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Abstract

We investigate the dynamic impact of institutions on economic growth using a panel dataset of 87 countries divided into two sets of middle-income and high-income for a period covering the years 2000-2020. The study aims to address certain gaps in the literature with regard to the transition mechanism of the impact of institutions on economic growth, the direction of causality, and the econometric complications associated with the excessive use of readily available aggregated indices. We provide a critical overview of the available institutional indices and construct two weighted indices from 21 indicators closely relating to the meaning of the term institutions as the *rules of the game* defined by Douglas North. Then we analyze the role of institutions on the effect of investment on economic growth using Generalized Method of Moments (GMM). We also examine the direction of causality from economic growth to institutional development. Results show that institutions more significantly influence economic growth through investment than the total factor productivity channel. While regulatory quality is found to have a larger impact on economic performance in high-income countries, improved legal systems and protected private property rights are more important for growth in middle-income countries. The results from the Granger non-causality test provide evidence for a strong effect of institutional development on output in the context of high-income and middle-income countries and a weaker impact of growth on institutions in the middle-income group.

Keywords: Institutions, Property Rights, Regulations, Economic Growth, Transmission Mechanism, GMM.

1. Introduction

Institutions are now widely accepted as important factors in explaining economic performance. Quality institutions, in particular, economic institutions such as property rights, quality of regulations, effective law enforcement mechanisms, institutions for macroeconomic stabilization, etc., influence economic growth by making the business environment more predictable via establishing a structure on the interactions of the people (Rodrik, 2008). Economic institutions also significantly improve resource distribution by reducing rent-seeking activities and encouraging efficient investment choices (Iqbal and Daly, 2014).

Over the last decades, an evolving body of literature has emphasized the crucial role of institutions in economic performance (e.g., North, 1990; Acemoglu, Johnson, and Robinson 2001; Dollar and Kraay 2003; Rodrik, Subramanian, and Trebbi 2004; Flachaire, García-Peñalosa, and Konte 2014; Nawaz 2015). However, certain aspects of the institutions-growth nexus still have received relatively less attention and remain ambiguous. In this paper, we re-examine the role of institutions in economic growth. Our study differs from the existing literature and contributes to it in four significant ways. First, using explanatory factor analysis, we construct two weighted sub-indices and a composite weighted index of institutional quality. These indices, in our view, more closely reflect the idea of institutions as *rules of the game* than the ones in the existing literature. Second, we attempt to disentangle the direct effect of institutions on economic growth from its effect on economic growth via investment. Third, we examine whether the impact of the institutions of legal system, property rights and regulatory quality on economic growth differs among countries categorized by their levels of per capita income. Finally, we examine the reverse causality from growth to institutions as well.

To the best of our knowledge, the studies closest in spirit to our work are Dawson (1998) and Aparicio, Urbano, and Audretsch (2016). However, these studies are based on readily available subjective measures of freedom and liberty. Siddiqui and Ahmed (2013) departs from using available indices and constructs three measures of institutions, institutional and policy rents, political rents, and risk-reducing technologies. But their study is based on a very short period of only 5 years, during which institutions might have hardly changed. Further, the indicators they use are associated mainly with economic and political liberty (e.g., political freedom, civil liberty, business freedom, press freedom rank, absence of violence) and policy factors (e.g., price control, political competition, voice and accountability). Also, most of these studies rely on estimation methods which, in our view, are inappropriate for the research question under consideration. For instance, methods like fixed effect and random effect produce inconsistent and biased results in the presence of endogeneity and unobserved heterogeneity, which are quite prevalent in the context of dynamic panel models.

In this study, we use an alternative econometric approach which is more appropriate in the current context, namely, the generalized method of moments (GMM), which accounts for the problems of endogeneity, measurement error, omitted variable bias, and unobserved country heterogeneity in dynamic panel models (Bond, Hoeffler, and Temple 2001). The empirical investigation is carried out on a sample of 87 countries divided into middle-income and high-income groups for a period covering the years 2000-2020. Because of data limitations, we were compelled to drop the group of low-income countries from this analysis.

The rest of the paper is organized as the following. Section two provides an overview of the literature. Section three elaborates on the construction of institutional metrics. Section four discusses the data and estimation methodology. Section five presents the results, and section six concludes the paper.

2. Literature Review

There is extensive literature on determinants of growth. Solow (1956) and Swan (1956) emphasized the accumulation of physical capital and [exogenous] technological change as the main determinants of growth. Mankiw, Romer, and Weil (1992) presented the augmented Solow model with human capital. They emphasized human capital as an important determinant of economic performance and showed a better fit of the MRW model to the data. The initial works by Romer (1986; 1990), Lucas (1988), and Rebelo (1991), with the important contributions from Aghion and Howitt (1992) and Grossman and Helpman (1991), introduced a theory of endogenous technological change by incorporating R&D and theories of imperfect competition into the growth framework (Barro and Sala-i-Martin 2004, 19). In these models, technological advances result from purposive R&D activities and determine the long-run growth within the model, thus giving rise to the designation 'endogenous growth theories' (Barro and Sala-i-Martin 2004, 20). The traditional neoclassical growth models, however, largely bypass the role of institutions as the important impact factors for factor accumulation, factor productivity, and economic growth.

The debate on the role of institutions in promoting economic growth received substantial attention over the last few decades. The pioneering work of the New Institutional Economists — Ronald Coase (1937; 1960), Douglas North (1990), Olson (1996), Williamson (1998), and Greif (1993), among others, emphasize institutions as the key determinant of cross-country differences in income. North (1990, 3) defines institutions as "the rules of the game in a society or, more formally, the humanly devised constraints that shape human interaction." Acemoglu and Johnson (2005) disaggregated institutions as a combination of three interrelated concepts: 1) the economic institutions such as property rights, entry barriers, contract enforcement mechanisms, tax-transfer schemes, etc., that govern the structure of incentives (incentives of economic agents to invest, make transactions, accumulate factors), and thus affect economic growth. 2) Political power that determines the distribution of economic resources and the structure and quality of economic institutions, and 3) Political institutions—consisting of institutions that allocate *de jure* political power across groups. In their view, the interactions between these three categories of institutions govern the institutional development and the performance of economies.

Empirical studies have also confirmed the fundamental role of institutional quality in economic growth. Knack and Keefer (1995) found that quality bureaucracy, political stability, and property rights positively influence economic growth. Hall and Jones (1999) studied the drivers of cross-country variations in income using the International Country Risk Guide (ICRG) database. They found that the differences in factor accumulation, factor productivity, and growth rate of output across countries are driven by differences in the quality of institutions and government policies that they refer to as 'social infrastructure.' They conclude that the countries with the best institutional quality had experienced 25-38 times higher GDP per worker than countries with the worst institutions. Rodrik (2000) studied the role of property rights institutions, macroeconomic stability, conflict management, and institutions of social insurance. He asserted countries with better institutional capacity recorded a higher growth rate.

The empirical literature on the role of institutions received a big boost after the hugely influential work of Acemoglu, Johnson, and Robison (2001). They used colonial history to derive econometric identifications and found that European settlers' mortality rate might be used as an indicator of how good or bad the institutions were in a colonial country and, thereby, which country had grown richer and which fell behind. Settlers' mortality rate as a proxy for institutional quality is highly criticized in the literature (e.g., Albouy, 2012; Lloyd and Lee, 2018). Out of the 64 countries in their sample, only 28 countries have settlers' mortality rates that originate within their borders; the other 36 countries are giving rates based on the authors' presumption of the similarity of disease environments (Lloyd and Lee, 2018). Acemoglu, Johnson, and Robinson (2002; 2005) showed that institutional capacity has a stronger impact on an economy's long-term growth than short-run performance. And Olson, Sarna, and Swamy (2000) and Méon and Weill (2005) concluded that countries with strong institutions exhibit higher total factor productivity.

Rodrik, Subramanian, and Trebbi (2004) provided a comparative study of the effects of geography, trade, and institutions on income levels in a sample of 80 countries. Their results indicate that institutions significantly influence income levels. But the measure of geography and trade, once institutions are controlled for, have a weak effect on the growth rate of income. La Porta, Lopez-De-Silanes, and Shleifer (2008), summarizing a series of their earlier works (La Porta et al. 1997; 1998) argued that legal origins, broadly interpreted as "persisting mechanisms of social control of economic life," have important consequences for legal and regulatory structures as well as for the economic performance. Their important contribution was that the differences in today's socioeconomic outcomes could be traced back to fundamental variations in legal traditions—with the common law proving more conducive to economic success as compared to civil law. Vedia-Jerez, Daniel and Coro (2016), using contract intensive money (CIM) as a proxy for institutional quality, found that institutions have had a substantial impact on the long-run economic growth of South American countries. In a country specific study, Nirola and Sahu (2019) explored the interactive effects of the size of government and institutional quality across states of India. They found that government consumption negatively impacts economic growth. But the extent of the negative impact of the government size is mitigated with better institutional quality, i.e., the higher a state's quality of institutions, the less severe the adverse impact of government expenditure on the economic growth of that state.

Another group of empirical studies has explored the freedom-growth nexus. Scully (1988) has analyzed the link between political, civil, and economic freedom and economic growth using the Gastil index of civil liberty and political rights. His analysis showed that politically open societies grow at three times the growth rate of countries where these freedoms are limited. Flachaire, García-Peñalosa, and Konte (2014) studied the role of political institutions measured by the degree of democracy and economic institutions measured by the index of economic freedom on economic growth. Their findings show that the influence of economic institutions on growth is larger in low-democracy than the high-democracy regimes, and political institutions only indirectly affect growth by determining the regime type. Buterin, Škare and Buterin (2017) using the economic freedom index as a measure of institutional quality, tested the impact of institutions on economic growth and expansion of the share of exports in GDP in a number of transition economies. Their results support the hypothesis of a positive and significant effect of institutional reform on economic growth. On the contrary, Barro (1996) found that the overall impact of democracy on economic growth is weakly negative, and there is some indication of a nonlinear relationship between the two, where democracy positively affects growth at low levels of political freedom but has a negative impact on economic growth when a moderate level of political freedom is attained. Some other studies (e.g., De Haan, J. and Siermann 1998; De Haan and Sturm 2000; Ganau 2017) found no relation between political and economic freedom and output growth.

