

# Empirical heterogeneity in the institutions-economic growth literature: A critical review

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**Abstract:** *The literature has arrived at a consensus regarding the positive effects of institutions on growth. Nevertheless, many economists argue that a unified analytical framework of institutions-growth studies is still missing and more research needs to be done to fully operationalise the institutional effects in the empirical growth analysis. This paper critically reviews the literature on institutions-economic growth nexus and carefully outlines the important dimensions of empirical heterogeneity the growing number of institutional studies have given rise to. Via a careful assessment and thorough evaluation of selected institutions-growth studies, the dimensions of heterogeneity are identified, namely modelling the institutions-growth link, measures of institutions, channel and size of effects of institutions on growth, reverse causality issue, estimation techniques and sources of institutional data. Arguably, a critical review of a similar stature is rarely done, and the findings of this review are expected to better-inform future empirical works in this field towards strengthening the empirical evidence to support the proposition that “institutions matter to growth.”*

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## 1. Introduction

According to the Gwartney, Holcombe and Lawson (2006), there are three strands of growth theory to discuss the explanatory factors underlying cross-country differences in income levels and growth rates. Firstly, a theory that focuses on the inputs of physical and human capital into the production process and technological advances as determinants of economic performance. This theory can be traced to the neoclassical theory of economic growth based on Solow (1956), and extended by Lucas (1988), Romer (1986, 1990) and others. Second, the geographic/location theory by

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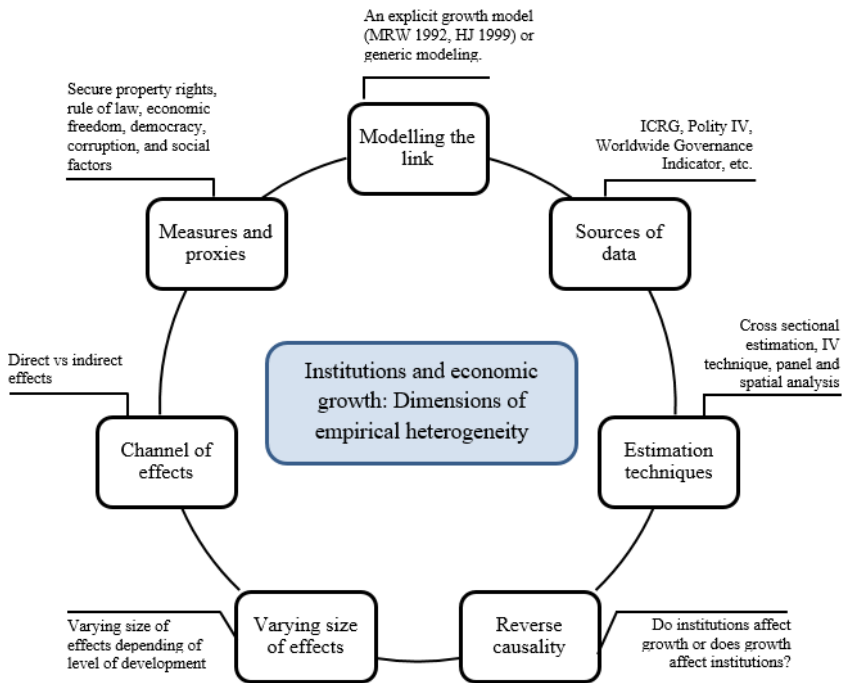
Diamond (1997), Gallup, Sachs and Mellinger, (1999) and Sachs (2001) that argues temperate climate and ease of access to markets are critically important for the achievement of high-income levels and growth rates. In contrast, tropical climatic conditions erode the energy level of workers and increase the risk of disabling and life-threatening diseases such as malaria.

Lastly, the institutional approach emphasises the importance of institutional quality on per capita income levels and growth rates. North (1990) is the pioneer of this approach and advocates that institutions are a primary cause of economic development in the short and long term. According to North, institutions form the incentive structure in society and provide the underlying determinants of economic performance. The most notable studies in this strand are Knack and Keefer (1995), Acemoglu, Johnson and Robinson (2001), Rodrik, Subramaniam and Trebbi (2004), to name a few. Acemoglu (2008) argues that the fundamental cause of the question of why some countries are much poorer than others is due to the institutional differences. These differences shape economic and political incentives and affect the nature of the equilibrium in the countries' economic development, growth, inequality and poverty. He notes that there is voluminous literature that documents the cross-country differences in economic institutions, and this literature can show strong positive effects of institutions on economic performance. Empirical studies show that the higher the quality of a country's institutions, the higher the country's economic performance.

Nevertheless, in spite of the overall consensus about the positive effects of institutions on economic growth, many economists argue that institutional studies fail to provide a unified analytical framework (Potts, 2007) and that more research need to be done to support the operationalisation of a proper institutional perspective in the empirical growth analysis (Pelikan, 2003; Rodrik, 2004). Consequently, the utmost motivation of this paper is to provide an in-depth assessment of selected institutions-growth studies and to critically distinguish the important empirical heterogeneities frequently found in the institutional studies. The outlined empirical heterogeneities are expected to better-inform future empirical works towards strengthening the empirical evidence supporting the proposition "institutions matter to growth". To the best of my knowledge, a critical review of a similar stature has rarely been done. The closest to this review is Aron (2000) but the year gap justifies the need for the latest review. The present review is a thorough analytical reading of selected empirical papers in the institutions-growth nexus. These papers are carefully assessed and critically evaluated to identify their distinctive components. It is possible to derive links to institutional to growth from the empirical studies investigating the impact of institutions on economic growth which include the measures of institutions frequently used, the channel and the size of effects of institutions on growth, the issue of

reverse causality that may bias the findings, the estimation techniques (and the econometric issues they intend to overcome), and the data sources. Within these common features, these empirical papers would have distinctive heterogeneities, and a comprehensive understanding of these heterogeneities could be useful for future institutions-growth researchers. To this end, future researchers in the institutions-growth nexus need to fully grasp the range of empirical heterogeneities the increasing number of institutional studies have given rise to. In this review, we carefully outline crucial heterogeneity dimensions, shown in Figure 1 below, upon which future institutional researchers should place a great deal of concern when pursuing their empirical studies. Figure 1 serves as the framework for undertaking the assessment.

