exhibits a marginally significant positive impact on growth ( $p = 0.050$ ), implying that integration into world economies helps foster growth in transition economies. It is interesting to note that renewable energy expansion exhibits a strong and statistically significant positive relationship with growth ( $p = 0.005$ ), implying that the green transformation can act as a growth engine and not just a growth constraint in transition economies. Other control variables such as GCF and FDI do not seem to exert statistically significant impacts within-country. Overall, it appears that institutional quality acts through specific governance channels, while macroeconomic stability and green growth policies act as complementary factors in fostering economic growth.

**Table 4.** Fixed effects (FE) regression results (clustered standard errors)

Variables	Coefficient	Std. Error	P-Value
<b>Main Variables</b>			
Law	-9.044	4.716	0.087*
Corruption	5.330	1.554	0.008***
Government	1.791	1.459	0.251
Regulatory Quality	14.506	6.813	0.062*
Inflation	-0.225	0.030	0.000***
GCF	-0.013	0.091	0.892
FDI	0.344	0.236	0.180
Trade	0.106	0.047	0.050**
Renewable Energy	0.503	0.136	0.005***
Constant	-12.997	7.055	0.099*
<b>Year Effects</b>			
2002	5.471	2.677	0.071*
2003	6.595	3.282	0.075*
2004	8.295	3.625	0.048**
2005	8.538	3.730	0.048**
2006	5.743	4.209	0.206
2007	3.614	2.984	0.257
2008	1.100	1.899	0.576
2009	-8.348	2.525	0.009***
2010	-3.819	1.319	0.018**
2011	-4.192	1.568	0.026**
2012	-7.120	2.252	0.012**
2013	-5.276	1.637	0.010**
2014	-8.460	1.384	0.000***
2015	-7.135	1.838	0.004***
2016	-7.324	1.794	0.003***
2017	-6.614	1.702	0.004***
2018	-8.348	1.917	0.002***
2019	-8.088	1.525	0.000***
2020	-15.739	3.031	0.001***
2021	-2.983	1.621	0.099*

Notes: Robust standard errors in parentheses.  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Observations = 154; Groups = 10.  $R^2$  (within) = 0.679;  $R^2$  (between) = 0.004;  $R^2$  (overall) = 0.093.  $\sigma_u = 12.128$ ;  $\sigma_e = 3.427$ ;  $\rho = 0.926$ .

However, it seems that the FE model provides the most methodologically sound results, controlling for unobservable country-specific heterogeneity and clustering standard errors by country. Additionally, the high value of  $\rho$ , 0.926, indicates that the bulk of the variation in GDP growth can be explained by differences between countries and therefore

supports the use of the within estimator.

It seems that controlling for corruption has a strong and significant effect on economic growth, which is different from the results obtained with the pooled OLS estimator. This indicates that improvements in the quality of governance have significant growth effects when country-specific differences are properly controlled for. Regulatory quality also has a significant effect on economic growth, which is strong. The macroeconomic stability is an important variable, as the negative and highly significant effect of inflation on economic growth indicates. Trade openness and the extension of renewable energy sources have a positive effect on economic growth, as the FE model indicates. Overall, the FE model provides robust support to the hypothesis of governance heterogeneity, thus emphasizing the architecture of institutions over the averages of institutions.

The FE estimation takes into account the unobserved country-specific heterogeneity effect. The high value of the within  $R^2$  of 0.679 shows that almost 68% of the variation in the country-specific growth rates is explained by the model. Regulatory quality retains a positive coefficient value of 14.51, which is statistically almost significant at 0.062. This shows that improvements in the efficiency of regulatory quality in the country over time explain the growth rates. Control of corruption retains a positive coefficient value of 5.33, which is statistically significant at 0.008. This shows that improvements in the efficiency of control of corruption in the country over time explain the growth rates. Inflation retains a negative coefficient value with high significance at less than 0.001. Renewable energy retains a positive coefficient value of 0.503 with high significance at 0.005. A high value of rho is observed at 0.926, which shows the significance of the unobserved country-specific effects.

**Table 5.** Random effects (RE) regression results (clustered standard errors)

Variables	Coefficient	Std. Error	P-Value
Law	1.467	1.899	0.440
Corruption	-4.345	2.595	0.094*
Government	-2.996	2.076	0.149
Regulatory Quality	8.190	4.179	0.050**
Inflation	-0.159	0.060	0.008***
GCF	-0.094	0.123	0.445
FDI	0.477	0.263	0.070*
Trade	-0.010	0.020	0.605
Renewable Energy	-0.083	0.041	0.046**
Constant	3.902	2.621	0.137

Notes: Robust standard errors in parentheses.  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Observations = 154; Groups = 10.  $R^2$  (within) = 0.587;  $R^2$  (between) = 0.753;  $R^2$  (overall) = 0.598. Residual standard deviation ( $\sigma_e$ ) = 3.427.  $\rho = 0$ , indicating that the fraction of variance attributable to panel-level effects is negligible.

Year FE are included but reported in Table A2.

This is predicated on the assumption that the country-specific effects are uncorrelated with the included explanatory variables. However, as can be seen in Table 5, the results obtained differ quite divergently from the results of the FE model. In the above model, as can be seen, the significance of the regulatory quality is evident once again. In addition, the inflation variable is again negatively correlated with the dependent variable. Moreover, the renewable energy variable is also negatively correlated with the dependent variable. However, as can be seen, the significance of the corruption control variable is evident once again, though the sign changes as well. In addition, the variance component of the country-

specific effect is also zero since rho is zero as well. This is quite divergent from the results of the FE model, where the unobservable effects explained over 90% of the total variance as well. As can be seen from the results above, the results of the FE model can be relied upon to evaluate the results pertaining to the effect of institutions on economic growth in the context of the transition economies.

The RE model produces estimates of the coefficients that are generally consistent with the results of the pooled OLS model. However, the variance component estimate of the country-specific effects ( $\sigma_u$ ) is effectively zero, as is the estimate of the intraclass correlation coefficient ( $\rho$ ). This implies that the model does not assign any explanatory power to the unobserved country-specific effects. As such, the RE model converges to the results of the pooled OLS model, suggesting little gain in efficiency from the GLS transformation. In light of the significant country-specific effects detected in the FE model, the results of the RE model should be viewed with some circumspection.

The Hausman test was used to assess the suitability of one regression specification over another in terms of the FE and RE specifications (Table 6). It was found that there is no significant difference in the parameters of the two regression equations since the null hypothesis is not rejected ( $\chi^2 = 36.59$ ;  $p = 0.157$ ). However, it should be noted that even though the difference variance matrix was not positive-definite, it was used because its results are important for reporting purposes. The complete Hausman test results are presented in Figure A1.

**Table 6.** Hausman test results

Test Statistic	Value
Chi-square ( $\chi^2$ )	36.59
Degrees of freedom	29
p-value	0.157

The Hausman test does not reject the null hypothesis of no systematic differences between the fixed and RE estimators ( $\chi^2 = 36.59$ ,  $p = 0.157$ ). Since the null hypothesis is not rejected, the random-effects model is selected as appropriate. Consequently, the RE model will serve as a base, while FE will act as a robustness check. This implies, theoretically, that the RE estimator is a consistent estimator. The RE model also shows a zero-variance component for the effects of country-specific units ( $\sigma_u = 0$ ), implying that the GLS transformation does not attribute any variation to the unobserved effects. In contrast, the FE model shows a high intraclass correlation coefficient ( $\rho = 0.926$ ), implying a high level of heterogeneity. In light of the strong theoretical foundation of institutional heterogeneity in transition economies, the FE model is retained as the preferred model. The huge discrepancy between the Re and FE values in the two models indicates that the findings depend on the specification of the model and thus must be interpreted cautiously. The estimated effect of renewable energy sources on the GDP growth rate is not robust due to the fact that its sign and significance change across model specifications. The large gap between rho in the FE and RE model means that the model is rather sensitive to estimation method and should be cautiously interpreted.

The high value difference between rhos calculated in the FE and RE models suggests that the outcomes are sensitive to the choice of the regression model. This is why one needs to be cautious when interpreting the obtained coefficients.

**Table 7.** The correlation matrix

	gdpgrowth	law	corr	gov	reg	inflation	gcf	fdi	trade	energyren
gdpgrowth	1.0000									
law	-0.0477	1.0000								
corr	-0.0097	0.8714	1.0000							
gov	-0.0331	0.6767	0.7438	1.0000						
reg	0.0007	0.8159	0.8322	0.8204	1.0000					
inflation	0.0222	-0.4109	-0.2780	-0.2756	-0.3853	1.0000				
gcf	0.2363	0.1973	0.1996	0.0545	0.2863	-0.0923	1.0000			
fdi	0.3837	0.1294	0.2295	0.2423	0.1665	0.0953	0.3733	1.0000		
trade	0.1522	0.2024	0.1198	-0.0105	0.0575	0.1935	0.3167	0.1109	1.0000	
energyren	-0.0268	0.6116	0.5225	0.4813	0.5871	-0.4036	0.2412	0.3452	-0.1069	1.0000

The correlation matrix (Table 7) helps us understand the relationships between the variables included in the model. On the whole, the correlation between the dependent variable and the explanatory variables is not high. For instance, the correlation between GDP growth and other explanatory variables, such as FDI, is relatively low. GDP growth is found to have a moderate positive correlation with FDI, which is 0.3837, and a relatively weaker correlation with GCF, which is 0.2363. The correlation between GDP growth and institutional variables is found to be relatively weaker, which indicates a more complex relationship between these variables, that needs to be understood through multivariate analysis. The correlation between the institutional variables is relatively more significant. The correlation between the governance indicators, which cover rule of law, control of corruption, government effectiveness, and regulatory quality, is found to be relatively higher, ranging from 0.67 to 0.87. The relatively higher correlation between these variables indicates the possible presence of multicollinearity, which might arise while including these variables in the regression model. On the contrary, the control variables have lower correlations among each other. This shows that the control variables represent different aspects of the macro-economic environment. Inflation is negatively correlated with most of the institutional variables. This shows that better institutions generally correspond with higher macro-economic stability. Renewable energy also shows moderate positive correlations with the institutional variables. This implies that better institutions may be better positioned to undertake structural changes.

Due to the high correlations among the institutional variables, the analysis also employs a second specification, where a composite institutional index is used. This composite index is obtained by averaging the four institutional variables. This would address the issue of multicollinearity, as well as provide a robustness test of the overall effect of institutions on economic growth.