Though the empirical studies have largely demonstrated the role of institutions as the important determinants of long-run growth, certain aspects of institutions and growth literature require further scrutiny. First, the literature largely remains silent on the transmission mechanism of the effect of institutions on economic growth. Second, most econometric studies on the institutions-growth nexus suffer from endogeneity, measurement error, and specification issues (De Haan and Sturm 2000; Dollar and Kraay 2003; Doucouliagos and Ulubasoglu 2006). These econometric complications result from the use of composite indices that integrate several variables with differing impacts and less sophisticated estimation methods. The composite indices also restrain understanding of which aspects of institutions are more important for growth across different development stages. Third, the literature, with a few exceptions, assumes the direction of causality running from institutions to economic growth without exploring the likelihood of reverse causality. This study aims to fill these gaps in the literature.

3. Measurement of Institutions

Despite the substantial progress being made over the recent decades in collecting comprehensive sets of data, the measurement of institutions is still in its nascent period of development and therefore one of the less understood areas. The empirical research on the institution-growth nexus

(Knack and Keefer 1995; Flachaire, García-Peñalosa, and Konte 2014; Ganau 2017; Antonakakis et al. 2017 and most of the studies reviewed above) largely adhere to using readily available composite institutional indices. The widely used measures include Worldwide Governance Indicators (WGI) (Kaufmann, Kraay, and Mastruzzi, 2011); Economic Freedom of the World index (Gwartney et al., 2018); index of Economic Freedom (Miller, Kim, and Roberts, 2018); Freedom in the World index by Freedom House; Business Environment Risk Intelligence index (BERI); International Country Risk Guide (ICRG) indicators by Political Risk Services Group; the Polity index by Center for Systematic Peace (CSP) and the Global Competitiveness index by the world economic forum.

These measures of institutions while containing tremendous information suffer from a number of limitations as subjective aggregated indices. First, technical complications, such as measurement error, endogeneity, multicollinearity among sub-indicators, and loss of specificity due to the agglomeration of the different variables into a single composite index (see Moers, 1999 and Chang, 2011). Second, the application of the simple averaging method and equal weighting for aggregating sub-indicator into an index, besides ignoring the relative importance of indicators, leads to a biased representation of variables with huge missing values. For instance, the Economic Freedom of the World index (EFW) leaves out the indicators with missing values and takes an average of the remaining variables. But in the end, the resulting index is reported as a composite index of certain indicators, including the ones with missing values, which, in effect, are not part of the calculation. This, at best, is misleading.

Moreover, certain sub-indices become incomparable across institutional dimensions, across time or across countries in some cases because they are based on different indicators. Take the example of the Area 2 sub-index of the EFW for the Bahamas, Barbados, Iran, Rwanda, etc., for 2005. The index for the Bahamas comes from 3 out of 9 indicators different from the 4 out of 9 indicators used for creating the index for Barbados, Iran, and Rwanda. This results in (a) an inaccurate ranking of countries with missing data for different indicators, (b) an unreasonably high or low value of the index for some countries, and (c) the final index being incorrectly reported as if it is an index of nine indicators. This problem is extensive in all datasets before 2020. The 2020 dataset uses the "autoregressively back-casting" method to fill up some cases of missing values. But still, the problem persists. Moreover, the application of an autoregressively back-casting exercise in the 2020 dataset suddenly changes the values of indices, which is unusual. We had to look at the dataset very closely while selecting indicator components to overcome these challenges. We have used a mix of the complete case analysis (CCA) and dropping variables (DV) methods to address the challenge of substantial missing data. And multiple imputation method is used for calculating missing values for variables with a couple of missing values.

Third, most of these indices (the polity IV, Fraser institute's Economic Freedom of the World index, freedom house's index of Political Rights and Civil Liberty, the heritage foundation's index of Economic Freedom, etc.) include certain components which are not directly relevant to the notion of institutions. By definition, objective, and construction, these indices are designed to measure policy outcomes or the extent of economic, civil, or political freedom across countries, not exactly the quality of *the rules of the game—institutions*. In other words, as noted in De Haan, Lundström, and Sturm (2006), amongst other shortcomings, it is not entirely clear whether the composite measures of economic freedom capture institutions or policies. While some indicators, like protection of property rights, regulations, and the legal structure, are part of the institutional context, others can be seen as measures of liberty and policy choices uncorrelated with institutional constraints. The use of the composite freedom indices as proxies for institutional quality is, therefore, an inadvertent detraction from the objective of assessing the importance of institutional quality toward analyzing the impact of freedom and policy measures on economic growth.

Similarly, the index of worldwide governance indicators that is extensively used in the literature captures mostly governance rather than institutional environment. Conceptually, 'institutional quality' is different from 'good governance.' While institutions are largely understood as rules of the game that constrain behavior (North, 1990), governance refers to the actual governance of contractual relations and the "play of the game" (Williamson, 2000, 597). Also, according to Williamson (2000), institutions are comprised of embedded formal and informal rules, such as property rights and bureaucracy, etc., that change significantly slower than the speed by which governance changes.

In this paper, we intend to address these shortcomings by creating two *weighted* indices of institutional quality using explanatory factor analysis. Our primary objective here is to choose indicator components that are closely related to the meaning of the term institutions understood as '*rules of the game'* in institutional theory (e.g., Coase, 1960; Olson, 1982; North, 1990; Cheung, 1970; Lueck, 1995 and others). According to Douglas North, institutions are “the humanly devised constraints,” including informal constraints (e.g., customs, traditions, sanctions, taboos, and codes of conduct) and formal rules (e.g., constitution, regulations, laws, property rights) that structure social, political and economic interactions (North, 1990, 10). All major works of Douglas North (e.g., North, 1973, 1990, 1981, 2006) emphasize on protection of property rights, credible commitments understood as effective enforcement of property rights and contractual arrangements, enhanced rule of law and independent judiciary as factors with decisive role in explaining economic growth and change. North considers the two main institutions—property rights and contract enforcement as the significant causes of the 17th-century English industrial revolution.

North’s critics, however, purport that the weakness of his theory is that he extensively emphasizes property rights for economic growth, while there are also non-institutional factors that play a significant role in the economic development of societies (Demsetz, 2008, 65-82). For North (1981, 21; 1990, 33), property right is the right to exclude. This notion has been criticized as too legalistic (Faundez, 2016). It is also not apparent whether the rules of the game for Douglas North are just heuristic devices that would assist us in understanding economic processes or are the cause that determines the activity of individuals (Faundez, 2016).

Similarly, Greif (2006, 30) understands institutions as interrelated equilibria “of rules, beliefs, norms, and organizations that together generate a regularity of (social) behavior.” Ronald Coase emphasizes the crucial role of the legal system in a world of positive transaction costs, though he does not provide a detailed account of market-supporting institutions (Medema, 2011). Williamson and Ostrom, however, emphasize “institutional arrangements (governance structures)” rather than “institutional environment—*rules of the game* (Spithoven, 2019). Acemoglu and Robinson (2012) follow the footsteps of the North and provide a political-economic model through which they describe the persistence of inefficient institutions as driven by the vested interests of the political elites who prefer sustaining a structure that best serves their interest. The old institutional economists have quite the same understanding of the role of institutions as “constraining and enabling behavior” that shapes beliefs, values, and preferences (Rutherford, 2013, 347), though they differ in their “methodology and normative stances” from the new institutionalists (Spithoven, 2019).

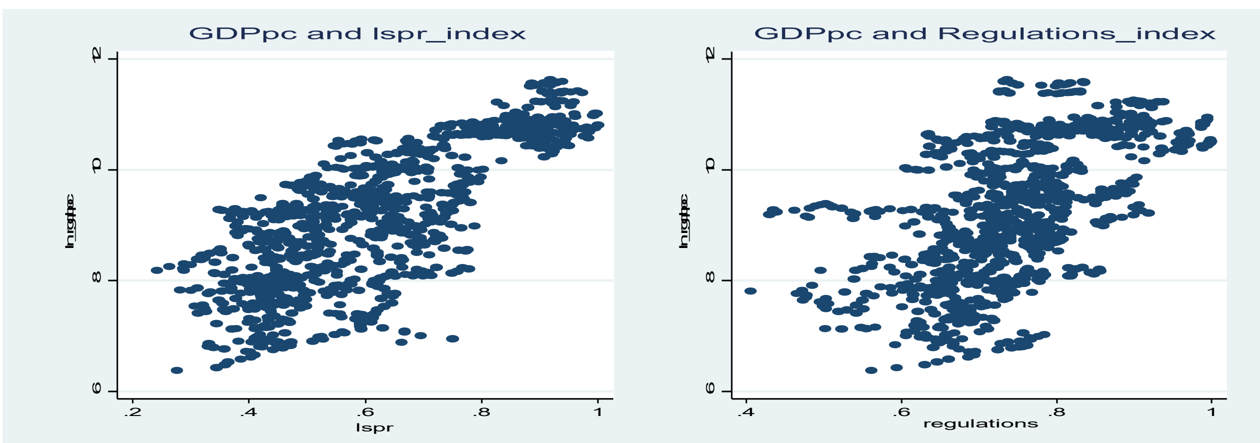
In this paper, we, therefore, use indicators of the disaggregated dimensions of formal economic institutions of property rights, laws and contract enforcement, and regulatory structures. We have retrieved the data for 21 selected variables from the database of economic freedom of the world (Gwartney et al., 2018) and the database of the worldwide governance indicators (Kaufmann et al., 2011) and applied factor analysis to create indices. In order to avoid one variable having an undue influence on principal factor components, we have standardized the variables to have zero means and unit variances at the start of the analysis (Nardo et al., 2005). The data varies approximately between 0 and 1, with higher values corresponding to better institutional quality. We have applied principal component factor analysis to extract factors. It is the most preferred method for creating composite indices as it allows for the construction of weights (JRCEC, 2008, 69). We have used varimax rotation to minimize the number of individual indicators that have a high loading on the same factor and obtain a simpler structure of factors in which each indicator is loaded exclusively on one of the retained factors. The indicator components are distinguished into two groups, legal system and property rights and regulatory quality, based on their loadings to one of the two groups. We used the Kaiser–Meyer–Olkin (KMO) measure to verify the sampling adequacy for the analysis. $KMO = 91.8$ suggests that the sample size is adequate for factor analysis. Average Bartlett's test of sphericity $[\chi 2 = 2147; p - value < 0.001]$ shows that the correlations between indicators were sufficiently large for PCA. Based on the scree plots and Kaiser rule of eigenvalues greater than 1, we retained only 2 components. On average, component 1 explains 77.9 percent, and component 2 explains 13.33 percent of the variance in data. The average cumulative variance explained by the two components is 81.23 percent. Individual indicators' weights showing the level of importance of each indicator in sub-indices are computed using equation 1, and indicators are aggregated into sub-indices of legal system property rights and regulatory quality using equation 2.

$$W_i = \frac{L_{ij}^2}{F_j} \dots \dots \dots 1 \qquad\qquad I_j = \sum_{i=1}^{n} X_i W_i \dots \dots \dots \dots \dots 2$$

Where W_i is the weight of indicator i in factor j, L_{ij} is the loading of $i - th$ indicator in $j - th$ factor, F_j is the total variance explained by $j - th$ factor, I_j is the sub-index j and X_i is the vector of the original standardized indicators. Factor analysis is applied separately for each year (Table 10 and figure 2 in the appendix provide factor loadings and scree plots across years).