**Figure 1:** Empirical heterogeneity dimensions in the institutions-economic growth literature



The critical review discusses the theoretical framework of the institutional empirical studies, followed by a critical analysis of the heterogeneities found in empirical studies including the measures of institutional quality, channels and size of effects, and reverse causality issue. Section 4 follows with a discussion of the various econometric techniques employed in the institution-growth studies as well as the empirical issues each technique seeks to overcome. Sources of frequently used institutional data are discussed in Section 5, and concluding remarks follow afterwards.

## 2. Theoretical Modelling of the Institutions-Growth Link

Since the 1990s, numerous empirical studies was devoted to investigating the nature of the relationship between institutional quality and economic growth via an explicit growth model. The two most widely used growth frameworks are that of Mankiw, Romer and Weil (1992)-henceforth MRW, and that of Hall and Jones (1999)-henceforth HJ. Both frameworks are discussed.

### 2.1 Mankiew, Romer and Weil (1992) Framework

The conventional Solow model identifies physical capital accumulation, labour force growth, and technical progress as primary determinants of growth. The MRW augments this model with human capital as an additional explanatory variable as Equation (1):

$$Y = K^\alpha H^\beta (AL)^{1-\alpha-\beta} \quad (1)$$

where  $\alpha, \beta > 0$  and  $\alpha + \beta < 1$  and an economy's output ( $Y$ ) is produced by physical capital ( $K$ ), number of workers ( $L$ ), and human capital ( $H$ ).  $A$  represents labour-augmenting technology that grows exogenously at rate  $g$ . The rates of population growth, ( $n$ ), technological or institutional progress ( $g$ ) and depreciation ( $\delta$ ) are all constant and exogenous for any period. This model can be solved for its steady-state level and the speed of convergence is given by the parameter  $\phi = (n + g + \delta) (1 - \alpha - \beta)$ . Equation (2) can then be derived:

$$\ln(y_T) - \ln(y_0) = \theta_0 + \theta_1 \ln(s_k) + \theta_2 \ln(s_h) + \theta_3 \ln(n + g + \delta) + \theta_4 \ln(y_0) \quad (2)$$

The institutional studies employing the Solow/MRW framework typically incorporate an institution term (normally  $I$ ) into Equation (3) by rewriting the production function in equation (1):

$$Y = IK^\alpha H^\beta (AL)^{1-\alpha-\beta} \quad (3)$$

where  $I$  denotes the influence of institutions on the productivity of input. Then, Equation (3) can be transformed into Equation (4):

$$\ln(y_T) - \ln(y_0) = \theta_0 + \theta_1 \ln(s_k) + \theta_2 \ln(s_n) + \theta_3 \ln I + \theta_4 \ln(n + g + \delta) + \theta_5 \ln(y_0) \quad (4)$$

Institutional studies that explicitly use this framework are, for example, Knack and Keefer (1995), Campos and Nugent (1998), Ali (2003), Assane and Grammy (2003), Ulubasoglu and Doucouliagos (2004), Lee and Kim (2009) and Hall and Ahmad (2014).

According to Campos and Nugent (1998), the use of MRW framework is motivated primarily by the fact that it contains a “shift” parameter that, as stated in Mankiw et al. (1992), “reflects not just technology, but also other possible factors such as resource endowments, climate, and so on...”. Campos and Nugent add institutions into the list of possible factors, thus making explicit the link between the institution and economic growth.

Among the advantages of the Solow/MRW model are the comparisons it affords with many other studies that use a similar framework, its ability to test other possible hypotheses, and the fact that it works well in samples of relatively homogenous countries. Ulubasoglu and Doucouliagos (2004) reason that although MRW’s framework is the simplest possible framework, it affords the possibility of looking at the effects of institutions on factor accumulation and productivity. Furthermore, the model’s empirical performance is relatively similar to other variants of neoclassical model, or other growth-determinants, including human capital.

## 2.2 *Hall and Jones (1999) framework*

Hall and Jones (1999) investigate the factors explaining variation in output per worker and document that institutions and government policies can explain the differences in capital accumulation, productivity and therefore, output per worker. They assume a simple Cobb-Douglas production function as Equation (5):

$$Y = K^\alpha (AH)^{1-\alpha} \quad (5)$$

where  $K$  denotes the stock of physical capital,  $H$  is the amount of human capital-augmented labour, and  $A$  is a labour-augmenting measure of productivity. They assume that labour,  $L$  is homogenous within a country and that each unit of labour has been trained with  $E$  years of schooling

(education). Human capital-augmented labour is therefore given as (Equation 6):

$$H = Le^{\phi(E)} \quad (6)$$

The function of  $\phi(E)$  reflects the efficiency of a unit labour with  $E$  years of schooling. Equation (5) can be conveniently rewritten in terms of output per worker,  $y \equiv Y/L$ , as in Equation (7):

$$y = (K/Y)^{\alpha/1-\alpha} hA \quad (7)$$

where  $h \equiv H/L$  is human capital per worker. HJ incorporates institutions (or social infrastructure as they called it in their study) in the model of growth (Equation 8):

$$\log Y/L = \alpha + \beta S + \epsilon \quad (8)$$

and (Equation 9):

$$S = \gamma + \delta \log Y/L + X\theta + \eta \quad (9)$$

where  $S$  denotes social infrastructure and  $X$  is a collection of other variables.

Rivera-Batiz (2002), Cavalcanti and Novo (2005), Eicher and Leukert (2009), and Eicher, Garcia-Penalosa and Teksoz (2006) follow the similar methodology of Eicher et al. (2006) particularly combine both by HJ and MRW approaches to explain cross-country per capita income level.

Other institutional studies do not explicitly employ any growth framework in their analysis. They present a standard regression of numerous development indicators, including the widely used economic growth or level income per capita on various institutional measures and other explanatory variables.

### 3. Empirical Heterogeneities in Institutions-Growth Studies

#### 3.1 Measures of Institutional Quality

Although institutional studies are able to show particularly consistent and strong positive growth-effects, numerous measures used to proxy for institutional quality, and among the widely used variables are security of property rights, rule of law (or political institutions), economic freedom, democracy, corruption, and social factors.