**Table 8.** Panel data estimation results for economic growth (OLS, FE, and RE models)

	(1)	(2)	(3)
	OLS	FE	RE
Law	1.467 (3.023)	-9.044 (4.716)	1.467 (1.899)
Corr	-4.345* (2.112)	5.330** (1.554)	-4.345 (2.595)
Gov	-2.996 (1.709)	1.791 (1.459)	-2.996 (2.076)
Reg	8.190** (2.647)	14.51 (6.813)	8.190 (4.179)
Infl	-0.159* (0.0646)	-0.225*** (0.0303)	-0.159** (0.0597)

GCF	-0.0938 (0.0924)	-0.0126 (0.0905)	-0.0938 (0.123)
FDI	0.477 (0.242)	0.344 (0.236)	0.477 (0.263)
Trade	-0.0105 (0.0201)	0.106 (0.0470)	-0.0105 (0.0202)
Energ	-0.0828 (0.0444)	0.503** (0.136)	-0.0828* (0.0414)
YEAR=2000	0 (.)	0 (.)	0 (.)
YEAR=2002	4.401* (2.029)	5.471 (2.677)	4.401* (1.864)
YEAR=2003	2.251 (3.287)	6.595 (3.282)	2.251 (2.972)
YEAR=2004	1.791 (2.446)	8.295* (3.625)	1.791 (2.134)
YEAR=2005	4.831 (2.598)	8.538* (3.730)	4.831 (2.914)
YEAR=2006	8.281 (4.329)	5.743 (4.209)	8.281 (5.154)
YEAR=2007	5.078 (3.929)	3.614 (2.984)	5.078 (3.646)
YEAR=2008	3.026 (2.000)	1.100 (1.899)	3.026 (2.473)
YEAR=2009	-6.352 (3.539)	-8.348** (2.525)	-6.352 (4.099)
YEAR=2010	0.338 (2.431)	-3.819* (1.319)	0.338 (1.973)
YEAR=2011	-0.843 (2.303)	-4.192* (1.568)	-0.843 (1.465)
YEAR=2012	-2.502 (2.497)	-7.120* (2.252)	-2.502 (2.514)
YEAR=2013	0.298 (2.812)	-5.276* (1.637)	0.298 (3.085)
YEAR=2014	-2.323 (2.708)	-8.460*** (1.384)	-2.323 (3.040)
YEAR=2015	-1.976 (2.112)	-7.135** (1.838)	-1.976 (2.229)
YEAR=2016	-1.348 (2.631)	-7.324** (1.794)	-1.348 (1.658)
YEAR=2017	-0.349 (2.247)	-6.614** (1.702)	-0.349 (1.815)
YEAR=2018	0.207 (2.442)	-8.348** (1.917)	0.207 (2.033)
YEAR=2019	0.136 (2.491)	-8.088*** (1.525)	0.136 (2.211)
YEAR=2020	-9.192** (3.351)	-15.74*** (3.031)	-9.192* (3.582)
YEAR=2021	4.969 (2.663)	-2.983 (1.621)	4.969 (2.578)
Constant	3.902 (3.660)	-13.00 (7.055)	3.902 (2.621)
Observations	154	154	154
R <sup>2</sup>	0.598	0.679	
Adjusted R <sup>2</sup>	0.503	0.604	

Notes: Standard errors in parentheses  
\* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

Table 8 presents a summary of the results obtained using the pooled OLS, RE, and FE models. The presentation of the results obtained using the three models has a two-fold purpose: first, it provides a comparison of the results obtained using different models; second, it provides a test for the robustness of the results obtained for the institutions to the presence of omitted variables at the country level. However, the panel nature of the data set (10 transition economies over time) and the high variance components due to the country effects ( $\rho = 0.926$  in the FE model) imply that the results obtained using the FE model will be used as the preferred specification. The results obtained using the FE model show that the aggregate effect of institutions on economic growth does not exist; rather, the effect of the control of corruption on economic growth is positive and statistically significant, implying that the growth dividends obtained in the transition economies as a result of the strengthening of anti-corruption policies are sizable.

In addition, the large and statistically significant coefficient for regulatory quality suggests the importance of the role played by structural policies to improve the efficiency and clarity of markets in the growth patterns. Government effectiveness does not have statistical significance in the within-country model and thus seems to play little role in stimulating growth in the absence of other structural policies. The macroeconomic stability has strong results in all the different model specifications. Inflation has a significant negative impact on growth, thus stressing the importance of price stability in the growth process in transition economies. Trade openness appears as a positive relationship in the FE model, suggesting that integration into the global economy could play a significant role in the growth process, controlling for country-specific structural factors. One of the more interesting results was the positive and statistically significant effect of renewable energy growth on economic growth in the FE model. While the RE model did not reject the statistical test of the FE model, the significant variations between countries indicated by the data, as well as the nature of the institutional variables, support the use of the FE model as the more credible approach to identifying the relevant variables. The results of the analysis tend to support the conclusion that economic growth in transition economies is driven by factors of governance, macroeconomic discipline, and changes in the structure of renewable energy systems, as opposed to averages of institutional factors.

The empirical results confirm that there is heterogeneity among institutional measures in relation to the association with economic growth and that the relationship depends on the specification used. The results from the random-effects regression, chosen as the base (based on the Hausman test,  $p = 0.157$ ), indicate that a significant positive relationship exists between regulatory quality and economic growth, hence confirming that better regulation is associated with improved economic performance. The relationship between corruption and economic growth, however, is negative and statistically significant, meaning that poorer control of corruption leads to low growth rates. Rule of law and government effectiveness fail to demonstrate a statistically significant impact on economic growth in the models estimated. Of all the macroeconomic variables, the most significant and negative variable in each of the regressions was inflation. The effect of FDI is positive but marginally insignificant, while trade openness and GCF lack a significant impact. First, it is crucial to note that the coefficient for renewable energy consumption

shows an unstable behavior. While the value is either negative or weakly significant in pooled and random-effects regressions, in the FE regression, the coefficient becomes significantly positive. Therefore, it can be noted that there is a difference between estimating the relationship using between-country (RE) and within-country (FE) variability; thus, the results should be considered carefully. When comparing the results of the FE and random-effects models, it can also be noted that estimates of parameters depend on model specification. Particularly, while there is almost no correlation between unobservable variables in the RE-model (as  $\rho$  is equal to zero), in the case of FE-approach, the degree of correlation between unobservable reaches approximately 0.93. Because of this, FE-estimation is considered as a robustness test. In general, the study confirms the hypothesis that the quality of institutions contributes to growth in the transition economies, yet their significance is not consistent and varies depending on particular dimensions and assumptions used in modeling. Because of possible multicollinearity and endogeneity, the conclusions can only imply associations rather than establish causality in the relationship studied.

In addition to these tests, a dynamic panel data regression using the two-step system GMM approach was performed (see Figure A2). The findings imply that the lagged dependent variable is not statistically significant ( $\beta = 0.066$ ,  $p = 0.832$ ) indicating no significant persistence in the dynamics of economic development. FDI appears marginally statistically significant ( $\beta = 0.434$ ,  $p = 0.062$ ) among other explanatory variables; all others are statistically insignificant.

Concerning model diagnostics, the Arellano-Bond test proves the existence of first-order serial correlation ( $AR(1)$ ,  $p = 0.049$ ) and excludes the presence of second-order correlation ( $AR(2)$ ,  $p = 0.351$ ). Nevertheless, the Hansen overidentifying restrictions test gives the value of the p-value equal to 1.000 which indicates a possible inadequacy of instruments. Taking into account the relatively small number of observations in the cross-sectional direction, such a finding indicates that estimates obtained by the method of GMM can be regarded with suspicion. Consequently, the FE estimation is regarded as more trustworthy and becomes the preferred specification. Further, four different model specifications were employed in Table 9. The first two were OLS pooling and FE regressions, respectively. The third one is the RE regression, and the fourth model used is the correlated random-effects/Mundlak estimator.

Table 9 provides the results of estimation using pooled OLS, FE, RE, and Mundlak models of GDP growth. All models use time FE; standard errors are provided in parentheses.

As shown in the results, inflation is negatively and significantly related to economic growth in all models, implying that an increase in the inflation rate leads to slower economic growth. In this case, the effect is the most pronounced in the FE and Mundlak models, showing the importance of within-country variation.

Among the institutional indicators used, we observe significant instability in model specifications. As we can see, some coefficients become insignificant and/or change their signs depending on the estimator used, while regulatory quality appears to be positively and significantly related to GDP growth in all models except the Mundlak one, implying some stability in the relationship. At the same time, we can observe that the effects of law, corruption control, and governance are sensitive to model specifications, implying

potential multicollinearity between them. FDI has a positive effect, although it is significant only in FE and Mundlak models, while trade openness is insignificant in models without FE terms but becomes significant in FE and Mundlak models.

**Table 9.** Panel data estimates of economic growth (OLS, FE, RE, and Mundlak models)

	-1	-2	-3	-4
inflation	gdpgrowth -0.159**	gdpgrowth -0.225***	gdpgrowth -0.159***	gdpgrowth -0.225***
law	1.467	-9.044*	1.467	-9.044*
corr	-3.023	-4.716	-1.899	-4.897
gov	-4.345**	5.330***	-4.345*	5.330***
reg	-2.112	-1.554	-2.595	-1.614
gcf	-2.996*	1.791	-2.996	1.791
fdi	-1.709	-1.459	-2.076	-1.515
trade	8.190***	14.51*	8.190**	14.51**
energyren	-2.647	-6.813	-4.179	-7.075
2000.year	-0.0938	-0.0126	-0.0938	-0.0126
2002.year	-0.0924	-0.0905	-0.123	-0.094
2003.year	0.477*	0.344	0.477*	0.344
2004.year	-0.242	-0.236	-0.263	-0.245
2005.year	-0.0105	0.106*	-0.0105	0.106**
2006.year	-0.0201	-0.047	-0.0202	-0.0488
2007.year	-0.0828*	0.503***	-0.0828**	0.503***
2008.year	-0.0444	-0.136	-0.0414	-0.141
2009.year	0	0	0	0
2010.year	(.)	(.)	(.)	(.)
2011.year	4.401**	5.471*	4.401**	5.471**
2012.year	-2.029	-2.677	-1.864	-2.78
2013.year	2.251	6.595*	2.251	6.595*
2014.year	-3.287	-3.282	-2.972	-3.408
2015.year	1.791	8.295**	1.791	8.295**
2016.year	-2.446	-3.625	-2.134	-3.765
2017.year	4.831*	8.538**	4.831*	8.538**
2018.year	-2.598	-3.73	-2.914	-3.873
2019.year	8.281*	5.743	8.281	5.743
2020.year	-4.329	-4.209	-5.154	-4.371
2021.year	5.078	3.614	5.078	3.614
	-3.929	-2.984	-3.646	-3.098
	3.026	1.1	3.026	1.1
	-2	-1.899	-2.473	-1.971
	-6.352*	-8.348***	-6.352	-8.348***
	-3.539	-2.525	-4.099	-2.622
	0.338	-3.819**	0.338	-3.819***
	-2.431	-1.319	-1.973	-1.37
	-0.843	-4.192**	-0.843	-4.192**
	-2.303	-1.568	-1.465	-1.629
	-2.502	-7.120**	-2.502	-7.120***
	-2.497	-2.252	-2.514	-2.338
	0.298	-5.276**	0.298	-5.276***
	-2.812	-1.637	-3.085	-1.7
	-2.323	-8.460***	-2.323	-8.460***
	-2.708	-1.384	-3.04	-1.437
	-1.976	-7.135***	-1.976	-7.135***
	-2.112	-1.838	-2.229	-1.908
	-1.348	-7.324***	-1.348	-7.324***
	-2.631	-1.794	-1.658	-1.863
	-0.349	-6.614***	-0.349	-6.614***
	-2.247	-1.702	-1.815	-1.768
	0.207	-8.348***	0.207	-8.348***
	-2.442	-1.917	-2.033	-1.991
	0.136	-8.088***	0.136	-8.088***
	-2.491	-1.525	-2.211	-1.583
	-9.192***	-15.74***	-9.192**	-15.74***
	-3.351	-3.031	-3.582	-3.148
	4.969*	-2.983*	4.969*	-2.983*

