Institutions and growth: Testing the spatial effect using weight matrix based on the institutional distance concept

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Abstract:

This study augments a standard growth model with institutional controls, and models the spatial dependence using geographical and institutional weight matrices. Spatial Durbin model is shown to be the most appropriate to describe the data and political institutions weight matrix best explains the institutional distance concept since it produces identical results to the exogenous geographical-based distance matrix. Overall, the findings give evidence to the institutional quality effects, particularly the security of property rights, on economic growth in the developing countries. We also find evidence of an indirect route of institutions spillover where institutions in a country lead to economic improvement in that country and generate positive effects on the neighbouring countries' income growth. Furthermore, our study is able to show that countries with similar political institutional settings have an increased spatial dependence and converge to a similar level of growth.

Keywords: Growth, institutions, spillover effects, institutional distance, spatial Durbin model.

JEL code: C21, O43, R10

1. Introduction

This paper contributes to the literature on growth and institutional quality by investigating a growth model which incorporates spatial effects based both on a conventional distance measure and a novel approach using a spatial weighting matrix based on institutional closeness. The intuition behind this paper is that the errors in a panel growth regression contain, at least in part, all the misspecification and omitted variables in the model. Institutional quality is hard to measure and so any index of quality must be subject to problems which will be reflected in the errors of the model. We would therefore expect that similar countries in an institutional sense will exhibit similar errors. This is the essence of the spatial institutional model we propose here. This study then examines spatial spillover effect of institutional quality and attempts to uncover the channel through which the institutional spatial spillover effect works, and hence explains the convergence process for countries with similar institutional settings.

A standard growth model is augmented with institutional variables to proxy for property rights and political institutions to test for the absolute effect of the institutional quality. To account for institutional spatial dependence, specific controls connecting the countries under study via various weight matrices are used. In addition to an exogenous weight distance matrix, this study introduces a new spatial weight matrix based on an institutional distance concept which has never been formally modelled previously. Two-stage testing is conducted to determine the most appropriate spatial model to be used.

Overall, this study finds substantial institutional spatial dependence in the countries under study, and the preferred model is one with spatially lagged dependent and explanatory variables. Furthermore, the institutional weight matrix based on endogenous political institutional variables is shown to perform empirically well in explaining the institutional distance since it produces similar results to that of exogenous geographical-based weight matrix. The findings of this study give support to significant institutions' absolute effect on economic growth in developing countries particularly the property rights institutions. Institutional spatial spillover is shown to exist between the countries, at least via an indirect route. In other words, an improvement in the quality of institutions in a country lead to economic improvement in that country and subsequently impact on the neighbouring countries' income growth. Finally, this study shows that countries with similar political institutional settings have an increased spatial dependence and eventually converge to similar level of growth.

The study is organized as follows: Section 2 presents a brief review of institutional spatial studies, followed by a discussion of the empirical framework in Section 3 and estimation strategy and data sources in Section 4. Section 5 explains the estimation results and Section 6 concludes with some remarks on the limitation of this study.

2. Brief review of the institutional spatial literature

The growth literature has investigated the significance of spacial effects on economic growth, see for instance an excellent survey by Abreu, et al. (2005) on the space-growth relationship, the empirical evidence and the methods widely used to test the relationship. The main channels through which space affects regional economic activity can be explained in term of absolute and relative location effects.

Absolute location effect 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, while 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, leads the standard growth model to be seriously misspecified. Abreu et al. (2005) note that a cluster of low growth regions could somehow be the results of spillover from one region to another and the effects could be emanating from numerous factors such as climate, technology, or institutions[1].

Theoretically, Bosker and Garretsen distinguish three possible channels through which the institutional setup of country *i* can have an impact on the income of country *j*, and they are either indirect or direct, or via an influence on the quality of institutions in country *j* and thereby on the income in country *j*. They are defined as follows:

[1] As far as the institutional impact on growth is concerned, on overall, it is fair to say that the institutional literature has already arrived at the academic consensus with strong empirical evidence supporting “institutions matter for growth” proposition. See for example influential studies by Hall and Jones (1999), Acemoglu et al. (2001; 2002), and Rodrik et al. (2004).

i. An indirect spatial institutional effect is when institutions in a neighbouring country lead to economic, social, or political outcomes in that country which in turn have an impact on the home country's income level (see Easterly and Levine 1998; Ades and Chua 1997; Murdoch and Sandler 2002).

ii. The direct route is when institutions in a neighbouring country produce spillover effect on economic, social, or political outcomes in the home country and thereby impact the country's income level (see Gleditsch and Beardsley 2004; Salehyan and Gleditsch 2006; Salehyan 2008 in the political science literature; and Kaminsky and Reinhart 2000 in the trade and financial flow literature).

iii. The last channel relates to the concept of institutional spatial spillover where the level of neighbouring institutions affects the quality of home country's institutions and thereby impacting the home countries' income level (See Kelejian et al. 2008; Faber and Gerritse 2009).

Empirically, there are a number of studies whose findings support the existence of institutional spatial dependence between neighbouring countries. For example, Easterly and Levine (1998) find evidence of spillover effects between growth in African countries and their neighbours suggesting that the copying of policies might be partially responsible for this relationship[2]. Simmons and Elkins (2004) examine the determinant of changes in policy regimes and find that switches between regimes can be explained by policy choices in countries experiencing the similar situations. These studies, however, are not based on formal spatial econometric models.

In a more formal study using an explicit spatial framework, Kelejian et al. (2008) find quality of institutions in neighbouring countries has a quantitatively important impact on the institutional development in the home country and this finding is statistically significant and robust to different empirical specifications[3]. In spite of similar finding as far as institutional

[2] Though the study by Easterly and Levine (1998) does not make an explicit use of spatial econometric model, their estimation method is however consistent with it as they instrument the spatial lag with explanatory variables of the neighbouring countries.

[3] Kelejian et al. (2008) model the spillover via spatial lag and error model. They tackle the endogenous spatial lag via instrument variable (IV) method and estimate spatial error relationship via Generalised Method of Moments (GMM). Various measures of institutional quality are used as dependent variable, whereas the

development in the home country is concerned, Faber and Gerritse (2009) however find no direct impact of nearby countries' institutional quality on home country's income. Similarly Claeys and Manca (2010) examine the spatial links of different political institutions across borders by applying various tests for spatial proximity and they find no evidence of contemporaneous spatial links and they argue this finding is robust to various measures of distance and of cultural proximity across countries[4].

The latter two studies are however in contrast with Ades and Chua (1997) and Murdoch and Sandler (2002) who find political instability and poor situations (like number of revolutions and coups, and civil wars) in neighbouring countries negatively affect the economic performance in the home countries. More recent and formal spatial studies from Bosker and Garretsen (2009) and Arbia et al. (2010) are able to present strong evidence in favour of the proposition that institutional quality in neighbouring countries undoubtedly matters for a country's economic development.