### ***3.1.1 Security of Property Rights***

Security of property and contractual rights has become an institutional quality widely accepted to be one of the significant determinants of cross-country growth. North (1990) postulates: “the inability of societies to develop effective, low-cost enforcement of contracts is the most important source of both historical stagnation and contemporary underdevelopment in the Third World...” Thus, the absence of secure property and contractual rights are shown to discourage investment and specialisation.

Among the studies that investigate this aspect of institution are Kormendi and Meguire (1985), Scully (1988), Barro (1991, 1996), Knack and Keefer (1995), Acemoglu et al. (2001), Havrylyshyn and van Rooden (2003), Rodrik et al. (2004) and Tavares (2004), Demetriades and Law (2006) and Hall and Ahmad (2014). They use various proxies to reflect the security of property rights, and overall, they find evidence of growth-augmenting effects of this institutional quality.

Kormendi and Meguire (1985) and Scully (1988) use Gastil indices of civil liberties and political freedom, while Barro (1991) uses coups and political assassinations (political instability) as proxies for the security of property rights.

Knack and Keefer (1997a) conduct an analysis by regressing per capita income growth on political instability as a measure of institution. They find that the low-income economies may not grow faster than high-income economies if they suffer from a weak institutional framework in term of ineffectiveness of rule of law, pervasiveness of corruption, high risk of expropriation and contract repudiation. This is the case even when other factors such as investments in human and physical capital are controlled. Rodrik et al. (2004) investigate the impact of institutions, geography and trade on income level and find that growth-effect of the institutional quality (measure of property rights and the rule of law) “trump” everything else.

### ***3.1.2 Rule of Law (Political Institutions)***

Knack and Keefer (1995) argue that the rule of law is a better measure of institutional quality than Gastil’s indices and political violence as these variables only partially capture the many relevant threats to property and contractual rights. Barro (1996) contends that political institutions are of the most important factors in explaining the growth differences among countries. Havrylyshyn and van Rooden (2003) show that the explanatory power of the analysis is increased when the institutional variables representing the political and legal framework are controlled, especially when the impact of the institutional environment is modelled to increase over time.

Tavares (2004) in his study on institutional reforms in Portugal finds evidence that legal system reform matters significantly to economic growth on the aggregate and procedural characteristics such as check collection. Meanwhile, Eicher and Leukert (2009) and Eicher and Schreiber (2009) document the significant effect of political/constitutional measure of institutions (or structural policies as they call it) on the different economic performance across the OECD and non-OECD countries. Law and Bany-Arifin (2008) also demonstrate that higher rule of law has the largest economically significant positive growth-effect in all income groups. They also find the rule of law, corruption, bureaucratic quality, and risk of expropriation are significant determinants on economic development of the middle- and low-income countries.

### ***3.1.3 Economic Freedom***

Ali and Crain (2002) and Carlsson and Lundstrom (2002) report that economic freedom is a more robust determinant of growth than political freedom and civil liberties. However, Ulubasoglu and Doucouliagos (2004) document that the total effects of both economic freedom and political freedom (direct and indirect) on growth are positive and significant.

Ayal and Karras (1998) argue that economic freedom enhances growth as it increases total factor productivity and capital accumulation. Dawson (1998) and Gwartney et al. (2006) also find that economic freedom affects growth directly and indirectly through enhanced investment. Ali (2003) and Assane and Grammy (2003) assert that economic freedom is an important determinant of growth and investment, and positive effect of institutional quality on growth is more pronounced with mutually-reinforcing support from economic freedom. They contend that economic freedom goes hand in hand with good institutions, suggesting that freedom can only be sustained in an environment of high institutional quality.

### ***3.1.4 Democracy***

Bardhan (2005) proposes that instead of depending on variables that based on property rights measures, to look into other measures of institutional quality such as participatory rights and democratic accountability. He finds evidence that rule of law is significant in explaining GDP per capita but not the level of literacy as opposed to democratic political rights variable. He argues that this evidence shows the importance of other sets of institutional quality variables other than property rights-based measures of institutional quality alone for the explanation of development.

Along this vein, Rivera-Batiz (2002) finds that governance-improving democracy matters towards improving growth, and shows evidence that



democracy is a significant determinant of total factor productivity (TFP) growth between 1960 and 1990 in a cross-section of countries. Butkiewicz and Yanikkaya (2004) argue that rule of law is not the only significant factor towards economic growth, but democracy also matters especially in developing countries. They, however, report that both are sensitive to sample selection and estimation technique.

### ***3.1.5 Corruption***

Meanwhile, Mauro (1995) looks from the perspective of corruption and finds that it is growth-retarding. Aidt, Dutta and Sena (2008) present an analysis of corruption and governance regimes and their relationship to growth. Their threshold model identifies that governance regime is defined by the quality of political institutions and shows that relationship between corruption and growth is regime-specific, i.e. corruption has high impact on growth in a regime with high-quality political institutions, whereas, in low-quality political institutions, corruption has no growth impact.

### ***3.1.6 Social Factors***

Hall and Jones (1999) coined the term “social infrastructure” to define institutions and government policies that determine the economic environment. The indicators they use to measure social infrastructure are an index of government-anti-diversion policies (GADP) and a country’s trade openness. They find that differences in social infrastructure cause the variations in capital accumulation, productivity and therefore output per worker.

La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997) and Knack and Keefer (1997b) and Zak and Knack (2001) use indicators of trust and civic norms in their regressions and find significant impacts of trust and civic cooperation on economic performance. Zak and Knack (2001) find that low trust environment reduces investment and the rate of economic growth. Trust is higher in economically, socially, and ethnically more homogenous societies and in countries where social and legal mechanisms for reducing opportunistic behaviour are better developed.

Easterly (2006) defines social cohesion as the nature and extent of social and economic divisions within society, and these divisions may include income, ethnicity, political party, language and other demographic variables. Countries that are strongly divided along class and ethnic lines will place severe constraints on the policymakers to bring about reforms. Empirically, he can show that social cohesion determines the quality of institutions, which in turn has important impacts on growth.

### 3.2 *Channel of Effects: Direct vs. Indirect*

While the significance of institutions as a predictor of growth and economic performance is never doubted, the channels through which its effects influence the economic growth are still hotly debated. The relationship between institutions and growth is undeniably complex, and it is likely that institutions may affect growth in many ways, perhaps directly, or by indirectly affecting variables that in turn affect growth, and by affecting aggregate production function determining how other variables affect growth. Among the studies to dwell on this contentious issue are Campos and Nugent (1998), Hall and Jones (1999), Ulubasoglu and Doucouliagos (2004), Eicher et al. (2006), and Cavalcanti and Novo (2005).