_cons	-2.663	-1.621	-2.578	-1.683
	3.902	-13.00*	3.902	19.25***
	-3.66	-7.055	-2.621	-4.001
N	154	154	154	154
	-1	-2	-3	-4
inflation	gdpgrowth -0.159**	gdpgrowth -0.225***	gdpgrowth -0.159***	gdpgrowth -0.225***
law	-0.0646	-0.0303	-0.0597	-0.0315
corr	1.467	-9.044*	1.467	-9.044*
gov	-3.023	-4.716	-1.899	-4.897
reg	-4.345**	5.330***	-4.345*	5.330***
gcf	-2.112	-1.554	-2.595	-1.614
fdi	-2.996*	1.791	-2.996	1.791
trade	-1.709	-1.459	-2.076	-1.515
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2000.year	-2.647	-6.813	-4.179	-7.075
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2003.year	-0.0924	-0.0905	-0.123	-0.094
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2005.year	-0.242	-0.236	-0.263	-0.245
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2007.year	-0.0201	-0.047	-0.0202	-0.0488
2008.year	-0.0828*	0.503***	-0.0828**	0.503***
2009.year	-0.0444	-0.136	-0.0414	-0.141
2010.year	0	0	0	0
2011.year	(.)	(.)	(.)	(.)
2012.year	4.401**	5.471*	4.401**	5.471**
2013.year	-2.029	-2.677	-1.864	-2.78
2014.year	2.251	6.595*	2.251	6.595*
2015.year	-3.287	-3.282	-2.972	-3.408
2016.year	1.791	8.295**	1.791	8.295**
2017.year	-2.446	-3.625	-2.134	-3.765
2018.year	4.831*	8.538**	4.831*	8.538**
2019.year	-2.598	-3.73	-2.914	-3.873
2020.year	8.281*	5.743	8.281	5.743
2021.year	-4.329	-4.209	-5.154	-4.371
	5.078	3.614	5.078	3.614
	-3.929	-2.984	-3.646	-3.098
	3.026	1.1	3.026	1.1
	-2	-1.899	-2.473	-1.971
	-6.352*	-8.348***	-6.352	-8.348***
	-3.539	-2.525	-4.099	-2.622
	0.338	-3.819**	0.338	-3.819***
	-2.431	-1.319	-1.973	-1.37
	-0.843	-4.192**	-0.843	-4.192**
	-2.303	-1.568	-1.465	-1.629
	-2.502	-7.120**	-2.502	-7.120***
	-2.497	-2.252	-2.514	-2.338
	0.298	-5.276**	0.298	-5.276***
	-2.812	-1.637	-3.085	-1.7
	-2.323	-8.460***	-2.323	-8.460***
	-2.708	-1.384	-3.04	-1.437
	-1.976	-7.135***	-1.976	-7.135***
	-2.112	-1.838	-2.229	-1.908
	-1.348	-7.324***	-1.348	-7.324***
	-2.631	-1.794	-1.658	-1.863
	-0.349	-6.614***	-0.349	-6.614***
	-2.247	-1.702	-1.815	-1.768
	0.207	-8.348***	0.207	-8.348***
	-2.442	-1.917	-2.033	-1.991

The next important point is the estimate of renewable energy (energyren). The sign of its estimate changes according to the specification used and its coefficient is very sensitive to the choice of the model used. In the pooled OLS and RE models, it takes a negative value. However, when FE or Mundlak regression is used, the coefficient becomes positive and significant. Further, when the within-between model is considered, it is seen that while the within coefficient takes a positive and significant value, the between coefficient

(estimated using mean values) takes a negative and significant value. This implies that an increase in renewable energy leads to growth within the country whereas an increase in renewable energy between countries results in low growth rates.

Further information can be gleaned from the Mundlak model (column 4) which allows us to separately assess the time-variant effect and the time-invariant country mean effect. As we see below, there are distinct differences in these two dimensions. Inflation continues to have negative and significant effect in the within-dimension case ( $\beta = -0.225$ ,  $p < 0.01$ ). Thus, an increase in domestic inflation is linked to a decrease in the rate of growth. Nevertheless, the cross-country variation of the mean effect (that is, the difference in the mean values) is insignificant ( $\beta = -0.006$ ). As far as institutional indicators go, in most cases, they tend to demonstrate instability in the time-variant dimension, whereas the country mean effects are highly significant. In particular, the mean values of laws ( $\beta = 15.95$ ,  $p < 0.01$ ), control of corruption ( $\beta = -9.36$ ,  $p < 0.01$ ), and governance effect ( $\beta = -7.37$ ,  $p < 0.01$ ) show great significance. Therefore, in this case, long-term country-specific effects of institutional indicators play an important role in the formation of GDP per capita growth rates.

It should be noted that the Mundlak model (Column 4) gives some additional information as it separately estimates within and between effects of variables. The significance of group means for most institutional variables, FDI, and renewable energy clearly indicates that the assumption made in the random effect model about independence of variables from the error term does not hold. FDI display a positive and non-significant within-country effect ( $\beta = 0.344$ ) and a strongly significant between-country effect ( $\beta = 0.697$ ,  $p < 0.01$ ), implying that an increase in the average level of FDI for countries leads to higher growth rates.

On the other hand, trade openness displays a positive and significantly influential within-country effect ( $\beta = 0.106$ ,  $p < 0.05$ ) while its effect on growth is negative and significant at the between-country level ( $\beta = -0.192$ ,  $p < 0.01$ ). As such, higher trade openness within a country is associated with higher growth rates, and thus higher trade openness may be detrimental to growth for some countries due to structural issues. A critical finding comes from the examination of renewable energy, which displays a positive and highly significant within-country effect ( $\beta = 0.503$ ,  $p < 0.01$ ), implying that higher renewable energy consumption is positively related to growth rate for countries. However, the between-country effect of renewable energy is negative and significant ( $\beta = -0.700$ ,  $p < 0.01$ ).

Consequently, it can be concluded that there is some violation of the assumption of the independent RE model where the unobservable variable and regressors are not correlated. This conclusion justifies the application of the correlated random-effects model (also known as Mundlak model) to address this issue. The findings indicate that the estimates are sensitive to the econometric framework, particularly for the institutional and environmental factors. The agreement between FE and the within component of the Mundlak approach implies that within-country variation offers better information content compared to cross-country comparison. VIFs were obtained to detect the possibility of multicollinearity among the predictors. According to the output, there is an indication of high to moderately high multicollinearity among the institutional indicators where the VIF for rule of law is 9.54, corruption control is 8.80, and regulatory quality is 8.19, thus explaining the theoretical

similarity of these indicators. In addition, low VIF levels among variables like inflation, FDI, trade, and renewable energy indicate no multicollinearity issues. In regard to the high level of VIFs among time dummies, this is not surprising and does not create any methodology problem. Overall, it can be noted that this information confirms the observation that the coefficient variability of institutions can be attributed to multicollinearity problems.

## 5. DISCUSSION

The findings provide evidence that the economic growth of the selected transition economies is influenced by the governance structure, the level of macroeconomic stability, and the green transformation process, rather than the average level of institutions and capital accumulation. The findings from the FE model provide evidence that the control of corruption has a significant and positive influence on the level of GDP growth, as indicated by the regression estimate  $\beta = 5.33$ ,  $p < 0.01$ . The findings provide evidence that the improvement in the mechanisms to control corruption in the selected transition economies is associated with significant growth benefits. However, government effectiveness does not have a significant influence on the level of GDP growth, which implies that the effectiveness of government administration is not necessarily associated with the level of economic growth.

Regulatory quality is observed to have a high positive coefficient estimate ( $\beta = 14.51$ ) which is just significant at 10%. Although the significance is low, the economic significance is quite high. This result is indicative of the decisive factor being the improvements made to the regulatory clarity and institutions in the private sector.

On the other hand, the rule of law is observed to be just significant with a negative coefficient estimate. This may be due to some kind of adjustment effects or the combination of institutions, as a high correlation is observed between the variables as per the correlation matrix. Macroeconomic stability is observed to be one of the strongest and consistent driving factors of economic growth. In this context, it is observed that inflation is highly negative and statistically significant ( $\beta = -0.225$ ,  $p < 0.001$ ). This is indicative of the fact that there is a considerable economic cost of price volatility in any economy over time.

Most importantly, however, the expansion of renewable energy sources reveals a positive and statistically significant relationship with growth in the FE estimates ( $\beta = 0.503$ ,  $p < 0.01$ ), suggesting that the improvement in the utilization of renewable energy sources is positively related to growth in individual countries and therefore may support the argument that green transition policies constitute growth-enhancing structural policies and not growth-detering economic policies. Openness also reveals a positive and marginally significant relationship with growth in the FE estimates ( $\beta = 0.05$ ). This finding supports the argument that external linkages may support domestic institutional reforms. GCF and FDI, on the other hand, fail to reveal robust relationships with growth in individual countries and therefore may suggest that growth in these economies is more dependent on the quality of individual institutional and structural conditions rather than capital inflows per se. On the whole, the results from the three models—i.e., the OLS, RE, and FE—reveal that the failure to account for unobserved country heterogeneity affects the magnitude and sign of the results on the key institutional

variables.

Therefore, the findings based on the FE model provide the most reliable results to suggest the joint effect of the heterogeneity of institutions, macroeconomic stability, and the development of renewable energy on the growth paths in the transition economies.

#### Hypothesis 1

H1: The effect of the different dimensions of economic governance on economic growth is heterogeneous, and the control of corruption has a positive effect on economic growth.

The findings based on the FE model strongly support the hypothesis on the heterogeneity of the effect of the different dimensions of economic governance on economic growth. The effect of the control of corruption is confirmed to be positive and statistically significant ( $\beta = 5.33, p < 0.01$ ), suggesting that the quality of the anti-corruption regime is strongly and positively correlated to economic growth. The effect of regulatory quality is confirmed to be strong and positive, although the coefficient is only marginally significant at the 10% level ( $\beta = 14.51$ ).