Arbia et al. empirically investigate the growth experience in European regions during the period 1991-2004 and models the spatial interdependence using institutional[5] and geographical[6] weight matrices. They are able to show that spatial externalities are a substantive phenomenon[7], and find 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.

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explanatory variables whose significant impact on institutional development previously documented in the literature are used, such as legal origins, ethnic fractionalisation, religion, natural resources as well as geographical variables. The results are consistent even when different weight matrices used such as common border, length of common border, and inverse distance.

[4] Claeys and Manca (2010) use Worldwide Governance Index institutional indicators obtained from the World Bank and Economic Freedom index by Fraser Institute with various weight matrices including geographical measures (contiguity, physical distance), economic linkage (trade, countries stage of development) or ease of exchange across cultures (using measures like linguistic diversity, ethnic and religious fractionalisation, legal origin).

[5] Arguably Arbia et al. (2010) are the first to employ institutional weight matrix in spatial study, but they instrument the endogenous institutional matrix using exogenous linguistic distance. Linguistic distance is normally used to reflect obstacles to trade, therefore they inverse linguistic distance to create a measure of language similarity which in turn reflects similar institutional arrangement.

[6] In spatial literature, the exogenous geographical-based measures of distance are widely used to establish the linkage via which the spatial dependence between regions/countries runs. Example of the geographical weight matrix will be discussed in empirical framework section.

[7] In econometric term, substantive spatial dependence is frequently modelled via spatial Durbin model where the spatial effect propagates to neighbouring regions by means of endogenous (spatially lagged dependent variable) as well as exogenous variables (spatially lagged explanatory variables).

3. Empirical framework

Consider a simple growth model based on Barro (1991) as follows:

$$g_t = \alpha + \beta \log y_0 + X\theta + \varepsilon \qquad (1)$$

where $g_t = \Delta \log y_t$ which is an *Nx1* vector of real GDP per capita growth rates, α is an *Nx1* vector of constant terms, $\log y_0$ is an *Nx1* vector of logs of real GDP per capita at the beginning of the period, X is an *Nxk* matrix of explanatory variables, β is the convergence coefficient, θ is *Kx1* vector of parameters, and $\varepsilon \sim N(0, \sigma^2 I)$ is an *Nx1* vector of i.i.d. error terms. β is the convergence parameter of the countries under study and it is expected to be negative as it shows the catching-up process by the countries to their steady state. A set of explanatory variables *X* is added as steady state determinants and following Mankiw et al. (1992) stock of physical (*sk*) and human (*sh*) capitals, as well as a term (n+g+δ) that accounts for the sum of population growth, growth in exogenous technological process, and depreciation rate, respectively are included. To capture the absolute location effect of institutions, we augment the model with indices of institutional quality namely the security of property right index (*iiqicrg*) and the political institutions index (*iiqpol*). In full, the matrix of *K* explanatory variables is therefore given by *X*=[*sk*, *sh*, n+g+δ, *iiqicrg*, *iiqpol*] where each element is an *Nx1* vector.

To account for the spatial dependence in the growth model of Equation (1), a spatial autoregressive error term is considered:

$$\varepsilon = \lambda W \varepsilon + u \qquad (2)$$

where *W* is an *NxN* spatial weight matrix incorporating the spatial connections of the system, λ is a spatial autoregressive parameter, ε is an *Nx1* vector spatially correlated errors, and *u* is an *Nx1* vector of a spatial disturbance term with i.i.d. properties.

Assuming the inverse $(I - \lambda W)^{-1}$ exists, and combining Equation (2) with Equation (1), a reduced form can be written as:

$$g = \alpha + \beta \ln y_0 + X\theta + (I - \lambda W)^{-1} u \qquad (3)$$

where I is the *Nx1* identity matrix. However, Equation (3) can be seen as a spatial error model (SEM) growth process where the spatial dependence operates via shocks to the income growth in the regions. The term $(I-\lambda W)^{-1}$ can be decomposed into:

$$(I-\lambda W)^{-1} = (\sum_{i=o}^{\infty} \lambda^i W^i) = I + \lambda W + \lambda^2 W^2 + ... \tag{4}$$

From this decomposition, the spatial autocorrelation is therefore assumed to be a global process as the country-specific shocks propagate themselves to neighbouring countries via a weight matrix. Notwithstanding that, this decomposition also renders the spatial externalities a nuisance factor since it operates through the "error term" which rather makes the spatial effect a relatively less important in the model (Arbia et al. 2010).

However Equation (4) above can be rearranged to model a more direct or more substantive effect of the spatial relationship, which is the following:

$$g = \alpha + \beta \log y_0 + X\theta + \lambda Wg + \phi W \log y_0 + \vartheta WX + u \tag{5}$$

where α is vector of constants i.e. $\alpha(1-\lambda W)$, and $\phi = -\lambda\beta$ and $\vartheta = -\lambda\theta$. It transforms into the Spatial Durbin Model (SDM) which incorporates a spatially lagged dependent variable and spatially lagged explanatory variables. $\phi = -\lambda\beta$ and $\vartheta = -\lambda\theta$ will be the restrictions for Equation (5) and these restrictions enable us to test whether spatial dependence is a nuisance factor that runs via error structure or a substantive factor which directly impacts the growth via endogenous (spatially lagged dependent variable) and exogenous variables (spatially lagged explanatory variables) of the model. We will discuss the test for these restrictions more in the next section.

Thus, if the convergence speed in the normal growth equation is given by the convergence coefficient, β which is the partial derivative of the per capita income growth with respect to the initial income per capita, a model with spatially augmented growth and initial income will thus transforms the convergence coefficient into an augmented partial derivative.

Specifically, a closer look at the spatial Durbin model in Equation (5) reveals that it can be rearranged into a form that gives a more meaningful economic interpretation the following:

$$g = (1-\lambda W)^{-1}(\alpha + \beta \log y_0 + X\theta + \phi W \log y_0 + \vartheta WX + u) \quad (6)$$

and therefore, the partial derivative of the per capita income growth with respect to the initial income per capita is given by:

$$\partial g / \partial \log y_0 = (1-\lambda W)^{-1}(\beta I + \phi W) \quad (7)$$

Since the spatial weight matrix is row standardized, and assuming, after the expansion in Equation (4), the effect of higher orders spatial terms rapidly approach zero and rounding it to first order effect only, the augmented convergence coefficient is therefore:

$$(1+\lambda)\beta + \phi \quad (8)$$

which makes the convergence speed now influenced by the neighbouring effects. In other words, the speed of convergence in the spatial model can be shown to be higher than the normal beta convergence due to the spatial spillover effects[8].