Ulubasoglu and Doucouliagos (2004) suggest that specification of the empirical models based on augmented Solow framework only captures the “marginal effect” of some categorical institutional variable on growth. This relationship is considered *direct* by the literature as institutional effects are assumed to go through shift parameter “A” in the production function. They argue that in general, *indirect* effects of institutions are often ignored and they posit that if institutions are to influence long term growth, their effects should work through both inputs of production (physical and human capitals accumulation and labour growth) and total factor productivity. They suggest a more explicit analysis of the link between institutions and determinants of production.

Eicher et al. (2006) note that previous empirical studies typically use a direct approach to estimate the power of institutions in explaining per capita income which relies on reduced forms, regressing output on institutions only. This parsimonious method highlights the effect of institutions in a dramatic fashion but sheds little light on the exact mechanics by which institutions affect output. They argue that institutions do not produce output hence their effects are indirect. They find that the largest impact of institutions is through its effects on productivity. While institutions have significant positive effects on the productivity of physical capital, it has a negative impact on human capital suggesting a substitute relationship between both.

Campos and Nugent (1998) document the possible link between institutional development and per capita growth operating through human capital formation. He finds that level of human capital demonstrated a positive significant effect on the institutional index, and that, by including institutional index in the growth regression, the magnitude and significance of the effect of human capital on growth are significantly raised. Hall and Jones (1999) and Cavalcanti and Novo (2005) posit that the differences in output per worker are driven by the differences in both human and physical capitals accumulation as well as productivity, and they are, in turn, influenced by the differences in institutions. Cavalcanti and Novo (2005)

present a framework similar to Hall and Jones (1999) but augment it with impacts of the cultural, geographical and historical factors on economic development that run indirectly through institutions.

The common analysis of the relationship of various institutional indicators on economic growth typically includes investment rate as one of the explanatory variables. Besides institutional factors, Gwartney et al. (2006) argue this method will underestimate the growth-enhancing effects of superior institutions if institutional quality influences the rate of investment. Their study isolates the independent impact of institutions on growth, through its impact on both level and productivity of investment. They find that higher quality institutions renders countries capable to achieving more growth per unit of investment and able to attract higher level of investment as a share of GDP and conclude that the indirect impact of institutional quality via private investment is sizeable.

Minier (2007), though he concurs with the findings of Glaeser, La Porta, Lopez-de-Silanes and Shleifer (2004) that there is little evidence supportive of the proposition that institutions affect growth, is able to show that institutions affect the relationship between trade openness and growth. He postulates that country with weak institutions appear to suffer from trade openness in ways that countries with better institutions do not.

### ***3.3 Varying Effects of Institutions***

Another notable outcome of the many studies on the relationship between institutions and economic development is that institutions play different roles, or have varying effects on countries at different stages of development. Various measures have been used by institutional studies to classify the stages of development of the countries in their attempts to identify the significance differentials of institutional parameter.

Campos and Nugent (1999) use the different growth experience of Latin America and East Asia, and found that different institutional characteristic seems to have played a prominent role in improving development performance in different regions. The rule of law appears to be most effective in Latin America, and in East Asia, quality of bureaucracy is most effective. Furthermore, they also find that complementarity/substitutability relationship among the various institutional characteristics seem to differ by region.

Cavalcanti and Novo (2005) segregate their sample countries via income differences they report that countries at the bottom of the conditional distribution of international income (CDII) receive stronger effects from improvement in institutions (6.2%) compared to those at the top of this distribution (3.8%). Eicher and Leukert (2009) find that the impact of institutions varies substantially across subsamples of OECD and non-OECD

countries; they are about three times larger in developing countries than in OECD countries. They are also able to show that there exists a standard set of economically important institutions among advanced and developing countries.

Aixalá and Fabro (2008) and Law and Bany-Ariffin (2008) divided the sample countries in their study based on the World Bank classification of countries, namely higher, medium-high, medium-low and lower-income). They find evidence of differential effects of institutional quality on different stages of economic development. Aixalá and Fabro (2008) show that, for rich countries, the rule of law is fundamental determinant of growth, while for poor countries it is the control of corruption. However, Law and Bany-Ariffin (2008) find that rule of law has statistically significant effect on growth in all income groups. Besides rule of law, they also find that control of corruption, bureaucratic quality, and lower risk of expropriation are also significant in medium-low and lower-income groups.

Lee and Kim (2009) classify their sample countries into Latin America (Brazil, Argentina, Chile, Mexico), Africa (Ghana, Nigeria, South Africa), and Asia (Philippines, Thailand, Malaysia, China, India). Excluded in the Asia group, Korea and Taiwan stand as an independent country class due to their different growth performance than the remaining countries in the Asia group. Their study finds both institutions and policies matter differently for different income groups. Institutions are significant for lower-income countries growth, but not the case for upper-middle and higher-income countries.

Hall and Ahmad (2014) investigate the effects of institutions on economic growth in a sample of 69 developing countries from three regions namely East Asia, Africa and Latin America. However, their focus is on the East Asian countries that have recorded significant economic growth prior to the Asian Financial crisis in 1998. They show that the effects of institutions vary according to different regions, and, in the case of East Asian countries, for the period before and after crisis.

### **3.4 Reverse Causality**

Despite the numerous evidence supporting the institutional impacts upon economic development, Glaeser et al. (2004) have come out with sharp criticism against the proposition. They instead suggest human capital is a more robust determinant of growth, instead of institutions. They follow North's (1981) definition of institution with focus on the keyword "*constraints*" and "*permanent and durable*" particularly suggesting that any institutional measure not reflecting these two elements would lead to bias and cannot be used to establish causality.

They outline their arguments based on two aspects, firstly, most indicators of institutional quality used to establish the proposition that institutions cause growth are constructed to be conceptually unsuitable for the purpose, and secondly, the instrumental variable techniques used in the literature are flawed. They argue that none of the mostly used indicators of institutions are able to reflect the above two elements, since these indicators are a measure of outcome since they rise with per capita income, and they are highly volatile.