On the other hand, government effectiveness is found to be statistically insignificant, while the effect of rule of law is found to be only marginally significant. These results confirm the fact that the different dimensions of economic governance do not equally impact economic growth, with aggregate institutional quality not being the relevant factor to explain economic growth, while the different pillars of economic governance, such as the control of corruption, are decisive factors to explain economic growth.

#### Conclusion for H1:

H1 is supported. Governance heterogeneity matters, and corruption control is a key institutional driver of growth.

#### Hypothesis 2

H2: Macroeconomic instability, as measured by inflation, has a negative effect on economic growth.

Inflation is found to have a very strong and highly significant negative coefficient in the FE model, which suggests that higher inflation rates are associated with lower rates of economic growth in the transition economies ( $\beta = -0.225, p < 0.001$ ).

#### Conclusion for H2:

H2 is highly supported because macroeconomic instability has a constraining effect on economic growth.

#### Hypothesis 3

H3: The expansion of renewable energy positively contributes to economic growth after controlling for country-specific heterogeneity.

From the findings of the FE model, it was established that renewable energy positively and significantly contributes to economic growth ( $\beta = 0.503, p < 0.01$ ). It was also interesting to note that the impact of renewable energy on economic growth turns out to be positive and significant only after controlling for country-specific heterogeneity.

This indicates that green structural transformation positively impacts economic growth.

#### Conclusion for H3:

H3 stands verified with hypothesis testing results showing that heterogeneity in governance plays an essential role in influencing economic growth. Among all determinants, controlling corruption seems to be the most significant determinant factor; however, regulatory quality also seems to have a significant impact on economic growth. Macroeconomic stability, represented by inflation rates, still remains one of the fundamental growth requirements with a

strong negative impact. In addition to this, expansion in renewable energy also seems to positively impact economic growth with country-specific effects controlled for; this further strengthens the case that green transition can become a structural driver of economic growth in transition economies.

The present study contributes to the literature by adding a more recent data set, disaggregating institutional quality, and incorporating renewable energy.

## 6. CONCLUSION

The primary aim of the present study was to empirically investigate the impact of institutional quality, macroeconomic stability, and structural variables on the growth of economies undergoing the process of transition, with a special emphasis on the heterogeneous impact of disaggregated governance indicators. To achieve the above research aim, the present study employed panel data analysis techniques on a set of countries over the years, with the analysis incorporating individual dimensions of governance such as the rule of law, control of corruption, government effectiveness, regulatory quality, as well as relevant macroeconomic variables such as inflation, FDI, trade openness, GCF, and renewable energy. The results demonstrate that the impact of institutional quality on economic growth is not linear. Rather, the dimensions of good governance have heterogeneous impacts on economic growth. In the context of the study, the control of corruption is identified as a positive and statistically significant determinant of economic growth after controlling for unobserved country-specific effects, thus emphasizing the significance of the integrity of institutions. On the contrary, the use of the aggregated institutional index does not produce statistically significant findings, thus indicating that the overall index may hide the individual impacts of the different dimensions of good governance. Among the macroeconomic variables, inflation consistently displays a negative and statistically significant effect, thereby underlining the significance of macroeconomic stability. The variable "Renewable Energy" was found to be insignificant or, in some cases, negative. However, as expected, this variable was found to be positive and statistically significant in the FE model, thereby underlining the significance of this variable as a driver of sustainable economic growth. The variable "FDI" was found to have a positive but relatively weak effect, while other variables, such as "trade openness" and "Gross Capital Formation," failed to achieve significance. Thus, the results emphasize the significance of institutional quality as well as the macroeconomic environment to the growth process, although the results show the complexities involved. The study adds to the existing literature as it shows the significance of using disaggregated governance indicators compared to aggregate ones, as well as the significance of methodology when working with panel data analysis. The results have significant policy implications as they emphasize the significance of institutional reform efforts, especially in the context of fighting corruption and improving the regulatory environment, as well as the maintenance of a healthy macroeconomic environment and the support of renewable energy sources, to the growth process of transition economies.

The empirical results of the present study have several implications for policymakers in the context of the economies in transition that aim to secure sustained economic growth. Firstly, the results emphasize the significance of the positive

impact of institutional quality improvements, especially with regards to the reduction of corruption, on the enhancement of the economic performance of the economies. On the other hand, the positive contribution of regulatory quality to the economies suggests the significance of the regulatory frameworks to the economies. The positive impact of regulatory quality suggests the significance of the regulatory frameworks to the economies. Policies aiming to simplify the regulatory environment, to overcome inefficiencies in the bureaucratic process, etc., can be beneficial to the economies. The continued negative impact of inflation underscores the significance of macroeconomic stability. Guaranteeing low inflation through the implementation of monetary and fiscal policies remains one of the fundamental prerequisites for sustaining economic development while promoting domestic and foreign investment. The results also underscore the emerging significance of renewable energy as a factor in promoting sustainable economic development. Supporting the development of renewable energy through targeted investments, financial support, and policy frameworks. In addition, it is evident from the results that institutional effects are not homogeneous, as indicated by the fact that the aggregated institutional index did not produce any significant results. This shows that policy interventions should not be based on generalized institutional reforms but rather target specific aspects of governance that are more important in terms of their contribution to economic outcomes. Generally, it is evident from the study that a combination of institutional reforms, macroeconomic stability, and support for structural transformation, especially in the energy sector, is critical in promoting long-term and sustainable economic growth in transition economies.

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## APPENDIX

**Table A1.** Panel structure and data availability

ID	Country	Year	GDP Growth	Inflation	Law	Corr	Gov	Reg	GCF	FDI	Trade	Energyren
1	Kosova	2000			-0.02383	0.371275						
1	Kosova	2001										
1	Kosova	2002			-0.06261	0.360482						
1	Kosova	2003			-0.83398	-0.50425						
1	Kosova	2004			-0.79521	-0.30508						
1	Kosova	2005			-0.82168	-0.52677						
1	Kosova	2006		0.6216469	-0.85836	-0.51405	-0.34006					
1	Kosova	2007		4.358497	-0.758	-0.73524	-0.21568	0.037798978				
1	Kosova	2008		9.3504176	-0.62731	-0.64877	-0.23973	0.032282241	37.28368	10.50	76.73074	
1	Kosova	2009	5.034854138	-2.410264	-0.59389	-0.58538	-0.40547	0.061585706	32.61962	8.04	77.75538	
1	Kosova	2010	4.93995096	3.4805076	-0.60997	-0.61535	-0.58356	-0.096795879	33.12849	9.17	82.17748	
1	Kosova	2011	6.319810229	7.3364177	-0.51936	-0.61815	-0.43583	-0.151747063	36.05734	8.44	86.15175	
1	Kosova	2012	1.712195959	2.4767378	-0.52674	-0.65336	-0.32497	-0.040483929	31.90172	4.76	81.36392	
1	Kosova	2013	5.340799119	1.7673243	-0.54289	-0.64972	-0.35639	-0.040910311	29.99786	5.52	75.10348	
1	Kosova	2014	3.348804784	0.4289578	-0.46437	-0.48626	-0.28958	-0.161953509	27.846	2.83	77.07605	
1	Kosova	2015	5.916231283	-0.5369294	-0.47875	-0.55997	-0.42455	-0.319047421	30.43247	5.45	74.02044	
1	Kosova	2016	5.571775047	0.2731694	-0.35806	-0.4384	-0.43844	-0.215008199	33.522	3.65	75.01881	
1	Kosova	2017	4.825655653	1.4882343	-0.43588	-0.52711	-0.41838	-0.156159088	34.69265	3.99	80.41014	
1	Kosova	2018	3.406632271	1.0537977	-0.38398	-0.52827	-0.44444	-0.343168259	36.29454	4.04	86.31508	
1	Kosova	2019	4.75680057	2.675992	-0.40994	-0.54138	-0.3702	-0.387807816	34.5582	3.61	85.75341	
1	Kosova	2020	-5.340275478	0.1982279	-0.40614	-0.46297	-0.3329	-0.320575327	33.40613	5.11	75.60802	
1	Kosova	2021	10.74565608	3.3536914	-0.30016	-0.3415	-0.25703	-0.288337767	35.95118	5.32	98.63843	
1	Kosova	2022	4.278498958	11.58051	-0.36527	-0.26382	-0.19492	-0.389362216	35.23265	8.17	110.012	
1	Kosova	2023	4.067627014	4.9443244	-0.31143	-0.18529	-0.08006	-0.295387387	33.94563	8.68	109.9519	
1	Kosova	2024	4.412738288	1.6194499					33.96514	7.68	113.7897	
2	Albania	2000	7.462858718		-1.02067	-0.85556	-0.91778	-0.415910125	34.04014	3.99	61.60926	41.4
2	Albania	2001	8.86373066						38.22805	5.11	64.24745	39
2	Albania	2002	4.628395874		-0.76232	-0.84534	-0.62433	-0.311400771	38.57534	2.99	65.99147	35.8
2	Albania	2003	5.33326426		-0.71632	-0.85379	-0.56399	-0.490216553	36.72213	3.07	64.82322	33.7
2	Albania	2004	5.266261739		-0.70103	-0.72373	-0.40837	-0.187491566	36.33195	4.61	65.03794	35.8
2	Albania	2005	5.130821931		-0.76383	-0.81326	-0.69639	-0.400731236	38.38439	3.18	69.11629	36.8
2	Albania	2006	6.01898124		-0.70314	-0.79055	-0.58095	-0.148599386	37.33896	3.55	72.20191	31.6
2	Albania	2007	6.500092612		-0.66155	-0.70694	-0.42772	0.034550302	35.66888	5.87	79.9119	32
2	Albania	2008	6.907062307	3.3208709	-0.60008	-0.60521	-0.36706	0.137666509	33.30567	9.41	75.24855	35.8
2	Albania	2009	2.690751524	2.2669221	-0.49437	-0.54527	-0.25594	0.241446003	32.44046	10.91	73.32136	37.1
2	Albania	2010	2.973154427	3.626047	-0.38576	-0.53162	-0.27945	0.233281955	32.49262	9.02	75.53253	37
2	Albania	2011	2.463516839	3.4291232	-0.44293	-0.70179	-0.20218	0.283972561	33.83761	8.08	80.699	35.8
2	Albania	2012	0.98412988	2.0315927	-0.51984	-0.77873	-0.26893	0.240491986	29.71503	7.50	76.96836	39.9
2	Albania	2013	1.707228318	1.9376208	-0.51883	-0.75137	-0.32446	0.254160255	29.05664	9.80	75.75062	41.1
2	Albania	2014	2.240226954	1.625865	-0.3112	-0.58657	-0.04977	0.279037684	28.30478	8.65	75.0212	38.6
2	Albania	2015	2.227704075	1.896174	-0.31969	-0.54514	0.027575	0.174237311	27.81346	8.63	71.27945	38.5
2	Albania	2016	3.908935514	1.2754317	-0.32263	-0.47237	0.029082	0.186607629	26.81435	8.71	74.01445	39.4
2	Albania	2017	3.283175933	1.9866613	-0.41419	-0.48139	0.098553	0.220610321	27.65759	7.71	76.78738	36.9
2	Albania	2018	3.671419281	2.0280596	-0.41475	-0.54602	0.080525	0.256079823	27.1253	7.83	75.69408	37.8
2	Albania	2019	2.062577902	1.4110908	-0.42632	-0.56427	-0.0623	0.272065461	25.28753	7.71	75.38213	40.1
2	Albania	2020	-3.313756369	1.6208866	-0.37803	-0.57354	-0.15512	0.221967235	26.21835	7.02	59.5207	44.4
2	Albania	2021	8.969576191	2.0414716	-0.28072	-0.57718	-0.03599	0.175859392	28.67227	6.76	75.5904	41.9
2	Albania	2022	4.826696119	6.7252027	-0.16559	-0.40819	0.064541	0.159353822	26.80237	7.58	84.69804	
2	Albania	2023	3.936616892	4.7597642	-0.1641	-0.33222	0.250855	0.171953663	23.43929	6.90	82.35249	
2	Albania	2024	3.961719112	2.2144895					24.9515	6.32	79.45464	
3	Bosnia and Herzegovina	2000	5.41431595		-0.60226	-0.59585	-1.05738	-0.683763087	30.30638	2.62	85.35774	19.4