As introduced in the Equation (2) above, *W* is the *NxN* spatial weight matrix that becomes the linkage among the countries in the sample. It is usually specified via a number of geographical measures of distance such as physical distance, contiguity measures, *k*-nearest regions, or a more complex decay function. The advantage of using geographical-based distance is that it is unambiguously exogenous to the model, and therefore it eliminates the problem of identification and causal reversion. However in this study, in addition to a geographical-based weight matrix, we go on to also use a weight matrix based on institutional similarity which is a novel extension to the standard model.

In this study, we use row standardized inverse squared distance[9] (denoted *winvsq*) whose elements are defined according to a gravity function that provides an exponential distance decay. Thus, the spatial relationship using this weight matrix is modelled according to the concept of impedance, or distance decay. All features influence all other features, but the

[8] We follow Arbia et al. (2010) to assume so to make the augmented convergence speed easier to compute.

[9] We use latitude and longitude data to compute the Great Circle distance i.e. the shortest distance between any two points on the surface of a sphere measured along a path on the surface of the sphere (as opposed to going through the sphere's interior). It is computed using the equation:

$$d_{ij} = \arccos\left[(\sin\phi_i \sin\phi_j) + (\cos\phi_i \cos\phi_j \cos|\delta\gamma|)\right]$$

where ϕ_i and ϕ_j are the latitude of country *i* and *j* respectively, and $|\delta\gamma|$ denotes the absolute value of the difference in longitude between country *i* and *j* (Seldadyo et al. 2010).

farther away something is, the smaller the impact it has. Because every feature is a neighbour of every other feature, a cut-off distance needs to be specified to reduce the number of required computations with large datasets, and we set it at minimum threshold which will guarantee that each countries has at least one neighbour. The matrix W is given by:

$$W \begin{cases} w_{ij} = 0 \text{ if } i = j \\ w_{ij} = d_{ij}^{-2} \Big/ \sum_j d_{ij}^{-2} \quad \text{if} \quad d_{ij}^{-2} \le \overline{d^{-2}} \\ w_{ij} = 0 \text{ if otherwise} \end{cases} \tag{9}$$

where d_{ij} is the great circle distance between country capital i and j, and $\bar{d}$ is the critical distance cut-off after which spatial effect is considered to be negligible. The elements of the main diagonal are set equal to zero by convention since a country cannot be a neighbour to itself. Since the data used in this study consists of i=1 to n=58 countries, and similarly the corresponding countries' capitals to calculate the distance is j=1 to k=58, and the time period is t=1984 to T=2007, the distance weight matrix for a particular year, t, will be:

$$W_t = \begin{pmatrix} 0 & w_{t,ij} & \cdots & \cdots & w_{t,ik} \\ w_{t,ji} & 0 & \cdots & \cdots & w_{t,jk} \\ \vdots & \vdots & \ddots & & \vdots \\ \vdots & \vdots & & \ddots & \vdots \\ w_{t,jn} & w_{t,in} & \cdots & \cdots & 0 \end{pmatrix} \tag{10}$$

and stacking the matrix first by time and then by cross section gives the full weighting matrix as:

$$W = \begin{pmatrix} W_t & 0 & \cdots & \cdots & 0 \\ 0 & W_{t+2} & \cdots & \cdots & 0 \\ \vdots & \vdots & \ddots & & \vdots \\ \vdots & \vdots & & \ddots & \vdots \\ 0 & 0 & \cdots & \cdots & W_T \end{pmatrix} \tag{11}$$

with a dimension of 58*24x58*24 i.e. 1392x1392.

Arbia et al. (2010) include a non-conventional weight matrix based on institutional heterogeneity between institutions in addition to geographical-based ones. They argue this new matrix can capture distance which is not geographically based yet still play an important role in shaping the economic behaviour both at micro and macro level. In this study, we formally integrate the institutional distance[10] into the spatial estimation by using a weight matrix constructed based on Kogut and Singh (1988) cultural distance (CD) index calculation as in Equation (12) below:

$$CD = \frac{\sum_{i=1}^{n}\left[(I_{ij} - I_{ik})^2 / V_i\right]}{n} \tag{12}$$

where I_{ij} is the index value for cultural dimension *i* for country *j*, I_{ik} is the index value for cultural dimension *i* for country *k*, V_i is the variance of the index of the cultural dimension *i*, and n is the number of cultural dimension *i*. In our study, we replace the cultural dimension with institutional dimensions constructed from four institutional indicators (therefore four dimensions) from the International Country Risk Guide (ICRG) database to construct an index to reflect the security of property rights (denoted *wicrg*), and four political institutions indicators from four different sources to construct an index of political institutions (denoted *wpol*). These institutional distance matrices are computed for each year for the whole sample period of 24 years and then stacked to complete the weighting matrix as in Equation (11).

We fully acknowledge that there is a possibility of an endogeneity issue in the use of these institutional matrices[11]. Notwithstanding that, the primary motivation of this study is to gauge the effect of institutional proximity to economic growth and therefore these matrices are of primary interest, and to mitigate this endogeneity issue, an exogenous weight matrix based on geographical distance is used as a benchmark against which the results of the estimation using institutional-based weight matrices are interpreted.

4. Estimation strategy and data sources

The dataset used in this study consists of a panel observation for 58 developing countries in three regions namely Africa, East Asia, and Latin America for a period of 24 years beginning

[10] Institutional distance concept is actually widely researched in the field of international management and international business based on the works by Kostova (1999) and Kostova and Zaheer (1999). They build on the Scott (1995)'s framework outlining three pillars of institutionalism to define institutional distance as the extent to which regulative, cognitive and normative institutions of two countries differ from one another. We are however more interested in the way the institutional distance is measured in the international management literature using Kogut and Singh index of cultural distance.

[11] Not only the matrices, the institutional control variables are also potentially endogenous especially when they are included in growth regressions since reverse causation is possible (see the argument by Glaeser et al. 2004).

from 1984 to 2007. Data on real GDP per capita and population growth are obtained from World Development Indicators (WDI) from the World Bank (2009). We follow Mankiw et al. (1992), Islam (1995), Caselli et al. (1996) and Hoeffler (2002) to assume exogenous technological change plus depreciation rate ($g+\delta$) as 0.05. We also follow them to use investment share of real per capita GDP as a proxy for capital and the investment data is obtained from Penn World Table 6.3 (Heston et al. 2009). To proxy for human capital, we use secondary school attainment for population age 15 and above from Barro and Lee (2010) educational data[12]. To measure formal institutional quality parameters that reflect security of property rights and the political institutions, we utilize institutional indicators from five sources. They are (1) International Country Risk Guide (ICRG) obtained from the PRS Group (2009) from which we use four variables –Investment Profile, Law and Order, Bureaucracy Quality, and Government Stability, (2) Polity IV data (Marshall and Jaggers 2008) –Polity2 variable, (3) Freedom in the World index also known as Gastil index (Gastil 1978) –Political rights variable, (4) The Political Constraint Index (POLCON) Dataset (Henisz 2010) –Polcon3 index, and (5) Database of Political Institutions by the World Bank (Beck et al., 2001) –Checks variable. To estimate the absolute location effect of institutions, we use simple average of the four ICRG indicators to make up the first index of institutional quality (*iiqicrg*) and this index reflect security of property right dimension, whereas simple average of the four political indicators from four different sources become the second index of institutional quality (*iiqpol*) and this index reflect the political institutions.