The legal system and property rights index is composed of 16 indicators, including judicial independence, impartial courts, protection of property rights, military interference in the rule of law, integrity of legal system, legal enforcement of contracts, reliability of police, regulatory trade barriers, centralized collective bargaining, mandated cost of worker dismissal, impartial public administration, tax compliance, control of corruption, government effectiveness, regulations, and rule of law. The regulatory quality index consists of 5 variables—administrative requirements, licensing restrictions, starting business,[1] regulatory burden, and hiring and firing regulations.[2] For robustness check, we have created a conventional *weighted* composite index combining subindices of legal system and property rights and regulatory quality. Pearson's rank correlation, given in figure 1, shows a positive rank correlation between GDP per capita and our measures of institutional quality.

Figure 1: Pearson's rank correlation (GDP per capita and the measures of institutions)



4. Data and Estimation Methodology

The dataset in this study covers 87 countries (44 high-income and 43 middle-income) over the period 2000-2020. The sources of the data are world development indicators (WDI)—World Bank,

[1] The extent to which regulations and bureaucratic procedures restrain entry and reduce competition.
[2] We dropped a couple of indicators from Area 4 of EFW that were relevant to our perception of institutions but had extensive missing values. We excluded Area 1 because it is all about the size of the government. We have included a direct independent variable in the model that captures the size of the government. Adding this area to the index would have led to duplication and identification issues. Similarly, we left out some variables from Area three and Area four, like "control of the movement of capital and people," "Freedom of foreigners to visit," "capital controls," etc., as they do not relate closely to our perception of institutions.

world economic outlook (WEO)—IMF, Penn World Table (PWT 10.0), Fraser institute's database of the economic freedom of the world, and the Worldwide Governance Indicators, World Bank. The data for real GDP per capita, gross capital formation, and trade volume are drawn from the WDI database. The government expenditure data is from the WEO database, IMF, and the education index[3] from Penn world table 10.0 is used as a proxy for human capital. For the institutional indicators, we relied on the Fraser institute's database of the economic freedom of the world (Gwartney et al., 2018) and worldwide governance indicators (Kaufmann et al., 2011). Variables used for the analysis and their respective measuring units are listed in table 1 below.

Table 1: Variables and Measurement Units

Code	Variables	Units	Source
$ln\_rgdppc-ln\_rgdppc_{t-1}$	log real GDP per capita	growth rate	WDI, WB
$ln\_rgdppcg_{t-1}$	lag log real GDP per capita	growth rate	WDI, WB
gexp	government total expenditure	percent of GDP	WEO, IMF
gcf	domestic investment	percent of GDP	WDI, WB
hc	human capital	years of schooling*return to education	PWT
trade	volume of trade of goods and services	percent of GDP	WDI, WB
lspr	legal system and property rights index	Index	EFW & WGI
regu	regulation index	Index	EFW & WGI
comp_inst	composite index of institutions	Index	EFW & WGI

Some macroeconomic studies of growth accounting use the five years average filtering of the variables aiming to avoid business cycle fluctuations. However, as highlighted in Attanasio, Picci, and Scorcu (2000) and Salahuddin, Islam, and Salim (2009), this practice might lead to a massive loss of annual information and cross-sectional heterogeneity without much success in removing business cycle effects. We thus prefer to use the annual data for all the variables from 2000 to 2020.

[3] The index is based on years of schooling and returns to education.

Estimating dynamic panel models is often problematic because the lagged dependent variable and the equation's disturbance terms are correlated (see Nickell, 1981). This causes the traditional panel data estimators to be inconsistent and biased in the usual large N and small T cases. The most favored approach that provides consistent estimation in dynamic models is the Generalized Method of Moments (GMM) (Harris and Mátyás, 2004) which was first developed by Anderson and Hsiao (1982). GMM generalizes the traditional method of moments (MM) by allowing the number of moment conditions to be greater than the number of parameters (Hall, 2005, 33-37). But it has several advantages over MM and IV approaches. By utilizing the maximum (optimal) number of moment conditions, GMM yields more efficient results than traditional MM and IV approaches in the presence of heteroscedasticity (Blundell and Bond, 1998; Harris and Mátyás, 2004; Siddiqui and Ahmed, 2013). GMM also corrects for the endogeneity problem—Nickell bias, omitted variable bias, and unobserved country heterogeneity—in dynamic panel models and thus can be used more conveniently to perform inference about the parameters in dynamic models (Bond, Hoeffler and Temple, 2001; Leszczensky and Wolbring, 2022; Harris and Mátyás, 2004). A significant advantage of GMM over less sophisticated methods like fixed effects is that it allows each country to have its specific production function instead of imposing a single technology on several heterogeneous cross-sections. A dynamic model estimated by GMM also helps in modeling persistence effects and accounting for serial correlation in the error term.

This method was extensively improved by Arellano and Bond (1991), who introduced the two-step first difference GMM as a system of equations. Subsequently, Arellano and Bover (1995) and Blundell and Bond (1998) presented the system GMM. They used the lagged differences as instruments for endogenous covariates, as they found lagged differences to be more efficient instruments. Both difference GMM and System GMM are designed for "small T, large N panels," i.e., fewer time periods and a larger number of cross-sections (Roodman, 2009). This paper uses the Arellano—Bover/Blundell—Bond two system GMM to estimate equations 11 and 14. For robustness check, we also evaluate the model using one step system GMM.

Following Mankiw, Romer, and Weil (1992), we start with a standard endogenous growth model considering a representative country having the following production function.

$$Y_{it} = A_{it} K_{it}^{\alpha} H_{it}^{\beta} L_{it}^{1-\alpha-\beta} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots..3$$

Where Y, A, K, H, and L are the standard notations for output, total factor productivity, physical capital, human capital, and labor.

We assume that the economies under investigation are characterized by a production function that exhibits the standard characteristics of twice continuously differentiable, constant return to scale, and diminishing marginal products, formally:

$$F_K(K,H,L,A) > 0, F_H(K,H,L,A) > 0, F_L(K,H,L,A) > 0, f(0) = 0$$

$$F_{KK}(k,h,l) < 0, F_{HH}(K,H,L,A) < 0, F_{LL}(K,H,L,A) < 0, k,h,l > 0$$

The income per capita for the $i-th$ representative country is defined as:

$$y_{it} \equiv \frac{Y_{it}}{L_{it}} \equiv A_{it}\hat{y}_{it} \equiv A_{it}f(k_{it},h_{it}) \equiv A_{it}k_{it}^{\alpha}h_{it}^{\beta} \dots\dots\dots\dots 4$$

Where $\hat{y}_{it} = \frac{Y_{it}}{A_{it}L_{it}}$ denotes the output per effective unit of labor.

The equations of motions of physical capital and human capital are defined as:

$$\dot{k_{it}} = s_k\hat{y}_{it} - (\delta_k + g + n)k_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 5$$

$$\dot{h_{it}} = s_h\hat{y}_{it} - (\delta_h + g + n)h_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 6$$

Where $y = Y/L$ is the level of output per unit of effective labor, $k = K/L$ is the stock of capital per unit of effective labor, s_k and s_h are the fractions of income invested in physical capital and human capital, respectively, n is the exogenous growth rate of population and δ is the depreciation rate of capital.

Equations 5 and 6 imply that the $i-th$ economy converges to the steady-state equilibrium[4] levels in terms of effective physical capital and human defined by:

$$k_i^* = \left\{\left(\frac{s_{k,i}}{n_i + g_i + \delta_k}\right)^{1-\beta}\left(\frac{s_{h,i}}{n_i + g_i + \delta_h}\right)^{\beta}\right\}^{\frac{1}{1-\alpha-\beta}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 7$$

[4] The steady state equilibrium is defined in terms of effective physical capital and human capital, which satisfies the following two conditions: $s_k y^* - (\delta_k + g + n)k^* = 0 \wedge s_h y^* - (\delta_h + g + n)h^* = 0$

$$h_i^* = \left\{\left(\frac{s_{k,i}}{n_i + g_i + \delta_k}\right)^{\alpha}\left(\frac{s_{h,i}}{n_i + g_i + \delta_h}\right)^{1-\alpha}\right\}^{\frac{1}{1-\alpha-\beta}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..8$$

Consequently, using equations 4, 7 and 8 together, one can derive the steady-state income per capita of $i - th$ country as the following.

$$y_{it}^* \equiv \frac{Y_{it}}{L_{it}} = A_t\left(\frac{s_{k,i}}{n_i + g_i + \delta_k}\right)^{\frac{\alpha}{1-\alpha-\beta}}\left(\frac{s_{h,i}}{n_i + g_i + \delta_h}\right)^{\frac{\beta}{1-\alpha-\beta}} \ldots\ldots\ldots 9$$

In the standard neoclassical growth theory, variable A (total factor productivity) can represent technological and other non-technological factors like institutions, climate, etc. Thus, we assume that the effect of institutions on growth occurs through total factor productivity[5], i.e.

$$A_t = I_{it}^{\theta} + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 10$$

Where, I_{it}^{δ} is the institutional quality variable and ε_{it} is the error term that captures other technological and non-technological factors. Substituting 10 into 9 and taking logs, we get the following equation, which we use for estimation:

$$lny_{it} = \left(\frac{\alpha}{1-\alpha-\beta}\right).ln\left(\frac{s_k}{n_i + g_i + \delta_k}\right) + \left(\frac{\beta}{1-\alpha-\beta}\right).ln\left(\frac{s_h}{n_i + g_i + \delta_k}\right) + \theta.lnI_{it} + \varepsilon_{it} \ldots 11$$

To capture the convergence effect (dynamism) and avoid the omitted variable bias, we add the lagged output and the control variables vector into specification 11.

5. Results and Discussions

5.1. Descriptive Statistics

The descriptive statistics for the dependent and explanatory variables given in Table 2 indicate that the average growth rate of real GDP per capita is 2.2 percent and 1.4 percent for middle-income and high-income countries, respectively, with a large discrepancy between countries – as low as -21.3 percent and as high as 21.5 percent. As expected, the institutional variables and the human capital indicator have the highest mean in high-income countries, indicating the institutional superiority of high-income countries and, correspondingly, their developed economic status. The

[5] We relax this assumption in section 5.3.

descriptive statistics also show that all variables are at their ordinary magnitudes – there are no outliers or exceptional values in the dataset.