3	Bosnia and Herzegovina	2001	2.423313172						31.57984	2.04	86.03573	20.3
3	Bosnia and Herzegovina	2002	5.027444207	-0.65601	-0.38754	-1.07195	-0.607061386	31.47439	3.98	78.72748	21.2	
3	Bosnia and Herzegovina	2003	3.867138795	-0.61685	-0.2821	-0.88034	-0.46620518	30.29844	4.49	80.56946	20.1	
3	Bosnia and Herzegovina	2004	6.325266169	-0.49067	-0.32471	-0.70137	-0.23462072	30.52	8.76	81.81269	20.1	
3	Bosnia and Herzegovina	2005	3.89717799	-0.51979	-0.23281	-0.76463	-0.578913093	29.45422	5.56	84.35546	19.7	
3	Bosnia and Herzegovina	2006	5.414003571	6.1255662	-0.49649	-0.30141	-0.63332	-0.468090147	25.81245	6.58	79.82995	18.1
3	Bosnia and Herzegovina	2007	5.857126342	1.5007771	-0.46991	-0.37412	-0.85872	-0.286616474	30.46919	11.67	83.55186	14.8
3	Bosnia and Herzegovina	2008	5.443831035	7.4270431	-0.40743	-0.36078	-0.6045	-0.175438628	32.31198	5.26	86.16288	14.3
3	Bosnia and Herzegovina	2009	-3.00445593	-0.3814643	-0.36014	-0.37999	-0.722	-0.110355966	23.71321	0.79	73.74749	17.4
3	Bosnia and Herzegovina	2010	0.86566926	1.9962124	-0.35565	-0.3364	-0.74056	-0.119476207	21.91467	2.58	80.96822	19.6
3	Bosnia and Herzegovina	2011	0.959511247	3.67125	-0.33178	-0.32669	-0.73636	-0.058966167	22.67591	2.53	87.83635	14.2
3	Bosnia and Herzegovina	2012	-0.821836474	2.0526745	-0.19718	-0.30936	-0.45469	-0.061737765	22.88357	2.28	88.14511	15.3
3	Bosnia and Herzegovina	2013	2.349856663	-0.0930457	-0.13941	-0.24468	-0.43331	-0.074898683	21.66859	1.72	87.93124	19.5
3	Bosnia and Herzegovina	2014	1.153851092	-0.8971941	-0.13223	-0.30007	-0.4921	-0.041672681	23.03401	2.94	90.55228	23.6
3	Bosnia and Herzegovina	2015	4.314750611	-1.036023	-0.26457	-0.41788	-0.62479	-0.184997484	22.16983	2.34	88.29199	25.2
3	Bosnia and Herzegovina	2016	3.242255212	-1.5841	-0.19301	-0.4868	-0.45214	-0.13902089	23.33038	1.83	88.24403	23
3	Bosnia and Herzegovina	2017	3.244100959	0.8101333	-0.20181	-0.55422	-0.51902	-0.057750978	25.16429	2.78	96.64588	18.5
3	Bosnia and Herzegovina	2018	3.827499205	1.4171081	-0.22558	-0.60617	-0.67087	-0.14139466	24.81202	2.94	98.43207	35.4
3	Bosnia and Herzegovina	2019	2.887343344	0.5627822	-0.22581	-0.64726	-0.70642	-0.128735393	25.19104	2.19	94.51613	36.8
3	Bosnia and Herzegovina	2020	-3.015095148	-1.051296	-0.31614	-0.6431	-1.0757	-0.18239288	23.4677	2.39	82.52165	37.7
3	Bosnia and Herzegovina	2021	7.38996234	1.981639	-0.30326	-0.66608	-1.07317	-0.19508715	26.25302	3.24	96.73911	36.6
3	Bosnia and Herzegovina	2022	4.226811011	14.020844	-0.30698	-0.68432	-1.06496	-0.157615319	27.90267	3.79	110.2053	
3	Bosnia and Herzegovina	2023	1.994395203	6.1059011	-0.35182	-0.58156	-0.96781	-0.141291112	27.0434	4.09	99.63303	
3	Bosnia and Herzegovina	2024	2.480047084	1.6921273					27.47985	3.39	95.1563	
4	North Macedonia	2000	4.549135783	-0.59657	-0.63898	-0.83855	-0.258749276	21.8801	5.77	80.16015	19.4	
4	North Macedonia	2001	-3.067256625					17.35547	12.66	71.47821	15.2	
4	North Macedonia	2002	1.493665472	-0.5763	-0.82606	-0.57117	-0.161741629	20.83022	2.84	71.53348	14.6	
4	North Macedonia	2003	2.222601657	0.8555621	-0.50677	-0.65116	-0.40903	-0.173230603	17.92932	2.41	71.06932	17.3
4	North Macedonia	2004	4.67408958	-0.4486502	-0.19275	-0.55422	-0.18195	0.020573849	21.04592	5.44	80.87048	18.2
4	North Macedonia	2005	4.724088642	0.525516	-0.29717	-0.4884	-0.33218	-0.232430562	19.84555	2.32	85.841	19
4	North Macedonia	2006	5.137025162	3.2136293	-0.53763	-0.40345	-0.13003	-0.09363433	21.40814	6.23	92.55167	19.8
4	North Macedonia	2007	6.473486858	2.251758	-0.4213	-0.39436	-0.23662	0.042447865	23.71269	8.80	106.093	15.7
4	North Macedonia	2008	5.47200139	8.3318967	-0.32038	-0.21142	-0.08984	0.119425923	27.93271	6.17	111.5701	15.6
4	North Macedonia	2009	-0.358614857	-0.739634	-0.29189	-0.14681	-0.13052	0.194719598	25.74248	2.76	87.17675	18.4
4	North Macedonia	2010	3.358750858	1.5099752	-0.30221	-0.09298	-0.18123	0.237565532	24.46809	3.20	97.88107	22.3
4	North Macedonia	2011	2.339886045	3.9047542	-0.26951	-0.10699	-0.22116	0.215584025	26.91313	4.84	113.1919	18.6
4	North Macedonia	2012	-0.456183224	3.3160557	-0.25157	-0.05118	-0.21019	0.264106423	28.92718	3.47	112.2148	18.3
4	North Macedonia	2013	2.925257665	2.7850006	-0.23095	-0.05652	-0.16853	0.247319892	28.80805	3.72	104.8572	21.2
4	North Macedonia	2014	3.629123513	-0.281705	-0.05582	-0.03275	0.015497	0.421686172	30.29523	0.54	112.5379	21.2
4	North Macedonia	2015	3.85586514	-0.2999205	-0.23785	-0.26603	-0.03027	0.359894544	30.40358	2.95	113.6984	23.9
4	North Macedonia	2016	2.848205194	-0.2392908	-0.34437	-0.29793	-0.03379	0.383369863	32.50969	5.15	116.1854	21.4
4	North Macedonia	2017	1.081772738	1.3516189	-0.31062	-0.32859	-0.01766	0.44345054	32.27294	3.37	124.1373	19
4	North Macedonia	2018	2.88059671	1.458313	-0.3085	-0.39262	0.055729	0.515392661	32.32881	5.11	133.2152	20.9
4	North Macedonia	2019	3.910419538	0.7664396	-0.30663	-0.45691	-0.12404	0.441836089	34.26012	4.36	138.5762	17
4	North Macedonia	2020	-4.68845001	1.2000735	-0.10609	-0.49427	0.028258	0.435726047	29.91737	0.06	128.2412	20
4	North Macedonia	2021	4.51067949	3.2307491	-0.10047	-0.37545	-0.12181	0.405005574	32.2208	4.97	146.7214	19.5
4	North Macedonia	2022	2.758884153	14.204717	-0.09689	-0.32399	-0.08138	0.452958882	36.01664	6.13	166.1474	
4	North Macedonia	2023	2.072542088	9.3618725	-0.16804	-0.34862	-0.05132	0.427339256	29.62781	4.05	147.7943	
4	North Macedonia	2024	2.756249173	3.4897409					30.59621	6.23	136.3249	
5	Serbia	2000	6.055092258	-1.27799	-1.15667	-0.83402	-0.857414663	9.063631	0.00	21.10904	22.1	