To estimate the growth model, four different specifications are employed, all with real GDP per capita growth (g) as the dependent variable, and log of initial income (log y_{1984}) as the variable to test for the convergence effect. Model (1) is a baseline model with only Mankiew, Romer and Weil (1992) –henceforth MRW– variables i.e. physical (sk) and human capitals (sh) and a sum of population growth, exogenous technological process and depreciation rate ($n+g+\delta$). Model (2) and (3) introduce institutional controls using *iiqicrg* and *iiqpol* indices, respectively, and finally Model (4) is the general model where both institutional indices enter the equation simultaneously.

The empirical analysis begins with testing for the spatial autocorrelation in the model. Equation (1) is estimated via Ordinary Least Square (OLS) and the presence of spatial

[12] We convert the 5-year average data obtained from Barro and Lee (2010) into annual data by using Eviews command copy from low frequency data to high frequency data.

autocorrelation in the residuals is tested using Moran's I test. If the presence of spatial autocorrelation is detected, OLS is then rejected because its estimates are no longer appropriate for models containing spatial effects. In the case of spatial autocorrelation in the error term, the OLS estimates of the response parameter remains unbiased, but it loses its efficiency property, and in the case of specification containing spatially lagged dependent variable, the estimates are not only biased, but also inconsistent[13]. It is therefore commonly suggested that maximum likelihood regression technique should be used to overcome this problem (see Elhorst 2003).

Having detected the presence of spatial effects we then proceed to determine the appropriate form of spatial model to use. LeSage and Pace (2009) argue that the spatial Durbin model is the best point to begin the test since the cost of omitting the spatially autocorrelated error term is less (efficiency loss of the estimators) compared to the cost of ignoring the spatially lagged dependent and independent variables (the estimators are biased and inconsistent). However, Florax et al. (2003) argue that using spatial lag model, conditional on the results of misspecification tests, outperforms the general-to-specific approach for finding the true data generating process[14].

In this study, two-stage testing process is used to determine the model that best fits the data. In the first stage, we use the robust Lagrange Multiplier (LM) tests developed by Anselin et al. (1996) to decide which model between the spatial error model and the spatial lag model that is better-suited to the data. It is called robust because the existence of one more type of spatial dependence does not bias the test for the other type of spatial dependence. This characteristic is obviously important because we will omit the spatial model that fails this test in most cases when estimated with different model specifications and using different weight matrices. The model that succeed in the first stage test will then be tested against the general model i.e. the spatial Durbin model in the second stage using the Likelihood ratio (LR) test for the spatial common factors. The LR test is as the following:

$$LR = 2(L_{ur} - L_r) \sim \chi^2(k) \quad (13)$$

[13] Notwithstanding that, inconsistency is only a minimal requirement for a useful estimator.
[14] Spatial Durbin model can be considered as a general spatial model since it takes into account the spatial effect emanating from spatially lagged dependent variable as well as spatially lagged explanatory variables.

Due to Elhorst (2010) which is partly based on Elhorst and Fréret (2009), and Seldadyo et al. (2010). To carry out the second stage testing, we estimate spatial Durbin model as the unrestricted model, and test it against the restricted model which is either the spatial lag or error model that succeeds in the first stage test.

5. Estimation results and discussions

Table 1 presents the results of standard OLS regression of the four growth models in Equation (1). These all fit the stylized facts about the presence of conditional convergence in developing countries. The coefficients for initial income are consistently negative and statistically significantly different from zero. Coefficients of the other growth determinants are also statistically significant with the expected sign except population growth which is positive. It is however not surprising to have positive population growth effect on economic growth especially in developing countries as shown by Headey and Hodge (2009) who found no strong support for the opposite hypothesis.

Table 1: Standard OLS growth regression and Moran's I test for spatial autocorrelation in residuals[a]

Model specification	(1)	(2)	(3)	(4)
log y_{1984}	-0.008*** (0.0015)	-0.009*** (0.0015)	-0.009*** (0.0015)	-0.009*** (0.0016)
sk	0.029*** (0.0026)	0.025*** (0.0026)	0.028*** (0.0026)	0.024*** (0.0027)
$n+g+\delta$	0.012*** (0.0016)	0.011*** (0.0016)	0.012*** (0.0016)	0.011*** (0.0016)
sh	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.001)	0.001*** (0.000)
iiqicrg		0.008*** (0.001)		0.009*** (0.001)
iiqpol			0.002*** (0.001)	0.001* (0.001)
constant	-0.115*** (0.017)	-0.126*** (0.017)	-0.118*** (0.017)	-0.136*** (0.017)
Adjusted R2	0.136	0.176	0.140	0.170
Moran’s I and Robust LM tests statistics for different weight matrix:				
a. *winvsq*				
Moran’s I test statistics	5.185***	4.884***	4.901***	4.744***
Spatial error: Robust LM test	40.286***	1.768	34.930***	2.53
Spatial lag: Robust LM test	67.543***	12.168***	59.907***	14.229***
b. *wicrg*				
Moran’s I test statistics	5.197***	3.163***	4.989***	3.316***
Spatial error: Robust LM test	10.533***	0.339	9.123***	0.005
Spatial lag: Robust LM test	25.030***	2.346***	23.107***	0.788
c. *wpol*				
Moran’s I test statistics	2.735***	2.690***	2.667***	2.854***
Spatial error: Robust LM test	19.620***	1.448	14.704***	0.076
Spatial lag: Robust LM test	28.111***	5.082**	20.793***	1.494

[a]Dependent variable is real GDP per capita growth. Model specification (1) is baseline model with

only MRW variables i.e. *sh*, *sk*, and $n+g+\delta$, model (2) with MRW variables and *iiqicrg*, (3) with MRW variables and *iiqpol*, and (4) with MRW variables, and both *iiqicrg* and *iiqpol* indices. Standard errors are in parentheses. ***, ** and * denote significance at 1%, 5% and 10% respectively.