The correlation coefficient matrix given in table 3 provides evidence for satisfactory levels of correlations between all variables. There are no multicollinearity problems or an exceptionally high degree of correlation between variables. As expected, the two subindices of institutional quality are highly correlated with the composite index, which indicates some consistency in our construction of the metrics of institutions. As there is a high correlation between institutional variables, if used together in an equation, that may cause multicollinearity. To avoid this problem and analyze the disaggregated effect of institutions, we test different measures of institutions independently in separate regressions.

The impact of Institutions on economic growth is expected to be different based on a country's stages of development, history, and the length of time horizon being investigated. As noted by Nawaz, Iqbal, and Khan (2014), there are numerous instances of institutions with similar natures and characteristics that have produced extremely different outcomes in different contexts. For example, in Latin American countries, similar laws and policies caused varying levels of economic development. To reflect on the importance of different types of institutions for the different stages of development, the analysis in this paper is carried out using a composite index and two disaggregated measures of institutional quality. Also, we isolate the influence of institutional quality based on the levels of development by dividing the sample into middle-income and high-income groups.

Table 2: Descriptive Statistics

	Middle income countries					High income countries				
Variables	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
ln_rgdppc	860	0.022	0.038	-0.213	0.356	880	0.014	0.037	-0.156	0.215
ln_rgdppc$_{t-1}$	817	0.026	0.030	-0.159	0.127	836	0.017	0.034	-0.156	0.215
gcf	893	24.11	7.23	8.93	50.78	903	23.34	4.74	10.66	54.69
hc	903	2.38	.45	1.31	3.43	924	3.17	.39	2.08	4.35
gexp	903	13.96	4.50	.95	35.66	924	18.56	4.10	8.41	27.93
trade	903	73.29	37.84	20.72	220.40	924	113.68	79.01	19.56	442.62
lspr	903	.27	.14	0	.61	924	.69	.16	.28	1
regu	903	.42	.11	0	.81	924	.47	.16	.06	1
comp_index	903	.29	.13	0	.65	924	.68	.16	.30	1

Table 3: Matrix of Correlation Coefficients

Variables	ln_rgdppc	ln_rgdppc$_{t-1}$	gcf	hc	gexp	trade	lspr	regu	comp index
ln_rgdppc	1.000								
ln_rgdppc$_{t-1}$	-0.431	1.000							
gcf	0.285	0.337	1.000						
hc	0.366	0.333	0.090	1.000					
gexp	-0.258	-0.226	-0.180	0.470	1.000				
trade	0.265	0.041	0.052	0.262	0.031	1.000			
lspr	0.505	0.514	0.325	0.504	0.528	0.373	1.000		
regu	0.257	0.240	0.228	0.220	0.090	0.371	0.107	1.000	
comp_index	0.594	0.566	0.311	0.698	0.489	0.403	0.890	0.618	1.000

5.2. Panel unit root test and descriptive statistics

The literature includes several methods of panel unit root tests with various advantages over one another. In this paper, we use the panel unit-root test proposed by Im, Pesaran, and Shin (2003) to test the presence of unit root in the data. Based on the (augmented) Dickey-Fuller statistics averaged across the groups, the IPS test entails estimating the following model.

$$\Delta Y_{it} = \alpha_i + \rho_i Y_{i,t-1} + \sum_{j=1}^{k} \beta_j \Delta Y_{i,t-1} + \mu_i t + \theta_t + \varepsilon_{it} \ldots \ldots \ldots \ldots \ldots 12$$

Where Δ is the first difference operator, μ_i and θ_t are the country-specific fixed effect and time effect, respectively, and k is the lag length. The null hypothesis for the test is $\rho_i = 0$, against the alternative hypothesis of $\rho_i < 0 for all i = 1,2,3, \ldots, N$. IPS statistic is defined as:

$$\overline{Z} = \frac{\sqrt{N}(\overline{t}_{NT} - \mu_T)}{\sqrt{\vartheta_T}} \ldots \ldots \ldots \ldots \ldots 13$$

Where $\overline{t}_{NT} = \left(\frac{1}{N}\right)\sum_{i=1}^{N} t_i$, μ_T and ϑ_T are the mean and variance, respectively and t_i is the t-statistic of $\hat{\beta}_i = 0$. The test results reported in Table 4 show that the human capital series is integrated of order one for both samples and government expenditure is integrated of order one in the sample of high income countries. We, therefore, include the first difference of these variables on the right hand side of the respective equations. The three indices of institutions, the growth rate of output per capita, measures of domestic investment and trade volume, and government expenditure—in middle income sample, are all stationary at levels I(0).

Table 4: Results obtained from Im, Pesaran, and Shin panel unit root tests

	Middle Income Countries		Conclusion	High Income Countries		Conclusion
Variables	**Level**	**Difference**		**Level**	**Difference**	
rgdppcg	-4.174 (0.000)		I(0)	-7.482 (0.000)		I(0)
gcf	-3.320*** (0.000)		I(0)	-5.142*** (0.00)		I(0)
hc	3.9972 (1.00)	3.743*** (0.08)	I(1)	3.365.48 (0.999)	3.177*** (0.0985)	I(1)
trade	-3.647 (0.000)		I(0)	-4.2467 (0.000)		I(0)
gexp	-2.99*** (0.001)		I(0)	-1.173*** (0.120)	-8.486*** (0.000)	I(1)
lspr	-4.924*** (0.00)		I(0)	-4.432*** (0.00)		I(0)
regu	-11.337*** (0.00)		I(0)	-11.349 (0.000)		I(0)
comp_index	-6.724*** (0.00)		I(0)	-7.918*** (0.01)		I(0)

P-values in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Note: *H0:* All panels contain unit roots. *H1:* Some panels are stationary

5.3. Empirical Results

The regression results showing the impact of institutional quality on economic growth are given in tables 6 and 7 for the middle-income and high-income countries, respectively. The dependent variable is the growth rate of real GDP per capita. Explanatory variables include domestic investment, human capital, the volume of trade of goods and services, government consumption, and the measures of institutional quality. The first lag of the dependent variable is also included on the right-hand side as a control variable to make the model dynamic and capture the convergence effect. Other things equal, we would expect countries starting poorer to experience a higher rate of growth as they face lower labor to capital ratio, thus higher marginal products of capital – the idea that was first proposed by Solow (1956). Another control variable in the model is the size of the government measured by general government total expenditure. A minimum level of government consumption for the provision of basic services is always essential. However, if the size of the government is too large, it may negatively impact economic growth from the supply side. This is evident from the neoclassical growth models with government expenditure. However, it might also positively impact the output from the demand side. The results of this study indicate that initial income and government consumption are negatively correlated with output growth. The negative effect of government consumption might be due to its adverse impact on saving or its crowding-out effect on the level of private investment. These findings are consistent with the earlier studies (e.g., Barro, 1991; Mankiw, Romer and Weil 1992; Romero-Ávila and Strauch, 2008; Bergh and Karlsson, 2010).

All institutional indices are positively and significantly related to the GDP per capita growth rate in both the samples of middle-income and high-income countries. While regulatory quality is found to have a comparatively higher impact on economic growth in high income countries, the quality of legal system and property rights assumes more importance for boosting economic growth in middle-income countries. This implies that for an average middle income country, improving the quality of its legal system and protecting and enforcing property rights is critical for improving economic growth. But an average high income country, which has already obtained a threshold level of the quality of the legal system and property rights, will gain a higher growth rate by relaxing regulatory restrictions on product and labor markets. The values of the estimated coefficients of the index of legal system and property rights for middle-income and high-income countries (column 1 in tables 5 and 6) imply that a 1 unit increase in the quality of the legal system and property right increases the long-term growth rate of real GDP per capita of an average middle-income country by 9 percent and that of an average high-income country by 3.05 percent. These results imply that secure property rights and an independent judicial system reduce individuals' and firms' risk of incurring investment losses by facilitating the effective enforcement of contracts. This, in turn, encourages investment, innovation, and profitable exchange among the economic actors, which are the features of a prospering modern economy.

The coefficients of the variable regulatory quality (column 2 in tables 5 and 6) show that a 1 point increase in regulatory quality leads to a 2.23 percent increase in per capita output of an average middle-income country and a 6.88 percent increase in the per capita GDP of an average high-income country. This finding is in line with the hypothesis that lower regulatory restrictions reduce transaction costs, including information costs, contract enforcement costs, policing, bargaining costs, etc., and facilitate the productive employment of capital resources by providing a conducive environment for exchange and economic activities. In a nutshell, the results indicate that over the period 2000-2020, middle income countries, on average, gained more from improvements in the quality of property rights and improved legal systems, and high-income economies benefited more from better regulatory quality in the form of lesser administrative and regulatory restrictions.

Among non-institutional factors, the conventional covariates of human capital, trade, and investment are found to have consistently positive effects on economic growth. A 1 percent increase in the volume of trade as a percentage of GDP has improved the growth rate of real GDP per capita by 6.5 percent and 1.3 percent in an average middle-income and high-income country, respectively (see column 3 in tables 5 and 6). The greater magnitude of the impact of the volume of trade for economic growth in the context of middle-income countries can be justified by the fact that as middle-income countries are not yet fully integrated into the global market, the growth benefit of imports and exports (the marginal productivity of trade flow) accruing to these countries is relatively higher than for fully integrated high income countries.

The results further indicate a positive and significant influence of human capital for both high-income and middle-income countries and a comparatively higher impact of human capital on economic growth in the context of middle-income countries. A 1 point increase in the human capital index increases economic growth by 7.2 percent in an average middle-income country and 4.7 percent in an average high-income country (column 3 in tables 5 and 6). This result shows that human capital is a crucial factor in the production process that determines the ability of an economy to manage its other factors of production and enhance innovation and productivity. The effect of domestic investment on growth is also significant at any conventional level for both groups of countries. The findings are in line with the existing studies on the relationship between human capital, trade liberalization, investment, and economic growth (Teixeira and Queirós, 2016; Dritsakis and Stamatiou, 2016; Alam and Sumon, 2020).