5	Serbia	2001	6.778519089						14.7411	0.00	53.89508	19.6
5	Serbia	2002	6.541048197		-0.90362	-0.89578	-0.55495	-0.638883829	17.37765	0.00	54.30288	18
5	Serbia	2003	4.559689512		-0.90482	-0.49419	-0.6655	-0.611243188	18.38796	0.00	58.29467	15.7
5	Serbia	2004	6.686867713		-0.73836	-0.49329	-0.25117	-0.467083603	24.85957	0.00	72.28762	14.6
5	Serbia	2005	5.903497983		-0.9487	-0.40605	-0.36093	-0.623985469	21.79439	0.00	71.99255	16.1
5	Serbia	2006	3.900663855		-0.53695	-0.27759	-0.2385	-0.530395031	21.7289	0.00	75.52924	15.3
5	Serbia	2007	7.832071663		-0.46427	-0.34168	-0.25529	-0.437243164	24.89894	9.85	72.71659	14
5	Serbia	2008	5.160892773	12.410987	-0.49175	-0.30246	-0.24973	-0.386879176	25.9134	7.48	75.74325	15.5
5	Serbia	2009	-3.142610465	8.1169509	-0.47446	-0.31794	-0.0702	-0.182950586	18.55458	6.24	63.50172	20.7
5	Serbia	2010	1.610972661	6.1425536	-0.43001	-0.31942	-0.07608	-0.065657973	17.32418	3.89	73.70886	20.5
5	Serbia	2011	0.054272479	11.137398	-0.32505	-0.29929	-0.13248	-0.016896952	18.14994	9.62	75.74936	17.4
5	Serbia	2012	-0.443956029	7.3303859	-0.33284	-0.35743	-0.17335	-0.070326254	18.81038	2.83	82.07668	19.5
5	Serbia	2013	0.451578763	7.6942636	-0.29883	-0.32784	-0.17909	-0.0626247	17.12356	4.08	84.33226	20
5	Serbia	2014	-1.804270248	2.0824479	-0.09478	-0.2474	0.001625	0.181434169	16.47785	4.07	88.3815	23.2
5	Serbia	2015	1.295738512	1.3923582	-0.07578	-0.31858	-0.00261	0.136262819	18.51431	5.67	93.52815	21.2
5	Serbia	2016	2.975197792	1.122314	-0.12702	-0.38332	-0.03861	0.024931239	18.16692	5.58	97.69069	20.9
5	Serbia	2017	2.363393787	3.1310625	-0.17973	-0.43591	0.073256	-0.046661455	19.7184	6.30	102.7404	20
5	Serbia	2018	4.649350355	1.9598408	-0.17032	-0.39657	0.07443	0.099695772	22.49926	7.71	105.5637	21
5	Serbia	2019	4.750207939	1.8492298	-0.14385	-0.45023	-0.01676	0.097264789	24.92663	7.92	107.5773	21.4
5	Serbia	2020	-0.950023992	1.5755329	-0.12301	-0.45147	-0.04292	0.080396354	24.09749	6.24	100.3245	26
5	Serbia	2021	7.949056505	4.0851029	-0.1155	-0.45914	0.012354	0.035520174	24.94509	6.95	112.3423	27.2
5	Serbia	2022	2.630986444	11.981512	-0.11396	-0.45654	0.065176	0.137092441	26.3842	6.90	131.9133	
5	Serbia	2023	3.847471128	12.371904	-0.0745	-0.4472	0.007634	0.137915701	24.61609	6.07	114.4921	
5	Serbia	2024	3.878012796	4.6705297					25.02644	6.20	111.725	
6	Montenegro	2000	3.100000059		0.316736	-0.17751			22.3884	0.00	87.9252	
6	Montenegro	2001	1.099838709						23.43569	0.00	100.4094	
6	Montenegro	2002	1.903936733		0.27407	-0.1567			18.76109	0.00	95.2294	
6	Montenegro	2003	2.482659229		-0.1754	-0.41199			15.41393	0.00	77.59839	
6	Montenegro	2004	4.426050717		-0.21566	-0.46746			16.63114	0.00	100.1097	
6	Montenegro	2005	4.180604509		-0.13882	-0.35425	0.329696	-0.132531121	17.7265	0.00	104.6251	47.6
6	Montenegro	2006	8.56641803		-0.21269	-0.38375	0.161155	-0.549078822	23.65472	0.00	118.1771	44.8
6	Montenegro	2007	6.810150125		-0.19427	-0.38119	-0.2801	-0.127576694	34.49868	25.49	128.8442	42.3
6	Montenegro	2008	7.222752592		-0.0889	-0.23952	-0.01186	-0.070495389	40.83647	21.48	132.4805	38.8
6	Montenegro	2009	-5.795096995		-0.01655	-0.21935	-0.00797	0.029315198	26.67111	37.42	99.82558	49.2
6	Montenegro	2010	2.734331082		-0.06361	-0.2539	0.132998	-0.007252727	22.27012	18.33	98.8685	49.1
6	Montenegro	2011	3.228451021	3.4501431	-0.05886	-0.22293	0.076654	0.000100756	19.1045	12.35	106.7527	42.8
6	Montenegro	2012	-2.723790771	4.1452472	-0.05848	-0.12976	0.120514	0.034414675	20.07428	15.18	108.78	45.9
6	Montenegro	2013	3.548979912	2.2058927	-0.03438	-0.2873	0.153825	0.093567498	18.8467	10.10	103.786	49.3
6	Montenegro	2014	1.783698581	-0.7105141	0.014001	-0.07553	0.293321	0.175064266	19.49501	10.85	100.4384	46
6	Montenegro	2015	3.390381397	1.5486916	-0.04568	-0.12352	0.166538	0.226326779	19.73579	17.45	104.1257	43
6	Montenegro	2016	2.949280321	-0.271385	-0.13513	-0.08208	0.13511	0.234211266	24.95989	5.20	104.136	43.9
6	Montenegro	2017	4.716465276	2.380236	-0.11164	-0.08498	0.171341	0.323530018	28.64672	11.67	106.7114	37.8
6	Montenegro	2018	5.077888811	2.6112238	0.002768	-0.01476	0.090412	0.391958714	31.35133	8.94	111.0989	40.6
6	Montenegro	2019	4.062944992	0.3615637	-0.00743	-0.0302	0.106434	0.394997239	30.91225	7.62	110.0161	38.7
6	Montenegro	2020	-15.30689376	-0.2556557	-0.04059	-0.04374	-0.10667	0.42420873	30.08752	11.24	87.8612	39.6
6	Montenegro	2021	13.04346425	2.410802	-0.08406	-0.04409	-0.03048	0.420747459	25.46857	11.91	105.7192	39.6
6	Montenegro	2022	6.406680329	13.040304	-0.12612	-0.11875	-0.02748	0.543230414	27.58259	13.96	125.4559	
6	Montenegro	2023	6.337697542	8.5847691	-0.04216	-0.07931	0.247063	0.374201149	25.44749	6.88	116.8067	
6	Montenegro	2024	3.040315798	3.3367501					25.88019	7.25	109.9441	
7	Moldova	2000	2.107716082	31.299302	-0.4687	-0.6232	-0.53564	-0.13722226	23.94696	9.90	126.1631	5.7
7	Moldova	2001	6.100000399	9.7646629					23.28236	6.99	124.5007	5.6
7	Moldova	2002	7.799999658	5.3012439	-0.62616	-0.98035	-0.58602	-0.403108656	21.66018	5.06	129.8395	5.8
7	Moldova	2003	6.599999958	11.746079	-0.53945	-0.88417	-0.66701	-0.41021201	23.1776	3.72	140.0565	5.9
7	Moldova	2004	7.399999734	12.524277	-0.36707	-1.03958	-0.84572	-0.430486381	26.35915	5.81	132.6991	4.8
7	Moldova	2005	7.500000149	11.959184	-0.35153	-0.67263	-0.75349	-0.460677326	30.82556	6.38	143.0236	4.3
7	Moldova	2006	4.799999837	12.777756	-0.51765	-0.64321	-0.79971	-0.348091394	32.74808	7.59	137.1548	5
7	Moldova	2007	3.000000226	12.367167	-0.50661	-0.66076	-0.83271	-0.283888221	38.10555	12.18	142.7205	4.4
7	Moldova	2008	7.800000145	12.783047	-0.42404	-0.63443	-0.78443	-0.201783881	39.22792	12.00	134.4216	4.9
7	Moldova	2009	-6.000000264	-0.0627186	-0.4346	-0.70146	-0.55626	-0.144404069	23.1419	4.85	110.3633	4.8
7	Moldova	2010	7.100000107	7.4838509	-0.35761	-0.67187	-0.65665	-0.132566243	23.85179	4.26	87.93785	20
7	Moldova	2011	5.818166147	7.687251	-0.32768	-0.62515	-0.6076	-0.103003003	24.04867	4.43	98.6176	20.4
7	Moldova	2012	-0.589733955	4.5463343	-0.32301	-0.61426	-0.55792	-0.11593055	24.19852	2.88	96.30641	22.1
7	Moldova	2013	9.043865607	4.597879	-0.3701	-0.75398	-0.40767	-0.085767806	24.9382	2.55	95.6873	23.8
7	Moldova	2014	4.999625854	5.0887855	-0.24621	-0.85431	-0.41993	0.014869669	23.78257	3.68	94.22829	24.3
7	Moldova	2015	-0.338235622	9.6762403	-0.38367	-0.94736	-0.72114	-0.080935068	24.06209	2.90	88.96642	24.7
7	Moldova	2016	4.646014363	6.359309	-0.52922	-0.99066	-0.69379	-0.133195177	21.98689	1.10	89.00468	25.3
7	Moldova	2017	4.175612051	6.57023	-0.45183	-0.83493	-0.57729	-0.052342266	21.93895	1.57	88.62339	26.1
7	Moldova	2018	4.075595466	3.045054	-0.4388	-0.75802	-0.50597	-0.032315399	26.59181	2.75	87.44679	25.3
7	Moldova	2019	3.552314085	4.8377835	-0.45809	-0.651	-0.44143	-0.047521766	25.10366	4.44	87.63224	22
7	Moldova	2020	-8.27597832	3.7659712	-0.51501	-0.587	-0.5336	-0.010916068	23.86444	1.35	79.26572	22.3
7	Moldova	2021	13.92999979	5.1064113	-0.35734	-0.4695	-0.4378	0.003381098	26.85613	2.82	88.47089	21.4
7	Moldova	2022	-4.6	28.737298	-0.2864	-0.34224	-0.3076	0.101790711	27.31043	4.03	112.1177	
7	Moldova	2023	1.2	13.41701	-0.15266	-0.28034	-0.16495	0.105498053	20.08459	2.16	93.99462	
7	Moldova	2024	0.103059412	4.6777352					21.13123	2.52	88.66612	
8	Ukraine	2000	5.9		-1.09372	-1.11061	-0.67599	-0.405505002	19.80378	1.84	115.7357	1.2
8	Ukraine	2001	8.800000004						21.81319	2.01	99.92613	1.2
8	Ukraine	2002	5.339647207		-0.844	-1.09139	-0.69551	-0.624253511	20.19066	1.58	95.99467	1
8	Ukraine	2003	9.516609864		-0.82322	-0.96666	-0.67391	-0.555056512	21.94264	2.74	102.5902	1
8	Ukraine	2004	11.79535253		-0.77509	-0.97934	-0.66646	-0.347879618	21.09587	2.55	109.9817	1.2
8	Ukraine	2005	3.071230392		-0.80454	-0.74064	-0.67129	-0.510850072	22.50653	8.75	94.64757	1.3
8	Ukraine	2006	7.571420763	9.0525249	-0.82137	-0.77278	-0.52343	-0.486631006	24.54276	5.01	89.18105	1.8
8	Ukraine	2007	8.215844452	12.83878	-0.74636	-0.82017	-0.72482	-0.409717262	27.78117	6.85	88.04656	2.4
8	Ukraine	2008	2.243491596	25.226462	-0.70302	-0.86251	-0.78746	-0.516110599	27.39259	5.69	94.17189	2.7
8	Ukraine	2009	-15.13646791	15.881192	-0.78673	-1.07174	-0.84437	-0.559112489	17.06841	3.92	87.47616	3
8	Ukraine	2010	4.092004367	9.3729311	-0.84416	-1.03196	-0.82075	-0.454440266	18.37237	4.57	95.72973	2.9
8	Ukraine	2011	5.44528081	7.9557247	-0.85114	-1.08671	-0.86709	-0.5637				