The result of Moran's I test in Table 1 indicates that the null hypothesis of no global spatial autocorrelation in the residuals of the OLS regression is overwhelmingly rejected. This finding holds when different weight matrices are used including the geographical- and institutional-based. Hence, it can be safely inferred that Equation (1) is misspecified and the OLS estimates are invalid. The model therefore should be modified to include spatial dependence term. From the robust LM test statistics, the spatial error model is apparently inappropriate as it fails in a number of cases (specifically in model (2) and (4)) compared to spatial lag model. The LR tests statistics for the common factors between spatial lag and spatial Durbin model are used to decide which of the two models best explains the data. Based on the result in Table 2 it is particularly obvious that spatial Durbin model is favoured over the spatial lag model.

Table 2: Likelihood ratio test between spatial Durbin and spatial lag model[b]

Model specification	(1)	(2)	(3)	(4)
Weight matrix : *winvsq*				
Log Likelihood for Spatial Lag Model	2147.774	2174.9646	2150.1035	2176.4316
Log Likelihood for Spatial Durbin Model	2170.784	2199.866	2172.502	2200.386
Degree of freedom	4	5	5	6
LR test statistics	46.019***	49.803***	44.796***	47.909***
Weight matrix: *wicrg*				
Log Likelihood for Spatial Lag Model	2143.543	2166.474	2146.435	2168.521
Log Likelihood for Spatial Durbin Model	2154.703	2167.873	2155.825	2169.568
Degree of freedom	4	5	5	6
LR test statistics	22.319***	2.799	18.782***	2.0928
Weight matrix: *wpol*				
Log Likelihood for Spatial Lag Model	2135.607	2167.036	2137.966	2168.453
Log Likelihood for Spatial Durbin Model	2147.660	2174.854	2148.113	2175.203
Degree of freedom	4	5	5	6
LR test statistics	24.106***	15.634***	20.295***	13.499**

[b]Please refer Table 1 footnote for information about Model (1) until (4). ***, ** and * denote significance at 1%, 5% and 10% respectively.

Now we turn to the estimation of Spatial Durbin model as in Equation (5) with three different weight matrices i.e. inverse squared distance (*winvsq*), the security of property rights index (*wicrg*) and the political institutions index (*wpol*) and the results of these models are presented in the Tables 3, 4 and 5, respectively.

Overall, the results support the conditional convergence hypothesis. The coefficients of initial income are always negative and significant across all estimations, The coefficients of the steady state determinants i.e. physical and human capitals are also positive and significant. The positive effect of population growth towards economic growth also remains.

The absolute effect of institutional quality on growth mirrors the result in the standard OLS growth regression especially in the models containing the *iiqicrg* index as it is always significant, whereas in most cases, the *iiqpol* index is not. The *iiqicrg* index however seems to be sensitive to the choice of the weight matrix as it only becomes significant when *winvsq* and *wpol* are used, and not when *wicrg* is used.

The coefficients for the spatially lagged dependent variables, λ, are positive and significant across all model specifications using the three weight matrices at least at 10% level and the Wald test for the null hypothesis of $\lambda = 0$ are overwhelmingly rejected. This finding gives convincing support to the proposition of positive spatial autocorrelation in per capita income growth of the developing countries. Since positive absolute effect of institutional quality towards per capita income growth is reported in the preceding paragraph, this further confirms the existence of the institutional spatial dependence between the countries, at least via the indirect route, where institutions in a country lead to economic improvement in that country (absolute effect) and generate spillover effect to neighbouring countries' income growth (relative effect).

This finding is apparently similar to Easterly and Levine (1998), Ades and Chua (1997), Murdoch and Sandler (2002), Bosker and Garretsen (2009) and Arbia et al. (2010) who find evidence of positive spillover effect of growth in neighbouring countries to home countries' growth. The Wald test for the null hypothesis that the coefficients of the spatially lagged explanatory variables are equal to zero is also rejected in almost all cases (except (2) and (4) when *wicrg* is used) and this is a clear indication that the spatial Durbin model is the most appropriate to explain the data.

The coefficients of spatially lagged initial income, though they are not significant in most cases, have the predicted negative signs when estimated with *winvsq* and *wpol* matrices but positive with *wicrg* matrix. One particular reason in explaining the insignificance of spatially lagged initial income is that the relative location of the developing countries, due to their proximity in physical space and institutional settings, generates spillover effect that operates only via the spatial per capita income growth process, and not via the spatially lagged initial income. This situation could points to a possibility that the developing countries under study do not essentially share similar long run growth determinants which otherwise would have caused an influence to spatial conditional convergence and allowed the countries to converge to the same long run growth path (see Abreu et al. 2005 and Arbia et al. 2010 for more discussion on spatial conditional convergence process).

For the augmented convergence speed, it is apparently higher than those obtained from the standard growth regressions once the magnitude of the neighbourhood effect is accounted. The rate of speed rises from 0.8-0.9% in standard growth regression (Table 1) to 1.9-2.2% in spatial growth regression with *winvsq* matrix (Table 3). This finding therefore confirms the positive effect of neighbouring countries' per capita income growth on home countries per capita income growth and suggests countries that belong to the same clusters in space tend to converge to a similar level of growth.

As for the model with institutional distance matrices, the regression using *wpol* matrix gives identical results to the model using *winvsq* matrix with convergence speed greater than that of standard regression and this gives an indication that countries with similar level of political institutional settings tend to converge to similar level of growth. However, in regression using the *wicrg* weight matrix, the augmented speed of convergence however is much lower than that of standard growth regressions and we are of the opinion that the reason to this finding is because of the weakness of *wicrg* as a weight matrix.

The estimation results also yield positive significant spatial externalities of the physical and human capitals (*wx_sk* and *wx_sh* respectively) i.e. there is significant spatial dependence in the physical and human capitals among the countries. This is not uncommon in the growth-space literature as shown by Lall and Yilmaz (2001) who estimate a conditional convergence model with human capital spill overs using data for the United States and they find evidence that human capital levels are spatially correlated. López-Bazo et al. (2004) meanwhile find evidence of technology diffusion in the EU regions where the level of technology in each region depends on its neighbours' level of technology which in turn related to the stock of physical and human capitals. Ertur and Koch (2006; 2007) propose a spatially augmented Solow model that is able to show the technological interdependence, and spatial externalities of physical (2007) and human capitals (2006). Again, estimation using *wicrg* matrix produce insignificant spatially lagged physical and human capitals in most cases.