Via OLS estimation of a model using income per capita growth between 1960 and 2000 as the dependent variable, and initial income per capita, initial education, the share of population in temperate zone, and eight institutional variables entering one at a time, as explanatory variables, they find that institutions have no predictive power on growth of per capita income. With regard to the instrumental variable techniques,

Glaeser et al. (2004) is also particularly concerned with the instruments used by Acemoglu et al. (2001), i.e. settler's mortality and indigenous population density in 1500. They argue that these instruments are invalid because they are strongly correlated with per capita income. A necessary condition for these variables to be valid instruments for institutions is that they do not influence per capita income through other channels (uncorrelated with the error term). They argue that when colonisers settled, they did not bring in their institutions, but their know-how instead, i.e. the effect of these instruments on growth could be operating through human capital channel. They go on to statistically prove that both instruments have high correlation with years of schooling in 1960 and 2000.

Nevertheless, Glaeser et al.'s findings are not largely irrefutable and may be called into question. Their proposition on the supremacy of the human capital over institutions as a primary determinant of growth has failed to recognise the various channels the effect of institutions may operate through as previously highlighted in section 2.2. The channel of institutional impacts could run through total factors productivity and factors accumulation including the human capital.

Furthermore, the OLS estimation they use to conclude that institutions not having predictive power on the growth of per capita income may suffer severe estimation problems as it ignores country-specific aspects of economic growth which may be correlated with independent variables, causing omitted variable bias. The methodology warrant re-estimation with more advanced econometrics methodologies for better accounting of causality, with more appropriate measure of institutions, and innovative instruments. Examples of latest analysis techniques in panel data are discussed in the following section.

#### 4. Econometric Techniques and Related Issues

The advances in the development of econometric methods have significantly improved the techniques used in investigating the complex relationship between institutions and economic growth. Several estimation techniques utilised by some institutional studies including the more recent ones are briefly discussed below. The lingering econometric problems and issues as far as the econometric techniques are concerned are also mentioned.

##### 4.1 *Cross-Sectional Estimation*

Mauro (1995), Acemoglu et al. (2000) (2001), Rodrik et al. (2004), and Glaeser et al. (2004) rely on cross-sectional estimation to investigate the growth-effects of institutions. In this method, researchers typically take averages of the time-varying variables across different years, and then apply OLS to a growth model with growth of period or log per capita income at the end of the preceding year used as dependent variables. On the right-hand side, several institutional factors and a vector of other controlled variables act as explanatory variables.

If there is a problem of endogeneity in the explanatory variables, it is invariably solved using an instrumental variable technique like 2SLS and 3SLS, with numerous instruments proposed. Mauro (1995) employs 2SLS analysis using ethno-linguistic fractionalisation as an instrument for institutions since the variable has negative and significant correlation to institutions.

Hall and Jones (1999) meanwhile use distance from the equator, the fraction of population that speaks English, fraction of population that speaks another European language, and predicted trade share of an economy (developed by Frankel and Romer (1999) based on gravity model of international trade) as the instruments for social infrastructure. They find social infrastructure have substantial effect on production and argue that differences in social infrastructure can explain between 25.2% to 35.1% differences in output.

As previously mentioned, Acemoglu et al. (2001) use settlers' mortality to be an instrument for institutions. To measure the efficiency of current institutions they use the protection from expropriation risk indicator (obtained from ICRG index used in Knack and Keefer, 1995), and for the instrument they use non-combat mortality rates per thousand of soldiers, bishops and sailors whose data runs from the period from 1817-1848 for 64 countries.

Rodrik et al. (2004) follow Acemoglu et al. (2001) by using settler's mortality as an instrument for institutions in their 2SLS analysis of the effect institution, integration and geography on income per capita. They find

evidence of bidirectional causality between institutional quality and trade and this finding shows that for the case when integration can influence institutional quality, it may also suggest that trade can have an indirect effect on incomes by improving Hall and Jones' (1999) institutional quality.

Easterly and Levine (2003) in their initial OLS analysis show that endowment variables affect both economic development and institutions. They employ the 2SLS method and instrument institution using endowment variables such as settler's mortality, latitude, as well as landlocked and crop/minerals dummies. In the second-stage regression, they include other exogenous variables such as French legal origin dummy, religions, ethno-linguistic fractionalisation, and macroeconomic policies variables such as inflation, openness, and real exchange rate overvaluation.

Butkiewicz and Yanikkaya (2004) also employ cross-country panel data analysis for 100 countries and for the sample period from 1970 to 1999 via seemingly unrelated regressions (SUR) and 3SLS. The dependent variable is real GDP annualised growth rate, and explanatory variables include initial GDP per capita, physical and human capitals, and a vector of other variables including measures of democracy and rule of law. The instrument variables are Mauro's (1995) ethno-linguistic fractionalisation and Rodrik's (1997) secondary enrolment ratios for institutional quality and democracy, respectively.

In addition to ethno-linguistic fractionalisation, Easterly (2006) use income inequality as instrument variables for social cohesion in their 3SLS analysis and the instruments pass Sargan and Hansen overidentification tests. They find evidence that more social cohesion will lead to better institutions, and this, in turn, will lead to higher growth.

Though it is widely used, the cross-sectional method usually faces a serious problem which may yield inconclusive results. Single cross-sectional estimation ignores country-specific aspects of economic growth, which may be correlated with independent variables, causing omitted variable bias. Although instrumental variable can be used to mitigate the potentially endogenous explanatory variables, it is, however, difficult to find reliable instruments.

#### **4.2 Panel Data Analysis**

Panel data analysis is employed when the data dimension in any particular study comes from both cross-sectional units and periods. The advantage of panel data is that it increases number of observations significantly. Meanwhile panel data analysis such as fixed and random effects as well as GMM techniques are capable of reducing the unobserved country heterogeneity problems, omitted variable bias, measurement error and

potential endogeneity issue that frequently affect growth models (Bond, Hoeffler, & Temple, 2001).

Based on the first-differenced panel GMM technique used by Caselli, Esquivel and Lefort (1996), Dollar and Kraay (2003) employ lagged level of trade and lagged institutional quality as instruments for trade and institutional quality, respectively. They argue these instruments can reduce identification problem suffered by the conventional instrument variables based on the historical/geographical factors as commonly used in the previous research. They also employ fixed-effects estimation, which can reduce the omitted variable bias and time-invariant heterogeneity in the estimation as a robustness check.