9	Georgia	2000	1.840381179		-0.9385	-1.04017	-0.42815	-0.51660037	26.58132	4.30	62.6614	47.2
9	Georgia	2001	4.807298672						30.32775	3.41	63.32993	53.1
9	Georgia	2002	5.474024887		-1.08406	-1.26414	-0.71264	-0.736232042	28.50118	4.72	71.62913	56.8
9	Georgia	2003	11.057031		-0.91225	-0.65077	-0.1985	-0.617242515	29.09588	8.39	77.63338	55.3
9	Georgia	2004	5.792682927		-0.74977	-0.45957	-0.55612	-0.437420189	30.98745	9.61	79.04075	54.5
9	Georgia	2005	9.591138329		-0.69596	-0.21285	-0.42787	-0.604643524	33.3296	7.07	84.5296	41.5
9	Georgia	2006	9.421480812	9.1609651	-0.46167	0.050152	-0.24479	-0.128548279	29.73481	15.12	89.12537	37.2
9	Georgia	2007	12.57556982	9.2448975	-0.34446	-0.12884	0.1216	0.29865846	33.45455	18.60	88.39341	36.2
9	Georgia	2008	2.42161441	9.9994876	-0.26294	-0.10208	0.305029	0.475642592	27.68979	12.52	86.29822	36.3
9	Georgia	2009	-3.650752296	1.7275146	-0.19932	-0.12204	0.297785	0.508792341	13.98588	6.14	78.19304	36.7
9	Georgia	2010	6.246408653	7.110179	-0.20598	0.012302	0.327388	0.586639822	20.92915	7.41	81.67339	39.1
9	Georgia	2011	7.934336525	8.5429333	-0.11962	0.11752	0.578813	0.651625037	23.12075	7.56	85.46594	31.5
9	Georgia	2012	6.57883102	-0.9436589	-0.00622	0.397421	0.630566	0.664130926	26.02762	5.73	89.73488	28.7
9	Georgia	2013	5.132885312	-0.5120584	0.00491	0.46362	0.606947	0.725804985	21.70009	5.97	93.81391	32.4
9	Georgia	2014	4.090490596	3.0688121	0.224749	0.828279	0.424184	0.760027528	25.65036	10.22	94.9507	30.7
9	Georgia	2015	3.351023503	4.0035782	0.222805	0.700735	0.263112	0.750866294	26.87716	11.40	97.01631	27.5
9	Georgia	2016	3.45021518	2.1349271	0.335772	0.713531	0.420896	0.861489713	28.90311	10.75	94.92625	27.2
9	Georgia	2017	5.159902617	6.0353173	0.262743	0.759496	0.481504	0.949060202	25.12482	11.72	102.5843	27.5
9	Georgia	2018	6.062036413	2.6152447	0.270511	0.724817	0.518134	1.031990647	27.9263	7.28	109.8477	27.4
9	Georgia	2019	5.380719266	4.8528982	0.248692	0.716545	0.766199	1.026524186	27.16823	7.93	117.8101	24.7
9	Georgia	2020	-6.290471785	5.2024649	0.222878	0.601493	0.716738	1.001167655	24.60569	3.48	92.89108	23.4
9	Georgia	2021	10.64423366	9.5669143	0.144437	0.66108	0.616529	1.05341959	20.67885	6.84	101.6009	25.2
9	Georgia	2022	10.95853214	11.898165	0.169469	0.62042	0.650143	1.032308698	24.06666	9.04	114.6954	
9	Georgia	2023	7.832201266	2.4877606	0.177279	0.617695	0.791286	0.946578145	24.99879	6.86	107.1512	
9	Georgia	2024	9.428572202	1.1097176					24.4999	4.69	103.4565	
10	Armenia	2000	5.900000003		-0.50102	-0.84809	-0.54642	-0.172101572	21.92233	5.45	72.23333	7.2
10	Armenia	2001	9.599999999						22.90436	3.30	69.86427	5.4
10	Armenia	2002	13.2		-0.43853	-0.77817	-0.04577	0.056333646	25.4183	4.66	73.9845	8.9
10	Armenia	2003	14		-0.30286	-0.64902	-0.19725	0.167570353	28.34795	4.38	80.05137	9.8
10	Armenia	2004	10.5		-0.48195	-0.70346	-0.11826	0.109250002	29.12256	6.91	73.07063	8.7
10	Armenia	2005	13.9		-0.38878	-0.68335	-0.1425	0.089062668	35.76544	5.96	70.13974	6.5
10	Armenia	2006	13.2		-0.54457	-0.66923	-0.2615	0.292330682	42.22546	7.31	61.03014	7.7
10	Armenia	2007	13.7		-0.49652	-0.74589	-0.38191	0.265207171	44.35162	7.25	56.97505	7
10	Armenia	2008	6.9		-0.33775	-0.71241	-0.17795	0.300939858	47.94284	8.09	54.54233	6.4
10	Armenia	2009	-14.1		-0.46871	-0.62146	-0.0269	0.27345407	41.14505	8.79	57.27424	7.8
10	Armenia	2010	2.2		-0.48136	-0.69504	-0.17152	0.268946558	38.81475	5.72	64.64298	9.4
10	Armenia	2011	4.699999999	7.6500081	-0.43771	-0.66456	-0.11503	0.246940598	31.9218	6.44	69.43557	8
10	Armenia	2012	7.200000001	2.5580201	-0.41828	-0.588	-0.03239	0.334273398	24.68095	4.68	75.96168	6.6
10	Armenia	2013	3.3	5.7896678	-0.34089	-0.53053	0.078317	0.235182688	22.15249	3.11	77.55505	6.8
10	Armenia	2014	3.600000001	2.9813087	-0.41773	-0.56545	-0.25733	0.158519909	21.28304	3.50	75.77887	7.1
10	Armenia	2015	3.199999999	3.7316912	-0.46255	-0.60975	-0.33179	0.189176843	20.73053	1.74	71.68207	10.7
10	Armenia	2016	0.2	-1.4036076	-0.16089	-0.6598	-0.31255	0.205158383	18.01551	3.17	76.07797	13.2
10	Armenia	2017	7.500000002	0.9695533	-0.20939	-0.63702	-0.25155	0.228397325	18.42174	2.19	87.20238	12.6
10	Armenia	2018	5.2	2.5202338	-0.19721	-0.40937	-0.17058	0.350590289	22.39974	2.14	92.47311	11.1
10	Armenia	2019	7.599999999	1.4434466	-0.17746	-0.22704	-0.22605	0.242604271	17.40853	0.74	97.847	10.3
10	Armenia	2020	-7.199999999	1.2114358	-0.12583	-0.00347	-0.30455	0.238748029	19.66383	0.46	70.12136	8.4
10	Armenia	2021	5.800000001	7.1848363	-0.11984	0.048685	-0.2822	0.131828442	22.96388	2.64	79.24891	9.1
10	Armenia	2022	12.6	8.6409111	-0.16952	0.027907	-0.31479	-0.019078802	22.25513	5.00	103.8786	25.1
10	Armenia	2023	8.3	1.9804188	-0.12202	0.0584	-0.18413	0.047635019	22.94131	2.40	123.4188	
10	Armenia	2024	5.9	0.269512					23.83275	0.51	150.0647	
11	Azerbaijan	2000	11.09999914		-1.14564	-1.29238	-0.9514	-0.859866619	20.67358	2.46	78.54857	2.1
11	Azerbaijan	2001	9.899999691						20.67688	14.36	78.81519	1.8
11	Azerbaijan	2002	9.438916342		-0.9642	-1.1955	-0.98521	-0.731832385	34.57649	32.47	92.81814	2.4
11	Azerbaijan	2003	10.20830001		-0.88464	-1.04623	-0.93323	-0.601958394	53.17148	55.07	107.5519	2.9
11	Azerbaijan	2004	9.253801326		-0.90052	-1.18083	-0.93377	-0.621019125	57.99043	54.37	121.5071	3.1
11	Azerbaijan	2005	27.96153807		-0.79261	-1.05252	-0.74181	-0.580545425	41.53484	33.80	115.8419	3.4
11	Azerbaijan	2006	34.46620936	8.3289248	-0.88593	-1.09591	-0.67119	-0.52337569	29.85938	21.38	105.2624	2.9
11	Azerbaijan	2007	25.46321591	16.699755	-0.88002	-1.12907	-0.80223	-0.466508985	21.52501	13.90	96.64181	3.8
11	Azerbaijan	2008	10.59143729	20.849087	-0.83616	-1.15665	-0.78588	-0.367752314	18.69363	8.16	89.2429	3.1
11	Azerbaijan	2009	9.369502784	1.4570484	-0.87918	-1.19408	-0.66452	-0.316738784	18.94864	6.55	74.74404	3.3
11	Azerbaijan	2010	4.78883271	5.7268722	-0.89115	-1.24537	-0.81302	-0.392555356	18.05958	6.34	74.98599	4.4
11	Azerbaijan	2011	-1.572997621	7.8583333	-0.93873	-1.19531	-0.7724	-0.386364639	20.26785	6.80	80.50805	3.5
11	Azerbaijan	2012	2.202939023	1.0662134	-0.87953	-1.14269	-0.79076	-0.488716811	22.31672	7.60	78.26307	2.8
11	Azerbaijan	2013	5.843415762	2.4157175	-0.75626	-0.97075	-0.45218	-0.425340503	25.65794	3.53	74.67584	2.5
11	Azerbaijan	2014	2.797585434	1.3734418	-0.69701	-1.02283	-0.31359	-0.268493652	27.51004	5.89	69.48323	2.1
11	Azerbaijan	2015	1.049546368	4.0276857	-0.71654	-0.95257	-0.25879	-0.37079981	27.91357	7.63	72.60151	2.3
11	Azerbaijan	2016	-3.063598454	12.443375	-0.53936	-0.85264	-0.15938	-0.395615548	25.68134	11.88	90.07732	1.9
11	Azerbaijan	2017	0.153614647	12.935918	-0.58492	-0.90653	-0.17138	-0.37242043	24.37893	7.02	90.40232	1.9
11	Azerbaijan	2018	1.500401707	2.2685469	-0.6198	-0.85323	-0.14513	-0.314388335	20.12948	2.98	91.67258	1.9
11	Azerbaijan	2019	2.479808934	2.6105718	-0.61043	-0.84968	-0.12816	-0.223895654	20.30778	3.12	85.81815	1.7
11	Azerbaijan	2020	-4.198960792	2.7598095	-0.72964	-1.07808	-0.15526	-0.336040139	23.66595	1.19	72.01787	1.3
11	Azerbaijan	2021	5.616440269	6.6502991	-0.60677	-0.84789	0.213475	-0.065053962	17.0786	-3.11	76.28687	1.3
11	Azerbaijan	2022	4.714680379	13.852259	-0.62555	-1.04091	-0.04121	-0.103344202	12.00371	-5.68	86.98227	
11	Azerbaijan	2023	1.354477318	8.7854305	-0.56659	-1.19547	-0.03264	-0.108809568	17.74319	0.35	83.53589	
11	Azerbaijan	2024	4.071402105	2.2121719					21.08242	0.31	82.68987	