Similar to its absolute effect, the relative effect of the institutional index, particularly *iiqicrg*, remains significant in all models estimated with matrix *winvsq* and *wpol*, but not with *wicrg*. On the other hand, the relative effect of *iiqpol* index is found to be insignificant most of the time. Contrary to the previously documented positive spillover effect of institutions towards growth (as earlier discussed in the review section, and see also Easterly and Levine 1998; Ades and Chua 1997; Murdoch and Sandler 2002; Bosker and Garretsen 2009; and Arbia et al. 2010), we however find negative spillover effects of the *iiqicrg* index. In hindsight, these contradictory findings could be thought of as the consequence of an endogeneity problem that plagues the spatial model estimation using institutional weight matrix (*wicrg* and *wpol*). Nevertheless, the relative effect of *iiqicrg* remains negative in the estimation using the exogenous geographical-based matrix (*winvsq*). This study is not the first to find no empirical support for the positive spillover effect of institutions since Faber and Gerritse (2009) and Claeys and Manca (2010) have also reported similar findings.

Table 3: Spatial Durbin regression of growth model using inverse squared distance weight matrix (*winvsq*)[c]

Model specification	(1)	(2)	(3)	(4)
log y_{1984}	-0.0058*** (0.0014)	-0.010*** (0.0018)	-0.0059*** (0.0015)	-0.0099*** (0.0018)
sk	0.0184*** (0.0029)	0.0137*** (0.0030)	0.0179*** (0.0029)	0.0135*** (0.0031)
$n+g+\delta$	0.0146*** (0.0055)	0.0138** (0.0054)	0.0147*** (0.0055)	0.0138** (0.0054)
sh	0.0008*** (0.0001)	0.0006*** (0.0001)	0.0007*** (0.0001)	0.0006*** (0.0001)
iiqicrg		0.0093*** (0.0021)		0.0091*** (0.0021)
iiqpol			0.0010 (0.0007)	0.0005 (0.0006)
*w_* log y_{1984}	-0.0150*** (0.0051)	-0.0080 (0.0056)	-0.0143*** (0.0051)	-0.0073 (0.0057)
wx_sk	0.0408*** (0.0087)	0.0429*** (0.0089)	0.0442*** (0.0091)	0.0445*** (0.0090)
$wx\_n+g+\delta$	0.0056 (0.0088)	0.0035 (0.0087)	0.0031 (0.0089)	0.0020 (0.0090)
wx_sh	0.0013*** (0.0005)	0.0016** (0.0006)	0.0014*** (0.0005)	0.0016*** (0.0006)
wx_iiqicrg		-0.0123*** (0.0041)		-0.0118*** (0.0042)
wx_iiqpol			-0.0040* (0.0024)	-0.0023 (0.0025)
constant	-0.1978* (0.1092)	-0.1805* (0.1018)	-0.1821* (0.1090)	-0.1737* (0.1025)
λ	0.1749** (0.0705)	0.2038*** (0.0700)	0.1802** (0.0701)	0.2057*** (0.0699)
Augmented convergence speed	-0.0218	-0.0200	-0.0213	-0.0192
Squared Correlation	0.1844	0.2164	0.1864	0.2169
Variance Ratio	0.1849	0.2160	0.1862	0.2164
Log likelihood	2170.784	2199.866	2172.502	2200.386
Wald test 1	6.160**	8.476***	6.606***	8.665***
Wald test 2	31.386***	30.522***	34.904***	32.253***
N	1392	1392	1392	1392

[c]Dependent variable is real GDP per capita growth. Please refer Table 1 footnote for information about Model (1) until (4). Standard errors are in parentheses. Wald test 1 is for null hypothesis that $\lambda=0 \sim \chi\ 2(1)$. Wald test 2 is for null hypothesis that coefficients on lags of X's (or spatially lagged explanatory variables)=0 $\sim\chi 2(1)$. ***, ** and * denote significance at 1%, 5% and 10% respectively.

Table 4: Spatial Durbin regression of growth model using institutional distance weight matrix (*wicrg*)[d]

Model specification	(1)	(2)	(3)	(4)
log y_{1984}	-0.0079*** (0.0014)	-0.0087*** (0.0016)	-0.0084*** (0.0014)	-0.0093*** (0.0017)
Sk	0.0270*** (0.0031)	0.0249*** (0.0032)	0.0265*** (0.0030)	0.0243*** (0.0032)
$n+g+\delta$	0.0124** (0.0052)	0.0115** (0.0052)	0.0127** (0.0052)	0.0117** (0.0052)
Sh	0.0007*** (0.0001)	0.0006*** (0.0001)	0.0007*** (0.0001)	0.0006*** (0.0001)
Iiqicrg		0.0058 (0.0038)		0.0062 (0.0042)
Iiqpol			0.0011 (0.0007)	0.0013* (0.0007)
*w*_log y_{1984}	0.0042 (0.0052)	0.0020 (0.0054)	0.0039 (0.0052)	0.0017 (0.0057)
wx_sk	-0.0001 (0.0112)	-0.0070 (0.0103)	0.0005 (0.0113)	-0.0063 (0.0102)
wx_n+g+δ	0.0051 (0.0059)	0.0039 (0.0057)	0.0050 (0.0059)	0.0035 (0.0059)
wx_sh	0.0013*** (0.0004)	0.0005 (0.0004)	0.0013*** (0.0004)	0.0005 (0.0004)
wx_iiqicrg		0.0015 (0.0058)		0.0012 (0.0064)
wx_iiqpol			-0.0005 (0.0016)	-0.0010 (0.0018)
constant	-0.2125*** (0.0661)	-0.1651** (0.0672)	-0.2099*** (0.0659)	-0.1583** (0.0667)
λ	0.2097*** (0.0684)	0.1610** (0.0677)	0.2097*** (0.0680)	0.1609** (0.0674)
Augmented convergence speed	-0.0054	-0.0081	-0.0063	-0.0091
Squared Correlation	0.1649	0.1818	0.1661	0.1838
Variance Ratio	0.1603	0.1821	0.1618	0.1841
Log likelihood	2154.703	2167.874	2155.826	2169.568
Wald test 1	9.408***	5.653**	9.499***	5.706**
Wald test 2	19.991***	2.539	18.387***	2.200
N	1392	1392	1392	1392

[d]Dependent variable is real GDP per capita growth. Please refer Table 1 note for information about Model (1) until (4). Standard errors are in parentheses. Wald test 1 is for null hypothesis that $\lambda=0 \sim\chi2(1)$. Wald test 2 is for null hypothesis that coefficients on lags of *X*'s (or spatially lagged explanatory variables)=0 $\sim\chi2(1)$. ***, ** and * denote significance at 1%, 5% and 10% respectively.