Table 5: Regression results for Middle income countries

	Two step system GMM			One step system GMM		
Explanatory variables	(1) rgdppcg	(2) rgdppcg	(3) rgdppcg	(4) rgdppcg	(5) rgdppcg	(6) rgdppcg
rgdppcg_1	-0.363**	-0.382***	-0.331**	-0.221*	-0.287**	-0.184
	(0.1118)	(0.1037)	(0.1156)	(0.0980)	(0.1058)	(0.0946)
gcf	0.0351***	0.0384**	0.0337**	0.0259***	0.0325***	0.0242***
	(0.0014)	(0.0014)	(0.0014)	(0.0013)	(0.0014)	(0.0013)
hc	0.0725	0.128**	0.0726	0.0979***	0.130***	0.0950***
	(0.0389)	(0.0456)	(0.0390)	(0.0129)	(0.0162)	(0.0131)
gexp	-0.0252**	-0.0318***	-0.0253**	-0.0284***	-0.0315***	-0.0274***
	(0.0078)	(0.0075)	(0.0081)	(0.0034)	(0.0036)	(0.0034)
trade	0.0612*	0.0105**	0.0650*	0.0604***	0.0935***	0.0610***
	(0.0023)	(0.0043)	(0.0033)	(0.0061)	(0.0047)	(0.0054)
lspr	0.090**			0. 087***		
	(0.1306)			(0.0393)		
regu		0.0223*			0.0173**	
		(0.0665)			(0.0186)	
compindex			0.094**			0.091***
			(0.1404)			(0.0380)
No. of obs.	809	809	809	809	809	809
No. of groups	43	43	43	43	43	43
No. of inst.	8	8	8	8	8	8
AR2(p-value)	0.198	0.243	0.215	0.618	0.507	0.630
Hansen (p-value)	0.202	0.215	0.201			

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Regression results for high income countries

	Two step system GMM			One step system GMM		
Explanatory variables	(1) rgdppcg	(2) rgdppcg	(3) rgdppcg	(4) rgdppcg	(5) rgdppcg	(6) rgdppcg
rgdppcg_1	-0.00374	0.0668	0.0271	0.0535	0.105*	0.0654
	(0.0554)	(0.0455)	(0.0526)	(0.0514)	(0.0473)	(0.0506)
gcf	0.0302***	0.0251***	0.0291***	0.0246***	0.0193***	0.0239***
	(0.0018)	(0.0015)	(0.0018)	(0.0013)	(0.0013)	(0.0013)
hc	0.0519	0.0474*	0.0470	0.0680***	0.0365**	0.0681***
	(0.0269)	(0.0215)	(0.0272)	(0.0111)	(0.0125)	(0.0119)
gexp	-0.0147**	-0.00907**	-0.0122*	-0.0149***	-0.00727***	-0.0140***
	(0.0050)	(0.0033)	(0.0047)	(0.0023)	(0.0020)	(0.0022)
trade	0.0165	0.00182	0.0132	0.0195***	0.00476	0.0175***
	(0.0021)	(0.0031)	(0.0051)	(0.0043)	(0.0049)	(0.0055)
lspr	0.0305**			0.0319***		
	(0.0500)			(0.0140)		
regu		0.0688**			0.0645**	
		(0.0288)			(0.0116)	
compindex			0.0597***			0.0580**
			(0.0493)			(0.0111)
No. of obs.	836	836	836	836	836	836
No. of groups	44	44	44	44	44	44
No. of inst.	8	8	8	8	8	8
AR2 (p-value)	0.432	0.549	0.398	0.411	0.587	0.432
Hansen (p-value)	0.409	0.119	0.413			

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.4. The transmission mechanism of the influence of institutions

To investigate the transmission channel of the effect of institutional quality on economic growth, we estimate equation 14 below, where we have introduced an interaction term between institutions and investment variables to determine the level of effect of institutions on the impact of investment on economic growth.

$$lnY_{it} = \alpha_i + \beta_i lnY_{i,t-1} + \theta_i lnK_{it} + \gamma_i lnH_{it} + \delta_i I_{it} + \rho_i (I_{it} * lnK_{it}) + \sigma_i X_{it} + \varepsilon_{it} \dots\dots 14$$

Where Y_{it} is the output, K_{it} is the investment, H_{it} the human capital, I_{it} the institutional variable, and X_{it} is a vector of control variables. The coefficients of the investment variable in tables 5 and 6 show the impact of domestic investment on economic growth when the institutional indicator is also included as an independent variable in the model. A 1 percent increase in domestic investment as a percentage of GDP increases economic growth by 3.37 percent in an average middle-income country and 2.91 percent in an average high-income country (see column 3, tables 5 and 6). When an interaction term is introduced in the model to capture the transmission channel of the effect of institutions, the magnitude of the impact of investment on the growth rate of GDP per capita significantly improves. Now, a 1 percent increase in domestic investment as a percentage of GDP leads to an 8.1 percent[6] increase in economic growth in an average middle-income country and a 6.6 percent[7] rise in the growth rate of an average high-income country (see columns 1 and 2 in table 7).

To minimize the overfitting of the model, we have paid careful attention to the number of instruments utilized in the GMM estimator. Roodman (2009) noted that the risk of instrument proliferation is very high in the difference and system GMM. A higher number of instruments weaken the power of the Hansen test of over-identification and overfit endogenous variables. Roodman (2009) suggests that, as a rule of thumb, the number of instruments should be lower than the number of groups. The number of instruments in our analysis is kept far below the number of cross-sections. In our model, we consider that the explanatory and control variables of the model are endogenous or at least pre-determined due to the inclusion of lagged dependent variable on the right hand side and presence of reverse causality among variables. Therefore, we have used lagged first-differences of explanatory and control variables as instruments in the iv-style. Extabond-2 is used for estimating system GMM, which yields more robust standard errors. We have also tested for over-identification of instruments using the Hansen test, which has the null hypothesis of "over-

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[6] $8.1 = (0.069 + 0.3 * 0.04) * 100$

[7] $6.6 = (0.057 + 0.681 * 0.014) * 100$

identifying restrictions are valid," and second-order autocorrelation using the Arellano-Bond (AR2) test with the null hypothesis of "no auto-correlation." The test results, reported with the regression outcomes, support the instrument's validity and the absence of 2nd-order serial correlation in the model.

Table 7: Impact of Institutions on Economic Growth through Investment

	Two step system GMM		One step system GMM	
Explanatory variables	(1) rgdppcg Middle income	(2) rgdppcg High income	(3) rgdppcg Middle income	(4) rgdppcg High income
rgdppcg_1	-0.354**	-0.0610	-0.224*	0.0518
	(0.1105)	(0.0841)	(0.0985)	(0.0648)
gcf	0.0696**	0.0570*	0.0587***	0.0396***
	(0.0025)	(0.0250)	(0.0007)	(0.0057)
hc	0.0553	-0.0370***	0.0726***	-0.0303***
	(0.0392)	(0.0060)	(0.0097)	(0.0028)
gexp	-0.0289***	-0.000533*	-0.0293***	-0.000541***
	(0.0082)	(0.0002)	(0.0033)	(0.0001)
trade	0.0629*	0.0236***	0.0643***	0.0212***
	(0.0003)	(0.0049)	(0.0001)	(0.0020)
comp_index	0.0978*	0.0663***	0.0834***	0.0600***
	(0.2538)	(0.1857)	(0.0836)	(0.0849)
comp_index*gcf	0.0403**	0.0139**	0.0344**	0.0142*
	(0.0081)	(0.0087)	(0.0024)	(0.0035)
No. of obs.	809	836	809	836
No. of groups	43	44	43	44
No. of inst.	9	10	9	10
AR2 (p-value)	0.254	0.137	0.657	0.176
Hansen (p-value)	0.433	0.519		

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The question of whether institutions follow or lead economic growth continues to be debated in the literature. On the one hand, Acemoglu, Johnson, and Robinson (2005) and North

(2006), in particular, vigorously support the institutions drive growth direction of causality. Conversely, Glaeser et al. (2004) strongly adhere to reverse causality. In the applied research, the direction of causality between institutional development and economic growth still stands ambiguous and is far less discussed. A few exceptions are (Chong and Calderon, 2000; Lee and Kim, 2009; Law, Lim and Ismail, 2013), who found a bi-directional causal relationship between the two variables. But these studies do not provide the disaggregated test of causality based on the level of income. Further analysis is required to validate the disaggregated patterns of causality between institutional quality and economic growth using advanced methods.

In this paper, we use an extension of the Granger (Granger, 1969) causality test for panel data provided by Dumitrescu and Hurlin (2012) to analyze the structure of the causal relationships between institutions and economic growth. Using the simple (Granger, 1969) test, one investigates whether x causes y (Lopez and Weber, 2017). However, in many economic variables, if there exists a causal relationship for a cross section, there is a high probability that it also exists for some other cross sections (individuals or countries). In such a case, the causality can be more efficiently tested in a panel context with $N \times T$observations (Dumitrescu and Hurlin, 2012).

The results from the Dumitrescu and Hurlin (2012) Granger non-causality test provided in table 8 show a marginal effect of GDP growth on institutions in the context of middle-income countries and a strong impact of institutional development on economic growth both in the context of high income and middle income countries. This indicates that in middle income economies where the level of institutional development is also not much advanced, the two variables cause each other. However, the direction of the causality from institutions to growth is more significant and stronger than the other way around. Therefore, the deliberate creation of better institutions can significantly boost economic growth across both middle income and high income countries.

Table 8: Dumitrescu & Hurlin Granger non-causality test results (series: GDPpc growth and Institutional Index)

Sample of Middle Income Countries			
Null Hypothesis	$\overline{W}$	$\overline{Z}$ (p-value)	$\tilde{Z}$(p-value)
GDPpc growth does not cause institutional development	2.6478	4.2773 (0.008)	3.2730 (0.003)
Institutional development does not cause GDPpc growth	3.7939	12.3178 (0.000)	10.1237 (0.000)
Sample of High Income Countries			
Null Hypothesis	$\overline{W}$	$\overline{Z}$ (p-value)	$\tilde{Z}$(p-value)
GDPpc growth does not cause institutional development	2.0773	3.0529 (0.041)	2.5214 (0.040)
Institutional development does not cause GDPpc growth	2.3891	9.5157 (0.000)	7.6848 (0.000)

We have also tested whether the explanatory variables jointly Granger cause output using the recently developed Granger non-causality test by Juodis et al. (2021). The primary advantage of Juodis et al. (2021) test over the Dumitrescu and Hurlin (2012) test is that the former accounts for 'Nickell' bias and provides better finite sample properties in panels with moderate time dimensions, unlike the latter, which is theoretically justified only for sequences where $\frac{N}{T^2} \rightarrow 0$ (Xiao et al., 2022). The test results reject the null hypothesis that explanatory variables of the model do not Granger cause output at a 5 percent significance level.