Table A2. Year fixed effects estimates

Year	Coefficient	Std. Error	P-Value
2002	4.401	1.864	0.018
2003	2.251	2.972	0.449
2004	1.791	2.134	0.401
2005	4.831	2.914	0.097
2006	8.281	5.154	0.108
2007	5.078	3.646	0.164
2008	3.026	2.473	0.221
2009	-6.352	4.099	0.121
2010	0.338	1.973	0.864
2011	-0.843	1.465	0.565
2012	-2.502	2.514	0.320
2013	0.298	3.085	0.923
2014	-2.323	3.040	0.445

2015	-1.976	2.229	0.375
2016	-1.348	1.658	0.416
2017	-0.349	1.815	0.847
2018	0.207	2.033	0.919
2019	0.136	2.211	0.951
2020	-9.192	3.582	0.010**
2021	4.969	2.578	0.054*

	---- Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fe	re	Difference	S.E.
law	-9.044067	1.46668	-10.51075	2.919535
corr	5.329602	-4.345357	9.674959	1.781468
gov	1.79115	-2.995839	4.786989	1.531662
reg	14.5061	8.189683	6.316418	2.359078
inflation	-.2246989	-.1592244	-.0654745	.0114974
gcf	-.0125989	-.0937667	.0811678	.0372823
fdi	.3437218	.4774127	-.1336909	.0961099
trade	.1061848	-.01047	.1166548	.0246279
energyren	.5025251	-.0828347	.5853597	.0984637
2002bn.year	5.471313	4.401369	1.069945	.
2003.year	6.594921	2.25136	4.343561	.
2004.year	8.29517	1.790995	6.504174	.
2005.year	8.538326	4.831111	3.707216	.
2006.year	5.743193	8.281464	-2.53827	.
2007.year	3.613786	5.077605	-1.46382	.
2008.year	1.100134	3.026248	-1.926115	.
2009.year	-8.347582	-6.352037	-1.995545	.
2010.year	-3.818721	.3380219	-4.156743	.
2011.year	-4.191668	-.8433708	-3.348297	.
2012.year	-7.120352	-2.501575	-4.618777	.
2013.year	-5.27603	.298086	-5.574116	.
2014.year	-8.459697	-2.322574	-6.137123	.
2015.year	-7.135111	-1.97635	-5.158762	.
2016.year	-7.323969	-1.348221	-5.975749	.
2017.year	-6.613545	-.3494232	-6.264122	.
2018.year	-8.348223	.2073145	-8.555538	.7961602
2019.year	-8.087826	.1357828	-8.223609	.5963771
2020.year	-15.73882	-9.192343	-6.546478	.5553818
2021.year	-2.983046	4.968727	-7.951773	.7465718

b = consistent under Ho and Ha; obtained from xtreg  
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(29) = (b-B)'[(V\_b-V\_B)^(-1)](b-B)  
= 36.59  
Prob>chi2 = 0.1570  
(V\_b-V\_B is not positive definite)

Figure A1. The complete Hausman test results

Dynamic panel-data estimation, two-step system GMM

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-----
Group variable: id                Number of obs   =    153
Time variable : year             Number of groups =    10
Number of instruments = 12       Obs per group: min =    11
F(10, 9) = 497.45                avg =    15.30
Prob > F = 0.000                  max =    20
-----

```

gdpgrowth	Coef.	Corrected Std. Err.	t	P> t	[95% Conf. Interval]	
gdpgrowth						
L1.	.0662158	.3025729	0.22	0.832	-.6182517	.7506834
inflation	-.0680226	.113364	-0.60	0.563	-.3244697	.1884245
law	0	(omitted)				
corr	8.47684	16.43461	0.52	0.618	-28.70082	45.6545
gov	-1.404755	3.731041	-0.38	0.715	-9.844956	7.035446
reg	-7.406246	12.08676	-0.61	0.555	-34.74839	19.9359
gcf	.1762272	.1892135	0.93	0.376	-.2518035	.6042579
fdi	.434157	.204046	2.13	0.062	-.027427	.8957411
trade	.0653147	.0532068	1.23	0.251	-.0550476	.1856769
energyren	-.0659676	.0924668	-0.71	0.494	-.275142	.1432068
_cons	-4.367078	9.936339	-0.44	0.671	-26.84464	18.11048

Instruments for first differences equation

```

Standard
D.(inflation law corr gov reg gcf fdi trade energyren)
GMM-type (missing=0, separate instruments for each period unless collapsed)
L2.L.gdpgrowth collapsed

```

Instruments for levels equation

```

Standard
inflation law corr gov reg gcf fdi trade energyren
_cons
GMM-type (missing=0, separate instruments for each period unless collapsed)
DL.L.gdpgrowth collapsed

```

```

-----
Arellano-Bond test for AR(1) in first differences: z = -1.97 Pr > z = 0.049
Arellano-Bond test for AR(2) in first differences: z = -0.93 Pr > z = 0.351
-----

```

```

Sargan test of overid. restrictions: chi2(1) = 0.03 Prob > chi2 = 0.853
(Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(1) = 0.00 Prob > chi2 = 1.000
(Robust, but weakened by many instruments.)

```

esttab pooled fe re mundlak, se star(\* 0.10 \*\* 0.05 \*\*\* 0.01)

	(1)	(2)	(3)	(4)
	gdpgrowth	gdpgrowth	gdpgrowth	gdpgrowth
inflation	-0.159** (0.0646)	-0.225*** (0.0303)	-0.159*** (0.0597)	-0.225*** (0.0315)
law	1.467 (3.023)	-9.044* (4.716)	1.467 (1.899)	-9.044* (4.897)
corr	-4.345** (2.112)	5.330*** (1.554)	-4.345* (2.595)	5.330*** (1.614)
gov	-2.996* (1.709)	1.791 (1.459)	-2.996 (2.076)	1.791 (1.515)
reg	8.190*** (2.647)	14.51* (6.813)	8.190* (4.179)	14.51** (7.075)
gcf	-0.0938 (0.0924)	-0.0126 (0.0905)	-0.0938 (0.123)	-0.0126 (0.0940)
fdi	0.477* (0.242)	0.344 (0.236)	0.477* (0.263)	0.344 (0.245)
trade	-0.0105 (0.0201)	0.106* (0.0470)	-0.0105 (0.0202)	0.106** (0.0488)
energyren	-0.0828* (0.0444)	0.503*** (0.136)	-0.0828** (0.0414)	0.503*** (0.141)
2000.year	0 (.)	0 (.)	0 (.)	0 (.)
2002.year	4.401** (2.029)	5.471* (2.677)	4.401** (1.864)	5.471** (2.780)
2003.year	2.251 (3.287)	6.595* (3.282)	2.251 (2.972)	6.595* (3.408)
2004.year	1.791 (2.446)	8.295** (3.625)	1.791 (2.134)	8.295** (3.765)
2005.year	4.831* (2.598)	8.538** (3.730)	4.831* (2.914)	8.538** (3.873)
2006.year	8.281* (4.329)	5.743 (4.209)	8.281 (5.154)	5.743 (4.371)
2007.year	5.078 (3.929)	3.614 (2.984)	5.078 (3.646)	3.614 (3.098)
2008.year	3.026 (2.000)	1.100 (1.899)	3.026 (2.473)	1.100 (1.971)
2009.year	-6.352* (3.539)	-8.348*** (2.525)	-6.352 (4.099)	-8.348*** (2.622)
2010.year	0.338 (2.431)	-3.819** (1.319)	0.338 (1.973)	-3.819*** (1.370)

2011.year	-0.843 (2.303)	-4.192** (1.568)	-0.843 (1.465)	-4.192** (1.629)
2012.year	-2.502 (2.497)	-7.120** (2.252)	-2.502 (2.514)	-7.120*** (2.338)
2013.year	0.298 (2.812)	-5.276** (1.637)	0.298 (3.085)	-5.276*** (1.700)
2014.year	-2.323 (2.708)	-8.460*** (1.384)	-2.323 (3.040)	-8.460*** (1.437)
2015.year	-1.976 (2.112)	-7.135*** (1.838)	-1.976 (2.229)	-7.135*** (1.908)
2016.year	-1.348 (2.631)	-7.324*** (1.794)	-1.348 (1.658)	-7.324*** (1.863)
2017.year	-0.349 (2.247)	-6.614*** (1.702)	-0.349 (1.815)	-6.614*** (1.768)
2018.year	0.207 (2.442)	-8.348*** (1.917)	0.207 (2.033)	-8.348*** (1.991)
2019.year	0.136 (2.491)	-8.088*** (1.525)	0.136 (2.211)	-8.088*** (1.583)
2020.year	-9.192*** (3.351)	-15.74*** (3.031)	-9.192** (3.582)	-15.74*** (3.148)
2021.year	4.969* (2.663)	-2.983* (1.621)	4.969* (2.578)	-2.983* (1.683)
mean_infla~n				-0.00596 (0.0864)
mean_law				15.95*** (5.311)
mean_corr				-9.358*** (2.800)
mean_gov				-7.368*** (1.380)
mean_reg				-6.743 (4.915)
mean_gcf				-0.189 (0.172)
mean_fdi				0.697*** (0.201)
mean_trade				-0.192*** (0.0522)
mean_energ~n				-0.700*** (0.124)
_cons	3.902 (3.660)	-13.00* (7.055)	3.902 (2.621)	19.25*** (4.001)
N	154	154	154	154



vif

Variable	VIF	1/VIF
inflation	2.07	0.483512
law	9.54	0.104790
corr	8.80	0.113599
gov	4.63	0.215863
reg	8.19	0.122038
gcf	2.00	0.499012
fdi	2.17	0.461588
trade	1.80	0.556284
energyren	2.44	0.409680
year		
2002	2.29	0.437241
2003	3.46	0.288950
2004	3.41	0.293341
2005	3.47	0.288543
2006	8.30	0.120512
2007	7.84	0.127545
2008	9.69	0.103229
2009	10.63	0.094035
2010	10.40	0.096164
2011	12.19	0.082067
2012	12.87	0.077695
2013	13.02	0.076814
2014	12.87	0.077672
2015	12.14	0.082404
2016	12.67	0.078913
2017	12.43	0.080449
2018	12.76	0.078370
2019	12.83	0.077940
2020	13.08	0.076427
2021	12.45	0.080302
Mean VIF	8.29	

**Figure A2.** Dynamic panel-data estimation, two-step system Generalized Method of Moments (GMM)