Table 5: Spatial Durbin regression of growth model using institutional distance weight matrix (*wpol*)[e]

Model specification	(1)	(2)	(3)	(4)
log y_{1984}	-0.0085*** (0.0014)	-0.0102*** (0.0015)	-0.0082*** (0.0014)	-0.0099*** (0.0015)
Sk	0.0289*** (0.0031)	0.0240*** (0.0031)	0.0290*** (0.0031)	0.0241*** (0.0031)
$n+g+\delta$	0.0134*** (0.0052)	0.0122** (0.0052)	0.0133** (0.0052)	0.0121** (0.0051)
Sh	0.0008*** (0.0001)	0.0006*** (0.0001)	0.0008*** (0.0001)	0.0006*** (0.0001)
Iiqicrg		0.0084*** (0.0018)		0.0084*** (0.0018)
Iiqpol			-0.0024 (0.0030)	-0.0015 (0.0031)
*w*_log y_{1984}	-0.0051 (0.0036)	-0.0020 (0.0036)	-0.0038 (0.0039)	-0.0009 (0.0038)
wx_sk	0.0160** (0.0074)	0.0190*** (0.0072)	0.0176** (0.0077)	0.0211*** (0.0074)
*wx_*$n+g+\delta$	0.0063 (0.0061)	0.0046 (0.0058)	0.0055 (0.0062)	0.0036 (0.0059)
wx_sh	0.0011*** (0.0003)	0.0007** (0.0003)	0.0011*** (0.0003)	0.0007** (0.0003)
wx_iiqicrg		-0.0048* (0.0028)		-0.0050* (0.0027)
wx_iiqpol			0.0021 (0.0035)	0.0008 (0.0036)
constant	-0.2050*** (0.0774)	-0.1915** (0.0825)	-0.2115*** (0.0778)	-0.1951** (0.0826)
λ	0.1145* (0.0644)	0.1287** (0.0622)	0.1111* (0.0645)	0.1268** (0.0624)
Augmented convergence speed	-0.0146	-0.0135	-0.0129	-0.0121
Squared Correlation	0.1601	0.1916	0.1608	0.1922
Variance Ratio	0.1602	0.1920	0.1608	0.1923
Log likelihood	2147.660	2174.854	2148.113	2175.203
Wald test 1	3.162*	4.289**	2.966*	4.124**
Wald test 2	20.557***	16.654***	20.130***	16.581**
N	1392	1392	1392	1392

[e]Dependent variable is real GDP per capita growth. Please refer Table 1 note for information about Model (1) until (4). Standard errors are in parentheses. Wald test 1 is for null hypothesis that $\lambda=0$ $\sim\chi2(1)$. Wald test 2 is for null hypothesis that coefficients on lags of *X*'s (or spatially lagged explanatory variables)=0 $\sim\chi2(1)$. ***, ** and * denote significance at 1%, 5% and 10% respectively.

6. Concluding remarks

This study empirically supports the existing evidence on the positive significant absolute effect of institutions towards economic growth in developing countries. It also finds that institutional spatial dependence in the countries under study does exist, and institutional spillover effects are shown to run via the indirect route i.e. institutions in a country lead to improvement in economic growth in that country and this situation consequently generates spillover effect on economic growth in neighbouring countries. This finding is similar to that of Easterly and Levine (1998), Ades and Chua (1997), Murdoch and Sandler (2002), Bosker and Garretsen (2009), and Arbia et al. (2010).

However, the spillover effect is found to operate only via spatially lagged per capita income growth, but not via spatially lagged initial income. This could possibly be due to the fact that developing countries under study do not share similar long run growth determinants hence the spatial divergence process. Furthermore, this study is also unable to find conclusive evidence on the direct channel of the effect for institutional spatial spillover since spatially lagged institutional variables have on overall negative coefficient (which is against the convention) and, in most cases, insignificant. This finding therefore effectively confirms the previously reported indirect channel of institution spillover effects.

With regard to the best institutional weight matrix to proxy for institutional proximity between the countries, the spatial matrix based on political institutional variables dominates that of security of property rights since the estimation using the former produces identical results to the estimation using an exogenous geographical-based matrix. This finding also implies that countries with a similar level of political institutional settings tend to converge to similar level of growth. This study also shows the presence of spatial externalities in human and physical capitals which are also in line with the findings in the previous literature.

Several limitations still abound. Endogeneity remains an important issue and it is not properly addressed in this study. The use of institutional weight matrix also suffers problem of endogeneity and one possible remedy to this problem is via instrumenting the matrix with an appropriate proxy, such as linguistic distance (see Arbia et al, 2010). Notwithstanding that, considering this is one of the rare attempts to formally model institutional spatial interdependence via an institutional distance matrix, and arguably the first to focus on developing coutnries[15].

[15] Arguably Arbia et al. (2010) are the first to employ spatial weight matrix based on institutional distance but the focus of their study is on European regions, unlike this study which is on developing countries.

BIBLIOGRAPHY

Abreu, M., de Groot, H. L. F., & Florax, R. J. G. M. (2005). Space and Growth: A Survey of Empirical Evidence and Methods. *Region et Developement, 21*, 12–43.

Acemoglu, D., Johnson, S., & Robinson, J. A. (2001). The colonial origins of comparative development: An empirical investigation. *American Economic Review, 91(5)*, 1369-1401.

Acemoglu, D., Johnson, S. and Robinson J.A. (2002). "Reversal Of Fortune: Geography and Institutions In The Making Of The Modern World Income Distribution", *The Quarterly Journal of Economics, MIT Press, vol. 117(4)*, pp 1231-1294

Acemoglu, D., Johnson, S., & Robinson, J. A. (2005). Institutions as a Fundamental Cause of Long-Run Growth, *Handbook of Economic Growth Vol. 1*, pp. 385-472.

Ades, A., & Chua, H. B. (1997). Thy Neighbor's Curse: Regional Instability and Economic Growth. *Journal of Economic Growth, 2(3)*, 279-304.

Anselin, L. (2001). Spatial econometrics. In B. H. Baltagi (Ed.), *A Companion to Theoretical Econometrics* (pp. 310–330). Oxford: Blackwell.

Anselin, L., & Bera, A. (1998). Spatial dependence in linear regression models with an introduction to spatial econometrics In A. Ullah & D. E. A. Giles (Eds.), *Handbook of Applied Economic Statistics* (pp. 237-289). New York: Marcel Dekker.

Anselin, L., Bera, A., Florax, R., & Yoon, M. (1996). Simple diagnostic tests for spatial dependence. *Regional Science and Urban Economics, 26(1)*, 77-104.

Arbia, G. (2006). *Spatial Econometrics. Statistical Foundations and Applications to Regional Convergence*. Berlin: Springer.

Arbia, G., Battisti, M., & Di Vaio, G. (2010). Institutions and geography: Empirical test of spatial growth models for European regions. *Economic Modelling, 27(1)*, 12-21.

Barro, R. J. (1991). Economic-growth in a cross-section of countries. *Quarterly Journal of Economics, 106(2),* 407-443.