Law and Bany-Ariffin (2008) similarly employ dynamic panel data analysis of the ICRG data for 72 countries for the 1980-2001 period. They specifically use Panel GMM (Arellano and Bond, 1991) and Pooled Mean Group estimator (Pesaran, Shin and Smith, 1999). They show both institutions and capital stock have positive and statistically significant effects on all stages of economic development.

Lee and Kim (2009) and Ulubasoglu and Doucouliagos (2004) do not favour the use of the Arellano-Bond (1991) technique. They argue first-differencing of production function will destroy the long-run relationship between inputs and outputs, the thing verily they want to capture. Moreover, most studies found insignificant results in production functions when data used is first-differenced. Also, this technique normally suffers from small sample bias problem. Thus, Lee and Kim (2009) adopted multiple techniques, combining cross-sectional estimation, fixed-effects panel data, and system GMM estimations. Since the former two still encounter estimation problems as discussed earlier, the system GMM is used to take better care of a small sample, omitted variables, and endogeneity problems.

System GMM is an advanced methodology developed by Arellano and Bover (1995), and Blundell and Bond (1998). This technique combines in a system the relevant regression expressed in first-differences and in levels. Estimating two equations in system GMM reduced potential bias and imprecision associated with a simple first-difference GMM estimator (Arellano and Bond, 1991). They also check for robustness with overidentification test of Sargan/Hansen, and test for second-order serial correlation of the residuals in differenced equation (AR2).

### ***4.3 Spatial Growth Model***

Spatial growth model extends an otherwise standard growth model with a spatial term that captures the relative location effects of growth-determinants, including institutions. Unlike absolute location effect which refers to the impact of being located at a particular point in space (for instance



in a certain region or climate zone, or at a certain latitude), relative location effect refers to the impact of being located *closer* or *further* away from other specific countries or regions.

The relative effect is related to the concept of spatial dependence, which according to Anselin and Bera (1998), Anselin (2001) and Arbia (2006) if omitted in the growth analysis, would cause the standard growth model to be seriously misspecified. Institutional-spatial model of growth postulates that, since institutions have been empirically shown to be a significant growth determinant, naturally institutionally similar countries may exhibit higher tendency to have economic interactions with each other, and eventually to achieve comparable growth levels and greater spillovers between them.

Arbia, Battisti and Di Vaio (2010) is arguably the first to empirically model the institutional-spatial interdependence of growth experience in European regions. Using institutional and geographical matrices to measure spatial proximity between countries, they can show that the relative location effect of institutions is highly significant to regional output per worker. They also find evidence that holding the geographical distance fixed, the regions sharing similar institutional characteristics tend to converge more rapidly to each other. Meanwhile, Ahmad and Hall (2017), via spatial the Durbin model using institutional and geographical proximity matrices, show that institutions, specifically the property rights institutions, matter for growth in developing countries, and there are indirect institutional spillovers where institutions in a country lead to growth improvement in the country and subsequently generate positive spill-over effects on neighbours' economic growth.

## 5. Sources of institutional data

The most widely used indicators of institutional quality are as follows:

### 5.1 *International Country Risk Guide*

Arguably, Knack and Keefer (1995) can be credited as the first who introduce the use of institutional quality indices from International Country Risk Guide (ICRG) and Business Environment Risk Intelligence (BERI) as a proxy to the security of property rights.

The components of ICRG indicators include (a) *Rule of Law* (indicator for established peaceful mechanisms for adjudicating disputes), (b) *Expropriation Risk* (representing the risk of expropriation), (c) *Repudiation of Contracts* (indicator of contract enforcement and government credibility of honouring the contract), (d) *Corruption in Government*, and lastly (e) *Quality of Bureaucracy*. The first two measures are interpreted as proxies for the security of property rights, while the latter two are taken as proxies for

general efficiency with which the government services are provided, and for the extent and damage of rent-seeking behaviour.

Meanwhile, institutional indicators from BERI include (a) *Contract Enforceability*, (b) *Infrastructure Quality*, (which allows some approximation to be made to the efficiency with which government allocate public goods), (c) *Nationalisation Potential*, and lastly (d) *Bureaucratic Delays* – the latter two are both parallel to ICRG’s variables *Expropriation Risk* and *Quality of Bureaucracy*, respectively.

The ICRG and BERI data have since been frequently utilised by numerous studies, such as, to name a few, Mauro (1995), Hall and Jones (1999), Chong and Calderon (2000a, 2000b), Rivera-Batiz (2002), Acemoglu et al. (2001), Assane and Grammy (2003), Rodrik et al. (2004), Butkiewicz and Yanikkaya (2004), Tavares (2004), Law and Bany-Ariffin (2008), Hall and Ahmad (2014), Ahmad and Hall (2017), and Kar, Roy and Sen (2019). Most of the studies have been discussed in the preceding section.

## 5.2 *Polity IV data – Polity 2 and Executive Constraints*

The Polity IV dataset, published by the Centre of Systemic Peace (latest citation Marshall, Gurr and Jaggers, 2017), is the widely used dataset for studying regime change and the effects of regime authority. The most popular indicator used by institutional studies is Polity 2 indicator that measures institutionalised democracy vs. institutionalised autocracy by computing the Polity index from six sub-components. One crucial component indicator is Executive Constraints, often individually used too apart from the Polity 2 index, is defined as the extent of institutionalised constraints on the decision making by chief executives imposed by accountability groups, hence concerns with check and balances between various parts of the decision making process.

Acemoglu and Johnson (2005) encourage the use of Polity IV variable executive constraints as “it is conceptually attractive since it measures institutional and other constraints that are placed on presidents and dictators. Theoretically we expect a society where elites and politicians are effectively constrained to experience less infighting between various groups to take control of the state, and to pursue more sustainable policies.”

Though the Executive Constraints variable is widely used to measure “limited government” hence a proxy for secure property rights, Glaeser et al. (2004) however argue that this indicator always received higher rating for countries rich in democracies, and less rating for dictatorships. They note that a closer look at how this variable is constructed reveals that it reflects the outcome of elections, and not measuring an actual political constraint on government.