6. Conclusion

The main results from the previous sections might be summarized as follows. First, we find that our results support the hypothesis that institutional quality exerts a positive and significant effect on economic performance. Second, we find that the effect of institutions on economic growth varies depending on the stages of economic development. Regulatory quality plays a crucial role in economic growth in the high income countries. In contrast, the quality of the legal system and protection of property rights assume a greater significance for growth in middle income countries. This implies that countries at different stages of their development trajectories require different sets of institutions to prosper. Third, the analysis of the transmission mechanism of the impact of institutions reveals that institutions more significantly influence output growth by boosting the level and productivity of domestic investment. Finally, the Granger causality test results provide evidence for a marginal effect of GDP growth on institutions, but a strong impact of institutional development on output growth.

The significance of the legal system and property rights for middle income countries might emanate from the fact that property rights are not well defined and enforced in these countries. Corruption is widespread, whereas the judicial systems are not fully independent and often subject to interference by executive and military forces in low and middle income countries. These complications are less serious in high income countries, since they have already established quality legal systems to effectively enforce contracts and protect private property. On the other hand, regulatory quality is more relevant for economic growth in high income countries. A small improvement in the quality of regulations, in the form of lesser administrative and regulatory hurdles, leads to growth benefits, possibly through lower transaction costs.

The main policy implication of this study is that well-defined and protected property rights, credible rules, an independent legal system, and quality regulations remain the significant determinants for long-run economic growth. Overall, the results indicate that at the higher stages of development, getting the regulatory environment right encourages more investment and furthers growth. In lower levels of development, improving the quality of the legal system and protecting private property needs more focus. Thus, the economic policy needs to focus on improving the quality of institutions, particularly in middle income and low income countries facing tremendous institutional deficiency.

We should, however, note that these conclusions are based on a sample of 87 HICs and MICs over a period of 20 years, and should not be generalized beyond that. Further, given the level of aggregation, we do not yet have full information on the exact mechanism by which each component of institutional index influences economic growth. It might also be interesting to examine the role played by institutions in low income countries, many of which are qualitatively distinct from middle and high income countries in often lacking even the most basic of economic institutions. However, lack of adequate data prevented us from examining these questions in greater detail in the current study. We leave these questions for future research work in this area.

References

Acemoglu, Daron, S. Johnson, and James A. Robinson. 2002. "Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution." *The Quarterly Journal of Economics* 117 (4): 1231–94.

———. 2001. "The Colonial Origins of Comparative Development: An Empirical Investigation." *American Economic Review* 91 (5): 1369–1401.

———. 2005. "Institutions as a Fundamental Cause of Long-Run Growth." In *Handbook of Economic Growth*, edited by Steven Aghion, Philippe; Durlauf, 1st ed., 385–472. Amsterdam: Elsevier B.V.

Acemoglu, Daron, and Simon Johnson. 2005. "Unbundling Institutions." *Journal of Political Economy* 113 (5): 949–95.

Acemoglu, Daron and James A. Robinson. 2012. "*Why Nations Fail: The Origins of Power, Prosperity and Poverty*." London: Profile Books.

Aghion, Philippe, and Peter Howitt. 1992. "A Model of Growth Through Creative Destruction." *Econometrica* 60 (2): 323–51.

Alam, Khandaker Jahangir, and Khairul Kabir Sumon. 2020. "Causal Relationship between Trade Openness and Economic Growth: A Panel Data Analysis of Asian Countries." *International Journal of Economics and Financial Issues* 10 (1): 118–26.

Albouy, D.Y., 2012. The colonial origins of comparative development: an empirical investigation: comment. *American economic review*, 102(6), pp.3059-76.

Anderson, T. W., and Cheng Hsiao. 1982. "Formulation and Estimation of Dynamic Models Using Panel Data." *Journal of Econometrics* 18 (1): 47–82.

Antonakakis, Nikolaos, Juncal Cunado, George Filis, and Fernando Perez de Gracia. 2017. "Oil Dependence, Quality of Political Institutions and Economic Growth: A Panel VAR Approach." *Resources Policy* 53: 147–63.

Aparicio, Sebastian, David Urbano, and David Audretsch. 2016. "Institutional Factors, Opportunity Entrepreneurship and Economic Growth: Panel Data Evidence." *Technological Forecasting and Social Change* 102: 45–61.

Arellano, Manuel, and Stephen Bond. 1991. "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations." *The Review of Economic Studies* 58 (2): 277–97.

Arellano, Manuel, and Olympia Bover. 1995. "Another Look at the Instrumental Variable Estimation of Error-Components Models." *Journal of Econometrics* 68 (1): 29–51.

Attanasio, Orazio P, Lucio Picci, and Antonello E Scorcu. 2000. "Saving, Growth, and Investment: A Macroeconomic Analysis Using a Panel of Countries." *Review of Economics and Statistics*

82 (2): 182–211.

Barro, R. J. 1991. "Economic Growth in a Cross Section of Countries." *The Quarterly Journal of Economics* 106 (2): 407–43.

———. 1996. "Democracy and Growth." *Journal of Economic Growth* 1 (1): 1–27.

Barro, R. J., and Xavier Sala-i-Martin. 2004. *Economic Growth*. Cambridge, London: The MIT Press.

Bergh, Andreas, and Martin Karlsson. 2010. "Government Size and Growth: Accounting for Economic Freedom and Globalization." *Public Choice* 142 (1–2): 195–213.

Blundell, Richard, and Stephen Bond. 1998. "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models." *Journal of Econometrics* 87 (1): 115–43.

Bond, S. R., A. Hoeffler, and J. R. Temple. 2001. *GMM Estimation of Empirical Growth Models. London, Centre for Economic Policy Research.*

Buterin, Vesna, Marinko Škare, and Denis Buterin. 2017. "Macroeconomic Model of Institutional Reforms' Influence on Economic Growth of the New EU Members and the Republic of Croatia." *Economic Research-Ekonomska Istraživanja* 30 (1): 1572–93.

Chang, Ha-joon. 2011. "Institutions and Economic Development: Theory, Policy and History." *Journal of Institutional Economics* 7 (4): 473–98.

Cheung, S. N. S. 1970. "The Structure of a Contract and the Theory of a Non-Exclusive Resource." *The Journal of Law and Economics* 13 (1): 49–70.

Chong, A, and C Calderon. 2000. "Causality and Feedback Between Institutional Measures and Economic Growth." *Economics and Politics* 12 (1): 69–81.

Coase, R. H. 1937. "The Nature of the Firm." *Economica* 4 (16): 386–405.

———. 1960. "The Problem of Social Cost." *The Journal of Law and Economics* 3: 1–44.

Dawson, John W. 1998. "Institutions, Investment, and Growth: New Cross-Country and Panel Data Evidence." *Economic Inquiry* 36 (4): 603–19.

Demsetz, H. 2008. *"From economic man to economic system."* Cambridge University Press, Cambridge.

Dollar, David, and Aart Kraay. 2003. "Institutions, Trade, and Growth." *Journal of Monetary Economics* 50 (1): 133–62.

Doucouliagos, C., and M. A. Ulubasoglu. 2006. "Economic Freedom and Economic Growth: Does Specification Make a Difference?" *European Journal of Political Economy* 22 (1): 60–81.

Dritsakis, N., and P. Stamatiou. 2016. "Trade Openness and Economic Growth: A Panel Cointegration and Causality Analysis for the Newest EU Countries." *The Romanian Economic Journal* 19 (59): 45–60.

Dumitrescu, E. I., and C. Hurlin. 2012. "Testing for Granger Non-Causality in Heterogeneous Panels." *Economic Modelling* 29 (4): 1450–60.

Faundez, J. 2016. "Douglass North's theory of institutions: lessons for law and development." *Hague Journal on the Rule of Law*, 8(2), pp.373-419.

Flachaire, E., C. García-Peñalosa, and M. Konte. 2014. "Political versus Economic Institutions in the Growth Process." *Journal of Comparative Economics* 42 (1): 212–29.

Ganau, Roberto. 2017. "Institutions and Economic Growth in Africa: A Spatial Econometric Approach." *Economia Politica* 34 (3): 425–44.

Glaeser, Edward L., Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer. 2004. "Do Institutions Cause Growth?" *Journal of Economic Growth* 9 (3): 271–303.

Granger, Clive W. J. 1969. "Investigating Causal Relations by Econometric Models and Cross-Spectral Methods." *Econometrica* 37 (3): 93–123.

Greif, Avner. 1993. "Contract Enforceability and Economic Institutions in Early Trade : The Maghribi Traders ' Coalition." *The American Economic Review* 83 (3): 525–48.

Grossman, Gene M., and Elhanan Helpman. 1991. "Quality Ladders in the Theory of Growth." *The Review of Economic Studies* 58 (1): 43.

Gwartney, James, Robert Lawson, Joshua Hall, and Murphy Ryan. 2018. "Economic Freedom of the World, 2018." *Fraser Institute*. Vol. 9. Vancouver, B.C.

Haan, J. and Siermann, C.L. De. 1998. "Further Evidence on the Relationship between Economic Freedom and Economic Growth." *Public Choice* 95 (3–4): 363–80.

Haan, Jakob De, Susanna Lundström, and Jan Egbert Sturm. 2006. "Market-Oriented Institutions and Policies and Economic Growth: A Critical Survey." *Journal of Economic Surveys* 20 (2): 157–91.

Haan, Jakob De, and Jan-Egbert Sturm. 2000. "On the Relationship between Economic Freedom and Economic Growth." *European Journal of Political Economy* 16 (2): 215–41.

Hall, A.R., 2005. *Generalized method of moments*. Oxford university press.

Hall, R. E., and C. I. Jones. 1999. "Why Do Some Countries Produce So Much More Output Per Worker than Others?" *The Quarterly Journal of Economics* 114 (1): 83–116.

Harris, M.N. and Mátyás, L., 2004. A comparative analysis of different IV and GMM estimators of dynamic panel data models. *International Statistical Review*, 72(3), pp.397-408.

Im, Kyung So, M. Hashem Pesaran, and Yongcheol Shin. 2003. "Testing for Unit Roots in Heterogeneous Panels." *Journal of Econometrics* 115 (1): 53–74.

Iqbal, Nasir, and Vince Daly. 2014. "Rent Seeking Opportunities and Economic Growth in Transitional Economies." *Economic Modelling* 37: 16–22.

JRCEC (Joint Research Centre-European Commission), 2008. Handbook on constructing composite indicators: methodology and user guide. OECD publishing.

Juodis, A., Karavias, Y. and Sarafidis, V., 2021. *"*A homogeneous approach to testing for Granger non-causality in heterogeneous panels.*" Empirical Economics,* 60(1), pp.93-112.