Barro, R. J., & Lee, J.-W. (2010). A New Data Set of Educational Attainment in the World, 1950-2010. *National Bureau of Economic Research Working Paper Series, No. 15902*.

Bosker, M., & Garretsen, H. (2009). Economic development and the geography of institutions. *Journal of Economic Geography, 9(3)*, 295-328.

Campos, N. F., & Nugent, J. B. (1999). Development Performance and the Institutions of Governance: Evidence from East Asia and Latin America. *World Development, 27(3),* 439-452.

Caselli, F., Esquivel, G., & Lefort, F. (1996). Reopening the Convergence Debate: A New Look at Cross-Country Growth Empirics. *Journal of Economic Growth, 1(3),* 363-389.

Claeys, P., & Manca, F. (2010). A missing spatial link in institutional quality. *Applied Economics Letters, 18(3)*, 223 - 227.

Crafts, N. (1999). East Asian Growth before and after the Crisis. *IMF Staff Papers, 46(2)*, 139-166.

Easterly, W., & Levine, R. (1998). Troubles with the Neighbours: Africa's Problem, Africa's Opportunity. *Journal of African Economies, 7(1),* 120-142.

Elhorst, J. P. (2003). Specification and Estimation of Spatial Panel Data Models. *International Regional Science Review, 26(3)*, 244-268.

Elhorst, J. P. (2010). Applied Spatial Econometrics: Raising the Bar. *Spatial Economic Analysis, 5(1),* 9-28.

Elhorst, J. P., & Fréret, S. (2009). Evidence Of Political Yardstick Competition In France Using A Two-Regime Spatial Durbin Model With Fixed Effects. *Journal of Regional Science, 49(5),* 931-951.

Ertur, C., & Koch, W. (2006). Convergence, Human Capital and International Spillovers: *Laboratoire d'Economie et de Gestion, CNRS UMR 5118*, Université de Bourgogne.

Ertur, C., & Koch, W. (2007). Growth, technological interdependence and spatial externalities: theory and evidence. *Journal of Applied Econometrics, 22(6),* 1033-1062.

Faber, G., & Gerritse, M. (2009). External influences on local institutions: spatial dependence and openness: *Utrecht School of Economics*.

Florax, R. J. G. M., Folmer, H., & Rey, S. J. (2003). Specification searches in spatial econometrics: the relevance of Hendry's methodology. *Regional Science and Urban Economics, 33(5),* 557-579.

Gastil, R. D. (1978). Freedom in the world : political rights and civil liberties. Retrieved from http://www.nsd.uib.no/macrodataguide/set.html?id=17&sub=1

Glaeser, E., L. , La-Porta, R., Lopez-de-Silanes, F., & Shleifer, A. (2004). Do Institutions Cause Growth? *Journal of Economic Growth, 9(3),* 271-303.

Gleditsch, K. S., & Beardsley, K. (2004). Nosy Neighbors. *Journal of Conflict Resolution, 48(3),* 379-402.

Hall, R. E., & Jones, C. I. (1999). Why do some countries produce so much more output per worker than others? *Quarterly Journal of Economics, 114(1),* 83-116.

Headey, D. D., & Hodge, A. (2009). The Effect of Population Growth on Economic Growth: A Meta-Regression Analysis of the Macroeconomic Literature. *Population and Development Review, 35(2),* 221-248.

Henisz, W. J. (2010). Political Constraint Index Dataset. from http://www-management.wharton.upenn.edu/henisz/

Hoeffler, A. (2002). The Augmented Solow Model and the African Growth Debate. *Oxford Bulletin of Economics and Statistics, 64(2),* 135-158.

Islam, N. (1995). Growth Empirics: A Panel Data Approach. *The Quarterly Journal of Economics, 110(4),* 1127-1170.

Kaminsky, G. L., & Reinhart, C. M. (2000). On crises, contagion, and confusion. *Journal of International Economics, 51(1)*, 145-168.

Kelejian, H. H., Murrell, P., & Shepotylo, O. (2008). Spatial Spillovers in the Development of Institutions. *Mimeo*, University of Maryland.

Kogut, B., & Singh, H. (1988). The Effect of National Culture on the Choice of Entry Mode. *Journal of International Business Studies, 19(3)*, 411-432.

Kostova, T. (1999). Transnational Transfer of Strategic Organizational Practices: A Contextual Perspective. *The Academy of Management Review, 24(2)*, 308-324.

Kostova, T., & Zaheer, S. (1999). Organizational Legitimacy under Conditions of Complexity: The Case of the Multinational Enterprise. *The Academy of Management Review, 24(1)*, 64-81.

Lall, S. V., & Yilmaz, S. (2001). Regional economic convergence: Do policy instruments make a difference? *The Annals of Regional Science, 35(1),* 153-166.

LeSage, J., & Pace, R. K. (2009*). Introduction to Spatial Econometrics*. Boca Raton, Florida: Chapman & Hall/CRC.

López-Bazo, E., Vayá Valcarce, E., & Artis, M. (2004). Regional Externalities and Growth: Evidence from European Regions. *Journal of Regional Science, 44(1),* 43-73.

Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A Contribution to the Empirics of Economic Growth. *The Quarterly Journal of Economics, 107(2),* 407-437.

Marshall, M. G., & Jaggers, K. (2008). Polity IV Project: Political Regime Characteristics and Transitions, 1800-2008. from http://www.systemicpeace.org/polity/polity4.htm

Murdoch, J. C., & Sandler, T. (2002). Economic Growth, Civil Wars, and Spatial Spillovers. *Journal of Conflict Resolution, 46(1)*, 91-110.

PRS Group, T. (2009). International Country Risk Guide dataset.

Rodrik, D. (1997). TFPG Controversies, Institutions, and Economic Performance in East Asia, *National Bureau of Economic Research, Inc*.

Rodrik, D., Subramanian, A., & Trebbi, F. (2004). Institutions rule: The primacy of institutions over geography and integration in economic development. *Journal of Economic Growth, 9(2)*, 131-165.

Salehyan, I. (2008). No Shelter Here: Rebel Sanctuaries and International Conflict. *The Journal of Politics, 70(01),* 54-66.

Salehyan, I., & Gleditsch, K. S. (2006). Refugees and the Spread of Civil War. *International Organization, 60(02)*, 335-366.

Scott, W. R. (1995). *Institutions and Organizations: Theory and Research.* Thousand Oaks CA: Sage.

Seldadyo, H., Elhorst, J. P., & Haan, J. D. (2010). Geography and governance: Does space matter*? Papers in Regional Science, 89(3)*, 625-640.

Simmons, B. A., & Elkins, Z. (2004). The Globalization of Liberalization: Policy Diffusion in the International Political Economy. *American Political Science Review, 98(01),* 171-189.