### 5.3 *Worldwide Governance Indicator*

The World Bank Governance Indicator (WGI) is originally developed by Kaufmann et al. (1999) in their first publication “Governance Matter.” It has six components (a) *Voice and Accountability*, (b) *Political Stability and Absence of Violence/Terrorism*, (c) *Government Effectiveness*, (d) *Regulatory Quality*, (e) *Rule of Law*, and (f) *Control of Corruption*. Kaufmann and his team continuously update the governance index until now. The indicator is increasingly popular with the researchers and is frequently employed in their studies for example Easterly and Levine (2003), Rodrik et al. (2004), Butkiewicz and Yanikkaya (2004), Easterly (2006), Aidt et al. (2008), and Huynh and Jacho-chávez (2009).

Nevertheless, the WGI indicator is not without its critics. Thomas (2009) poses a fundamental question about whether the WGI indicators have a correct ‘construct validity’ in its measurement, i.e. whether they measure what they purport to measure. He finds that there are reasonable questions about the construct validity of the indicators and the indicators’ hypothesis about the nature of governance is still untested. Meanwhile, Langbein and Knack (2010) utilise three analyses namely factor, confirmatory factor and path analysis to test both measurement and causal models of the six WGI indicators. They find that, rather than distinguishing among aspects of the quality of governance, the WGI indicators appear to be measuring the same broad concept.

### 5.4 *Other Data Sources*

Other than the data sources discussed above, recent studies have also utilised data from other sources such as from CIRI Human Rights Index, Index of Economic Freedom from The Heritage Foundation, Index of Democracy from PRIO International Peace Research Institute, Political Constraint Index (POLCON dataset), and Corruption Perception Index from Transparency International, and many more.

Basu (2008) and Basu and Das (2010) make use of extensive institutional data from multiple sources including all of the above and develop two indices, namely the Development Quality Index (DQI) and Institutional Quality Index (IQI) using the multivariate statistical method of principal components. DQI is constructed based on three dimensions, i.e. economic, health and knowledge, whereas IQI covers three dimensions of institutional quality, i.e. economic, social and political. The studies find evidence that institutions, economic policies and geography are three critical determinants of the differential levels of development across countries.

## 6. Discussion and concluding remarks

Via a thorough analytical reading of selected important empirical papers in the institutions-growth nexus, this review paper summarises, as in Table 1, the significant findings of the empirical papers, the related references in each finding and the critical information for each empirical heterogeneity dimension. Table 1 shows that empirical heterogeneities in the institutional studies may come from various sources, such as different modelling techniques to link growth to institutions, diverse proxies and measures of institutional quality used in the studies, the direct and indirect channels through which the effects of institution run, the varying sizes of effects depending on economic development and location of sample countries, issue of reverse causality that shows the effect may run from growth to institutions, different econometric techniques to estimate the institutions-growth relationship, and the sources of institutional data.

To conclude, the institutional approach has undoubtedly emerged as a significant strand of growth analysis to explain the underlying factors behind the cross-country income differential and growth. There are voluminous studies investigating the institution-growth relationship, and on overall, these studies can show a particularly consistent and strong result, i.e. institutions have economically and statistically significant positive effects on economic growth. Notwithstanding the vital growth-effect of institutions, the literature in the institutional studies is arguably still without a unified analytical framework and that more research needs to be done before the institutional perspective can be fully operationalised into the empirical growth analysis. Consequently, it is expected that the distinctive empirical heterogeneities discussed in this review would serve to fill the above literature gap and will become a crucial guide to better-inform future empirical works in the institutional-growth analysis towards strengthening the evidence supporting the proposition “institutions matter to growth.”

**Table 1:** Summary of important findings, related references and key information for each empirical heterogeneity dimension in the institutions-growth literature

Heterogeneity dimensions	Summary of major findings	Related references	Key information
Modelling the link	<ul style="list-style-type: none"> <li>• Two major growth framework namely Mankiw, Romer and Weil (1992) and Hall and Jones (1999) – giving explicit link between institutions and growth.</li> <li>• MRW: has a shift parameter that reflects technology, resource endowment, climate (and institutions, according to Campos and Nugent, 1998).</li> <li>• Some studies do not employ any growth framework, only a standard regression of growth on institutions.</li> </ul>	<ul style="list-style-type: none"> <li>• MRW: Knack and Keefer (1995), Campos and Nugent (1998), Ali (2003), Assane and Grammy (2003), Ulubasoglu and Doucouliagos (2004), Lee and Kim (2009) and Hall and Ahmad (2014).</li> <li>• HJ: Rivera-Batiz (2002), Cavalcanti and Novo (2005), Eicher and Leukert (2009), and Eicher, Garcia-Penalosa and Teksoz (2006)</li> </ul>	<ul style="list-style-type: none"> <li>• Both MRW and HJ allow decomposition of differences in output into capital-output ratio</li> <li>• MRW differs from HJ in that MRW assumes productivity differences uncorrelated with physical and human capitals</li> <li>• HJ assumes productivity correlated with human capital</li> <li>• MRW emphasises on inputs, but HJ emphasises productivity.</li> </ul>
Measures and proxies	Most widely used institutional qualities: <ul style="list-style-type: none"> <li>• Security of property rights</li> <li>• Rule of law (political institutions)</li> <li>• Economic freedom</li> <li>• Democracy</li> <li>• Corruption</li> <li>• Social factors</li> </ul>	<ul style="list-style-type: none"> <li>• Security of property rights: Kormendi and Meguire (1985), Scully (1988), Barro (1991), Knack and Keefer (1997a), Rodrik et al. (2004), Demetriades and Law (2006), Hall and Ahmad (2014).</li> <li>• Rule of law: Knack and Keefer (1995), Barro (1996), Havrylyshyn and van Rooden (2003), Tavares (2004), Eicher and Leukert (2009), Eicher and Schreiber (2009), Law and Bany-Arifin (2008).</li> </ul>	<ul style="list-style-type: none"> <li>• Security of property rights ensures effective and low-cost enforcement of contracts to encourage investment and other economic activities.</li> <li>• Rule of law is also known as political institutions to ensure there is an established peaceful mechanism for adjudicating disputes, impartiality in the legal system.</li> <li>• Economic freedom: institutions and policies of a nation protect the freedom of individuals to make their own economic decisions.</li> </ul>