Kaufmann, D., Kraay, A., and Mastruzzi, M., 2011. "The Worldwide Governance Indicators: Methodology and Analytical Issues." *Hague Journal on the Rule of Law* 3 (2): 220–46.

Knack, Stephen, and Philip Keefer. 1995. "Institutions And Economic Performance: Cross-Country Tests Using Alternative Institutional Measures." *Economics & Politics* 7 (3): 207–27.

Law, Siong Hook, Thong Cheen Lim, and Normaz Wana Ismail. 2013. "Institutions and Economic Development: A Granger Causality Analysis of Panel Data Evidence." *Economic Systems* 37 (4): 610–24.

Lee, Keun, and Byung-Yeon Kim. 2009. "Both Institutions and Policies Matter but Differently for Different Income Groups of Countries: Determinants of Long-Run Economic Growth Revisited." *World Development* 37 (3): 533–49.

Leszczensky, L. and Wolbring, T., 2022. How to deal with reverse causality using panel data? Recommendations for researchers based on a simulation study. *Sociological Methods & Research,* 51(2), pp.837-865.

Lloyd, P. and Lee, C., 2018. A review of the recent literature on the institutional economics analysis of the long-run performance of nations. *Journal of Economic Surveys*, 32(1), pp.1-22.

Lopez, Luciano, and Sylvain Weber. 2017. "Testing for Granger Causality in Panel Data." *The Stata Journal: Promoting Communications on Statistics and Stata* 17 (4): 972–84.

Lucas, Robert E. 1988. "On the Mechanics of Economic Development." *Journal of Monetary Economics* 22 (1): 3–42.

Lueck, Dean. 1995. "The Rule of First Possession and the Design of the Law." *The Journal of Law and Economics* 38 (2): 393–436.

Mankiw, N. G., D. Romer, and D. N. Weil. 1992. "A Contribution to the Empirics of Economic Growth." *The Quarterly Journal of Economics* 107 (2): 407–37.

Medema, S. G. 2011. "The Coase theorem lessons for the study of the history of economic thought." *Journal of the History of Economic Thought* 33(1):1–18.

Méon, Pierre Guillaume, and Laurent Weill. 2005. "Does Better Governance Foster Efficiency? An Aggregate Frontier Analysis." *Economics of Governance* 6 (1): 75–90.

Miller, Terry, Anthony B Kim, and James M Roberts. 2018. "2018 Index of Economic Freedom." *The Heritage Foundation*. Washington.

Moers, Luc. 1999. "How Important Are Institutions for Growth in Transition Countries?" *Tinbergen Institute Discussion Papers 99-004/2, Tinbergen Institute*, 1–42.

Nardo, M., Saisana, M., Saltelli, A. and Tarantola, S., 2005. Tools for composite indicators building. European Comission, Ispra, 15(1), pp.19-20.

Nawaz, Saima. 2015. "Growth Effects of Institutions: A Disaggregated Analysis." *Economic Modelling* 45: 118–26.

Nawaz, Saima, Nasir Iqbal, and Muhammad Arshad Khan. 2014. "The Impact of Institutional Quality on Economic Growth: Panel Evidence." *The Pakistan Development Review* 53 (1): 15–31.

Nickell, S., 1981. Biases in dynamic models with fixed effects. *Econometrica: Journal of the econometric society*, pp.1417-1426.

Nirola, Nupur, and Sohini Sahu. 2019. "The Interactive Impact of Government Size and Quality of Institutions on Economic Growth- Evidence from the States of India." *Heliyon* 5 (3): e01352.

North, D.C. 1990. *"Institutions, Institutional Change and Economic Performance."* 1st ed. Cambridge, MA: Cambridge University Press.

———. 1981. *"Structure and change in economic history."* W.W. Norton, New York.

———. 2006. *"Understanding the Process of Economic Change."* Princeton: Princeton University Press.

North, D. C. and Thomas, R. P. 1973. *"The rise of the Western world: a new economic history."* Cambridge University Press, Cambridge.

Olson, Mancur. 1982. *"The Rise and Decline of Nations Economic Growth, Stagflation, and Social Rigidities."* New Haven: Yale University Press.

———. 1996. "Distinguished Lecture on Economics in Government: Big Bills Left on the Sidewalk: Why Some Nations Are Rich, and Others Poor." *Journal of Economic Perspectives* 10 (2): 3–24.

Olson, Mancur, Naveen Sarna, and Anand V. Swamy. 2000. "Governance and Growth: A Simple Hypothesis Explaining Cross-Country Differences in Productivity Growth." *Public Choice* 102 (3–4): 341–64.

Porta, Rafael La, Florencio Lopez-De-Silanes, and Andrei Shleifer. 2008. "The Economic Consequences of Legal Origins." *Journal of Economic Literature* 46 (2): 285–332.

Porta, Rafael La, Florencio Lopez-De-Silanes, Andrei Shleifer, and Robert W. Vishny. 1997. "Legal Determinants of External Finance." *The Journal of Finance* 52 (3): 1131.

Porta, Rafael La, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert W. Vishny. 1998. "Law and Finance." *Journal of Political Economy* 106 (6): 1113–55.

Rebelo, Sergio. 1991. "Long-Run Policy Analysis and Long-Run Growth." *Journal of Political Economy* 99 (3): 500–521.

Rodrik, Dani. 2000. "Institutions for High-Quality Growth: What They Are and How to Acquire Them." *Studies in Comparative International Development* 35 (3): 3–31.

———. 2008. *One Economics, Many Recipes*. Princeton, Oxford: Princeton University Press.

Rodrik, Dani, Arvind Subramanian, and Francesco Trebbi. 2004. "Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development." *Journal of Economic Growth* 9 (2): 131–65.

Romer, Paul M. 1986. "Increasing Returns and Long-Run Growth." *Journal of Political Economy* 94 (5): 1002–37.

———. 1990. "Endogenous Technological Change." *Journal of Political Economy* 98 (5): S71–102.

Romero-Ávila, Diego, and Rolf Strauch. 2008. "Public Finances and Long-Term Growth in Europe: Evidence from a Panel Data Analysis." *European Journal of Political Economy* 24 (1): 172–91.

Roodman, David. 2009. "How to Do Xtabond2: An Introduction to Difference and System GMM in Stata." *Stata Journal* 9 (1): 86–136.

Rutherford, M. 2013. *"The Institutionalist Movement in American Economics, 1918–1947."* Cambridge: Cambridge University Press.

Salahuddin, Mohammad, Rabiul Islam, and Syed Abdullah Salim. 2009. "Determinants of Investment in Muslim Developing Countries: An Empirical Investigation." *International Journal of Economics and Management* 3 (1): 100–129.

Scully, Gerald W. 1988. "The Institutional Framework and Economic Development." *Journal of Political Economy* 96 (3): 652–62.

Siddiqui, Danish Ahmed, and Qazi Masood Ahmed. 2013. "The Effect of Institutions on Economic Growth: A Global Analysis Based on GMM Dynamic Panel Estimation." *Structural Change and Economic Dynamics* 24 (1): 18–33.

Solow, Robert M. 1956. "A Contribution to the Theory of Economic Growth." *The Quarterly Journal of Economics* 70 (1): 65.

Spithoven, A. 2019. "Similarities and Dissimilarities between Original Institutional Economics and New Institutional Economics." *Journal of Economic Issues*, 53:2, 440-447.

Swan, T. W. 1956. "Economic Growth and Capital Accumulation." *Economic Record* 32 (2): 334–61.

Teixeira, Aurora A.C., and Anabela S.S. Queirós. 2016. "Economic Growth, Human Capital and Structural Change: A Dynamic Panel Data Analysis." *Research Policy* 45 (8): 1636–48.

Vedia-Jerez, Daniel H., and Coro Chasco. 2016. "Long-Run Determinants of Economic Growth in South America." *Journal of Applied Economics* 19 (1): 169–92.

Williamson, Oliver E. 1998. "Transaction Cost Economics: How It Works; Where It Is Headed." *Economist* 146 (1): 23–58.

Xiao, J., Juodis, A., Karavias, Y., Sarafidis, V. and Ditzen, J., 2022. "Improved tests for granger non-causality in panel data." *MPRA Paper No. 114231.*

Appendix

Table 10: Factor loadings

Indicators	2020		2019		2018		2017		2016		2015	
	lspr	regu	lspr	regu	lspr	regu	lspr	regu	lspr	regu	lspr	regu
Judicial Independence	0.90	0.13	0.90	0.11	0.90	0.10	0.89	0.12	0.89	0.07	0.89	0.02
Impartial courts	0.92	0.29	0.92	0.25	0.92	0.25	0.91	0.29	0.92	0.27	0.93	0.20
Protection of property rights	0.80	0.43	0.80	0.42	0.81	0.40	0.82	0.38	0.82	0.37	0.83	0.30
Military interference in the rule of law	0.78	-0.17	0.78	-0.16	0.78	-0.15	0.77	-0.05	0.78	-0.15	0.77	-0.15
Integrity of legal system	0.95	0.07	0.93	0.13	0.93	0.14	0.94	0.13	0.94	0.07	0.94	0.03
Legal enforcement of contracts	0.70	0.43	0.71	0.39	0.71	0.38	0.70	0.36	0.73	0.34	0.75	0.26
Reliability of police	0.74	0.44	0.76	0.39	0.76	0.37	0.77	0.30	0.77	0.37	0.80	0.31
Regulatory trade barriers	0.79	0.05	0.74	0.17	0.73	0.17	0.71	0.28	0.81	0.01	0.80	0.01
Hiring and firing regulations	0.16	0.81	0.17	0.83	0.18	0.84	0.12	0.86	0.10	0.80	0.10	0.79
Centralized collective bargaining	-0.13	0.42	-0.08	0.51	-0.08	0.51	0.00	0.56	-0.02	0.37	-0.10	0.42
Mandated cost of worker dismissal	0.54	0.08	0.55	0.04	0.55	0.04	0.55	-0.02	0.53	-0.06	0.53	-0.01
Administrative requirement	0.30	0.79	0.31	0.81	0.33	0.80	0.30	0.82	0.30	0.78	0.32	0.73
Regulatory Burden	0.36	0.64	0.39	0.59	0.37	0.57	0.44	0.46	0.46	0.51	0.55	0.49
Starting business	0.38	0.26	0.40	0.23	0.41	0.22	0.40	0.26	0.45	0.32	0.46	0.31
Impartial public administration	0.87	-0.17	0.88	-0.14	0.88	-0.13	0.91	-0.18	0.85	-0.12	0.85	-0.15
Licensing restrictions	0.15	0.58	0.15	0.57	0.16	0.56	0.21	0.48	0.22	0.47	0.24	0.46
Tax compliance	0.51	0.39	0.51	0.36	0.51	0.36	0.91	-0.18	0.54	0.38	0.58	0.31
Control of corruption	0.94	0.18	0.94	0.16	0.94	0.16	0.93	0.21	0.94	0.18	0.94	0.16
Government effectiveness	0.92	0.29	0.93	0.26	0.93	0.24	0.92	0.28	0.94	0.20	0.94	0.20
Regulatory quality	0.93	0.21	0.93	0.17	0.93	0.20	0.91	0.27	0.93	0.21	0.93	0.21
Rule of law	0.94	0.22	0.94	0.20	0.95	0.20	0.94	0.23	0.96	0.17	0.96	0.15
Eigenvalues	10.96	2.96	11.18	2.93	11.15	2.87	11.56	2.94	11.33	2.51	11.50	2.24
Variance (%)	0.69	0.18	0.70	0.18	0.70	0.18	0.69	0.17	0.71	0.15	0.72	0.14
Cumulative Variance (%)		**0.87**		**0.88**		**0.88**		**0.86**		**0.86**		**0.86**
KMO Measure of Sampling Adequacy		0.920		0.924		0.921		0.925		0.926		0.914
Bartlett Test of Sphericity	χ^2=2116; *DF* = 234; P-value = 0.00		χ^2=2158; *DF* = 210; P-value = 0.00		χ^2=2109; *DF* = 210; P-value = 0.00		χ^2=2354; *DF* = 210; P-value = 0.00		χ^2=2141; *DF* = 210; P-value = 0.00		χ^2=2180; *DF* = 210; P-value = 0.00	