**Table 1:** (Continue)

<b>Heterogeneity dimensions</b>	<b>Summary of major findings</b>	<b>Related references</b>	<b>Key information</b>
		<ul style="list-style-type: none"> <li>• Economic freedom: Ali and Crain (2002), Carlsson and Lundstrom (2002), Ulubasoglu and Doucouliagos (2004), Ayal and Karras (1998), Dawson (1998), Gwartney, et al. (2006), Ali (2003), Assane and Grammy (2003)</li> <li>• Democracy: Bardhan (2005), Rivera-Batiz (2002), Butkiewicz and Yanikkaya (2004)</li> <li>• Corruption: Mauro (1995), Aidt, Dutta and Sena (2008)</li> <li>• Social factors: Hall and Jones (1999), La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997), Knack and Keefer (1997b), Zak and Knack (2001), Easterly (2006).</li> </ul>	<ul style="list-style-type: none"> <li>• Democracy: Participatory rights and democratic accountability, constraints of country's executives.</li> <li>• Corruption: bribery to facilitate operations.</li> <li>• Social factors: social infrastructure, trust and civic norms, social cohesion.</li> </ul>
Channel of effects	<ul style="list-style-type: none"> <li>• Direct vs indirect effects.</li> <li>• Direct effect when institutions are explicitly incorporated into growth framework.</li> <li>• Indirect effect is often ignored according to Ulubasoglu and Doucouliagos (2004).</li> </ul>	<ul style="list-style-type: none"> <li>• Campos and Nugent (1998), Hall and Jones (1999), Ulubasoglu and Doucouliagos (2004), Eicher, et al. (2006), and Cavalcanti and Novo (2005), Gwartney et al. (2006), Minier (2007), Glaeser, La Porta, Lopez-de-Silanes and Shleifer (2004).</li> </ul>	<ul style="list-style-type: none"> <li>• Indirect effects: via human capital (Campos and Nugent, 1998), via both human and physical capitals (Hall and Jones, 1999), via both capitals and other possible channel such as cultural, geographical, and historical factors (Cavalcanti and Novo, 2005).</li> </ul>

**Table 1: (Continue)**

Size of effects	<ul style="list-style-type: none"> <li>• Different stages of development</li> <li>• Different region/location of countries</li> </ul>	<ul style="list-style-type: none"> <li>• Campos and Nugent (1999), Cavalcanti and Novo (2005), Eicher and Leukert (2009), Aixelá and Fabro (2008), Law and Bany-Ariffin (2008), Lee and Kim (2009), Hall and Ahmad (2014)</li> </ul>	<ul style="list-style-type: none"> <li>• Between different region such as Latin America, East Asia, Africa</li> <li>• OECD vs non-OECD</li> <li>• Between different conditional distribution of international income (CDII)</li> <li>• Higher income, medium-high income, medium-low income, lower income</li> </ul>
Reverse causality	<ul style="list-style-type: none"> <li>• The possibility of effects coming from growth to institutions</li> </ul>	Glaeser et al. (2004) argue that it is growth that affects institutions, not vice versa.	<ul style="list-style-type: none"> <li>• Most indicators are conceptually unsuitable for studying the effects of institutions on growth</li> <li>• The instrumental variable techniques used in the literature are flawed</li> </ul>
Estimation techniques	<ul style="list-style-type: none"> <li>• Cross-sectional estimation (OLS, IV technique)</li> <li>• Panel data analysis (FE, RE and GMM)</li> <li>• Institutional-spatial model of growth.</li> </ul>	<ul style="list-style-type: none"> <li>• Cross-sectional estimation: Mauro (1995), Acemoglu et al. (2000) (2001), Rodrik et al. (2004), Glaeser et al. (2004), Hall and Jones (1999), Easterly and Levine (2003), Butkiewicz and Yanikkaya (2004), Easterly (2006).</li> <li>• Panel data analysis: Dollar and Kraay (2003), Law and Bany-Ariffin (2008), Lee and Kim (2009), Ulubasoglu and Doucouliagos (2004), Hall and Ahmad (2014).</li> <li>• Institutional-spatial model: Arbia et al., (2010), Ahmad and Hall (2017).</li> </ul>	<ul style="list-style-type: none"> <li>• IV methods: instruments are such as ethnolinguistic fractionalisation, distance from equator, settlers' mortality, endowment variables, secondary enrolment, income inequality</li> <li>• GMM method: instruments are lagged levels and lagged differences of the endogenous variables</li> <li>• Spatial model use geography and institutions to measure proximity.</li> </ul>

**Table 1: (Continue)**

Sources of data	<p>Major sources are:</p> <ul style="list-style-type: none"> <li>• International Country Risk Guide (ICRG)</li> <li>• Polity IV data – Polity 2 and Executive Constraints</li> <li>• Worldwide Governance Indicator (WGI).</li> </ul>	<ul style="list-style-type: none"> <li>• ICRG: Mauro (1995), Hall and Jones (1999), Chong and Calderon (2000a, 2000b), Rivera-Batiz (2002), Acemoglu et al. (2001), Assane and Grammy (2003), Rodrik et al. (2004), Butkiewicz and Yanikkaya (2004), Tavares (2004), Law and Bany-Ariffin (2008), Hall and Ahmad (2014), Ahmad and Hall (2017), and Kar, Roy and Sen (2019)</li> <li>• Polity IV: Acemoglu and Johnson (2005), Glaeser et al. (2004)</li> <li>• WGI: Easterly and Levine (2003), Rodrik et al. (2004), Butkiewicz and Yanikkaya (2004), Easterly (2006), Aidt et al. (2008), and Huynh and Jacho-chávez (2009).</li> </ul>	<ul style="list-style-type: none"> <li>• ICRG: five indicators namely (a) <i>Rule of Law</i>, (b) <i>Expropriation Risk</i> (c) <i>Repudiation of Contracts</i> (d) <i>Corruption in Government</i>, and (e) <i>Quality of Bureaucracy</i>.</li> <li>• Polity 2 measures institutionalised democracy/institutionalised autocracy, computed from six component indicators.</li> <li>• Executive constraints – to measure limited government.</li> <li>• WGI: six indicators namely f (a) <i>Voice and Accountability</i>, (b) <i>Political Stability and Absence of Violence/Terrorism</i>, (c) <i>Government Effectiveness</i>, (d) <i>Regulatory Quality</i>, (e) <i>Rule of Law</i>, and (f) <i>Control of Corruption</i>.</li> </ul>
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