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2014		2013		2012		2011		2010		2009		2008	
lspr	regu	lspr	regu	lspr	regu	lspr	regu	lspr	regu	lspr	regu	lspr	regu
0.90	-0.08	0.90	-0.01	0.90	-0.03	0.91	-0.05	0.91	-0.04	0.91	-0.08	0.91	-0.10
0.95	0.07	0.95	0.12	0.95	0.12	0.96	0.08	0.96	0.08	0.96	0.00	0.96	-0.01
0.84	0.12	0.85	0.18	0.85	0.14	0.85	0.13	0.87	0.13	0.87	0.01	0.89	-0.02
0.76	-0.18	0.76	-0.21	0.75	-0.20	0.74	-0.25	0.72	-0.27	0.70	-0.21	0.68	-0.16
0.92	-0.09	0.92	-0.06	0.92	-0.09	0.91	-0.12	0.91	-0.11	0.91	-0.10	0.91	-0.09
0.72	0.18	0.73	0.10	0.72	0.09	0.70	0.08	0.71	0.07	0.71	0.07	0.72	0.07
0.88	0.11	0.87	0.18	0.88	0.15	0.89	0.15	0.89	0.17	0.90	0.08	0.88	0.09
0.80	0.06	0.73	0.28	0.79	0.27	0.81	0.22	0.79	0.20	0.78	0.06	0.79	0.04
-0.09	0.62	-0.04	0.73	-0.04	0.69	-0.09	0.65	-0.12	0.70	-0.03	0.89	-0.04	0.87
-0.18	0.57	-0.13	0.54	-0.13	0.54	-0.15	0.60	-0.20	0.57	-0.18	0.60	-0.17	0.62
0.57	-0.04	0.58	-0.07	0.56	-0.06	0.57	-0.03	0.59	-0.02	0.58	-0.03	0.51	0.02
0.33	0.56	0.24	0.73	0.23	0.72	0.25	0.71	0.29	0.75	0.38	0.58	0.40	0.53
0.53	0.41	0.33	0.57	0.39	0.51	0.38	0.78	0.44	0.73	0.41	0.84	0.30	0.86
0.50	0.31	0.49	0.20	0.49	0.20	0.52	0.12	0.55	0.07	0.49	0.17	0.54	0.19
0.85	-0.23	0.85	-0.18	0.84	-0.19	0.84	-0.23	0.87	-0.19	0.86	-0.16	0.86	-0.16
0.32	0.44	0.28	0.49	0.38	0.51	0.55	0.52	0.42	0.44	0.40	0.55	0.45	0.53
0.58	0.27	0.58	0.29	0.61	0.27	0.61	0.18	0.60	0.20	0.60	0.15	0.60	0.14
0.95	0.07	0.94	0.09	0.95	0.06	0.96	0.02	0.96	0.04	0.97	0.01	0.96	-0.01
0.95	0.13	0.96	0.09	0.96	0.10	0.97	0.07	0.97	0.06	0.97	0.02	0.96	0.03
0.94	0.20	0.94	0.12	0.94	0.13	0.95	0.07	0.95	0.06	0.95	-0.01	0.95	0.00
0.97	0.06	0.97	0.04	0.97	0.03	0.97	0.00	0.97	0.01	0.97	-0.05	0.97	-0.05
11.78	1.67	11.63	1.96	11.79	1.80	12.00	1.68	12.11	1.73	11.60	2.36	11.63	2.34
0.77	0.11	0.75	0.12	0.76	0.11	0.78	0.11	0.77	0.11	0.72	0.15	0.72	0.14
	0.88		**0.87**		**0.87**		**0.89**		**0.88**		**0.87**		**0.86**
	0.924		0.917		0.923		0.925		0.929		0.913		0.915
χ^2=2093; DF = 210; P-value = 0.00		χ^2=2065; DF = 210; P-value = 0.00		χ^2=2081; DF = 210; P-value = 0.00		χ^2=2080; DF = 210; P-value = 0.00		χ^2=2063; DF = 210; P-value = 0.00		χ^2=2039; DF = 210; P-value = 0.00		χ^2=2018; DF = 210; P-value = 0.00	

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2007		2006		2005		2004		2003		2002		2001		2000	
lspr	**regu**	**lspr**	**regu**	**lspr**	**regu**	**lspr**	**regu**	**lspr**	**regu**	**lspr**	**regu**	**lspr**	**regu**	**lspr**	**regu**
0.91	-0.14	0.91	-0.14	0.91	-0.11	0.92	-0.07	0.92	-0.07	0.92	-0.03	0.92	-0.05	0.91	-0.16
0.97	-0.04	0.96	-0.04	0.96	0.01	0.96	0.06	0.97	0.02	0.97	0.05	0.96	0.07	0.96	-0.11
0.88	-0.05	0.89	-0.06	0.89	-0.02	0.87	0.06	0.87	0.00	0.87	0.08	0.88	0.06	0.89	-0.08
0.67	-0.19	0.66	-0.16	0.68	-0.13	0.71	-0.11	0.69	0.04	0.71	-0.03	0.75	-0.03	0.76	0.03
0.91	-0.09	0.91	-0.05	0.92	-0.01	0.92	0.01	0.91	0.05	0.91	0.09	0.91	0.06	0.91	0.03
0.72	0.09	0.75	0.12	0.75	0.16	0.76	0.17	0.75	0.17	0.74	0.24	0.74	0.24	0.73	0.23
0.86	0.10	0.76	0.17	0.83	0.18	0.83	0.20	0.83	0.12	0.82	0.13	0.81	0.12	0.80	0.04
0.82	0.01	0.84	-0.05	0.84	-0.03	0.84	-0.04	0.90	0.00	0.90	-0.01	0.86	0.06	0.87	0.02
-0.10	0.89	-0.10	0.95	-0.13	0.78	0.01	0.75	-0.02	0.80	0.06	0.83	-0.03	0.72	-0.24	0.68
-0.16	0.63	-0.18	0.63	-0.23	0.68	-0.20	0.65	-0.22	0.63	-0.21	0.51	-0.22	0.67	-0.24	0.63
0.53	0.00	0.54	-0.02	0.55	-0.03	0.57	0.07	0.55	0.15	0.54	0.19	0.54	0.13	0.54	0.29
0.39	0.55	0.48	0.54	0.50	0.56	0.53	0.54	0.52	0.49	0.50	0.47	0.44	0.57	0.45	0.52
0.31	0.88	0.30	0.84	0.27	0.64	0.20	0.59	0.33	0.59	0.42	0.59	0.36	0.50	0.43	0.49
0.60	0.10	0.54	0.11	0.61	0.17	0.63	0.10	0.57	0.05	0.57	0.10	0.57	0.12	0.57	0.27
0.85	-0.16	0.85	-0.16	0.87	-0.16	0.87	-0.14	0.87	-0.16	0.88	-0.14	0.89	-0.10	0.89	-0.10
0.46	0.48	0.44	0.49	0.41	0.55	0.45	0.53	0.49	0.51	0.42	0.56	0.49	0.45	0.49	0.56
0.59	0.11	0.58	0.09	0.60	0.15	0.60	0.10	0.61	0.05	0.62	-0.04	0.60	0.11	0.59	0.04
0.96	-0.04	0.96	-0.05	0.97	-0.01	0.96	0.07	0.96	0.02	0.96	0.03	0.97	0.02	0.97	-0.04
0.96	0.01	0.97	0.01	0.97	-0.03	0.97	0.03	0.96	-0.04	0.97	-0.02	0.97	-0.02	0.96	-0.05
0.96	-0.01	0.96	-0.03	0.96	-0.01	0.96	0.04	0.96	0.03	0.96	0.03	0.96	0.10	0.95	0.08
0.97	-0.07	0.97	-0.07	0.97	-0.02	0.96	0.02	0.96	-0.02	0.96	0.01	0.96	-0.03	0.95	-0.13
11.68	2.39	11.64	2.68	12.50	1.57	12.42	1.47	12.43	1.34	12.38	1.50	12.20	1.46	12.49	1.17
0.72	0.15	0.70	0.16	0.78	0.10	0.79	0.10	0.77	0.09	0.77	0.09	0.78	0.10	0.80	0.08
	0.87		**0.86**		**0.88**		**0.89**		**0.86**		**0.86**		**0.88**		**0.88**
	0.904		0.903		0.922		0.928		0.907		0.905		0.916		0.925
χ^2=2054; *DF* = 210; P-value = 0.00		χ^2=2099; *DF* = 210; P-value = 0.00		χ^2=2035; *DF* = 210; P-value = 0.00		χ^2=1997; *DF* = 210; P-value = 0.00		χ^2=2033; *DF* = 210; P-value = 0.00		χ^2=2057; *DF* = 210; P-value = 0.00		χ^2=2022; *DF* = 210; P-value = 0.00		χ^2=1994; *DF* = 210; P-value = 0.00	

Figure 2: Scree plots of eigenvalues