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**UNU-MERIT Working Paper Series**

**#2014-086**

**The geographic dimensions of institutions  
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**UNU-MERIT Working Papers**

**ISSN 1871-9872**

**Maastricht Economic and social Research Institute on Innovation and Technology,  
UNU-MERIT**

**Maastricht Graduate School of Governance  
MGSOG**

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# **The Geographic Dimensions of Institutions<sup>1</sup>**

**by  
Samyukta Bhupatiraju<sup>2</sup>**

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<sup>1</sup> I am thankful to Prof. Bart Verspagen and Dr. Thomas Zieseemer for their suggestions. The views expressed in this paper are the views of the author and do not necessarily reflect the views and policies of UNU-MERIT or Maastricht University. All remaining errors are those of the author.

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## **Abstract**

In this paper we examine the role of institutions relative to economic performance, absolute geography and financial performance of a country. In order to do this, we use the spatial principal component analysis and a spatial canonical correlation analysis to obtain multi-dimensional measure of institutions, economic performance, absolute geography and financial performance of countries. Our analysis shows that the first canonical functions in all the cases give us results that conform to current literature. That is, we find that a higher level of development is correlated to a higher level of institutional quality, deeper financial structure as well as "good" geography of the Jeffery Sachs variety. From the second canonical functions we find that economic growth is correlated to market steering. We further find that geographic conditions need not define the institutional set up of countries. A similar institutional set up need not result in a similar financial structure in countries. We show that there is a necessity to take spatial interactions with neighbouring countries into account while analysing the relationships between institutions, geography, economic and financial performance of a country. We find that space indeed has a strong influence on the prevailing institutional and economic conditions of countries. While the impact of space on geography is very obvious, we find that it has no bearing on the financial performance of countries.

Keywords: economic performance; institutional quality; financial performance; geography; spatial principal components analysis; spatial canonical correlation analysis; spatial concentration

JEL Codes: O10, O16, O17, O43, R12, R15

## 1. Introduction

Explaining uneven economic development among countries has been a primary concern of empirical growth literature. Growth performance of countries is often explained in the context of convergence or divergence, given their wide-ranging ‘initial conditions’. One such strand of literature that has taken centre stage in explaining these differences is new institutional economics (NIE). According to NIE, differences in institutional quality and governance structures<sup>3</sup> explain growth differentials among countries<sup>4</sup> (Acemoglu et al. (2001, 2002, 2004), Engerman and Sokoloff (2002, 2005), Rodrik et al.(2004)).

Institutions refer to *formal rules* (constitutions, laws and regulations, political systems etc.) and *informal rules* (value systems, beliefs, social norms etc.) that humans use when interacting within a wide variety of repetitive and structured situations at multiple levels of analysis (North 2005, Ostrom 2005). Institutions are categorised into economic (property rights, presence of markets, regulatory structures etc.), political (constitutional arrangement) and social institutions (presence of health care markets, unemployment support systems, pension provision systems, and other informal social institutions such as social norms, religious norms etc.) (Bennedsen et al.2005).

Although there is no absolute definition for “good governance” most include the depth of democracy and public accountability, bureaucracy and judiciary, stability of property rights, corporate governance, financial institutions, social welfare and labour institutions (Chang 2002, Khan 2004). In other words, it is how the social and economic environment of a country is managed (World Bank 1992:1)<sup>5</sup>.

Studies in this area establish that there is a definite causal link between institutions and economic development directly and a link between geography and economic development via their influence on institutions (Rodrik et al. 2004, Easterly and Levine 2003, etc.). These studies have helped establish a stylised fact that better institutions are strongly related to higher economic development. Most of these studies tend to use GDP per capita as the single most important measure of economic development. GDP per capita is no doubt an important indicator of economic development. However, most economists would agree that it does not help paint a complete picture of a country’s level of development. In this paper, we would like to use a broader set of indicators to measure the economic performance of a country, in order to re-examine the relationship between development, institutions and geography. Geographic determinism and international trade as the key drivers of growth in a country are the other two strands of literature that stand out. The former states that geographic differences (environmental differences) determine development differences in a country. It states that geography (climate, natural resources, disease ecology, etc.) determines not only the capacity of food production, but also labour productivity<sup>6</sup>, and trade policies of a country<sup>7</sup>. The latter states that international trade is the key driver of productivity and thus has a direct impact on the growth of a country<sup>8</sup>. Some studies have tried to evaluate which of these competing hypotheses gains ‘primacy’ over the others in explaining the ultimate driver of growth and development<sup>9</sup>.

Geography is often considered as the most exogenous factor that can be used in econometric studies. Geographic determinism primarily enters literature in the form of its ‘absolute location’. By this we mean the physical

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<sup>3</sup> Although, institutional quality, institutions and governance do not mean the same, they are often used interchangeably. In this paper too, we use them interchangeably.

<sup>4</sup> It is understood in NIE that the ‘quality’ of institutions is determined by how strongly property rights are protected and how “free” markets are, i.e., stronger property rights laws and “freer markets” imply higher quality of institutions (Chang 2011).

<sup>5</sup> See Section 2.1 for the formal definition.

<sup>6</sup> The prevalence and incidence of diseases (like malaria, HIV) are much higher in tropical countries and thus burdensome not only in terms of costs incurred for treatment but also in its debilitating effect on labour, often reducing labour productivity (Bloom and Sachs 1998, Sachs 2001, Gallup and Sachs 2001 etc.)

<sup>7</sup> Landlocked economies tend to have lesser trade openness and higher transport costs. Countries that have a coast line tend to have lower transport costs as well as policies that encourage international trade, thus allowing them more growth opportunities (Mellinger, Sachs and Gallup 1999)

<sup>8</sup> Frankel and Romer (1999), Dollar and Kraay (2003) etc.

<sup>9</sup> These include Rodrik et al.(2004), Easterly and Levine (2003), Rodrik (2003) etc.

geographic characteristics of a country, like its climatic conditions, physical endowments etc., which determine the ability of a country to develop. Geography in this form is discussed as an ultimate determinant of economic development. In recent years however, with the emergence of literature on regional convergence, geography in the form of its 'relative location' has been gaining importance. 'Relative location' refers to the relative spatial characteristics of a country, namely, its neighbouring countries and their influence on it (Abreu et al. 2004)<sup>10</sup>. In this paper, we would like to use both these concepts. In particular, we would like to see the impact of physical geography and institutions on economic growth, given the relative location of countries and their influence on each other. We do this with the help of a canonical correlation analysis, which allows us to correlate one set of variables against another set of variables.

The aim of this paper is to understand the interactions between institutions, economic performance, financial performance and the geography of a country from a spatial perspective. The analysis aims at understanding the underlying spatial patterns of institutions when summarised in combination with geography, economic performance or financial performance of countries. We do so by using a new method of spatial canonical correlation analysis, which is explained below. We describe these spatial patterns at a cross-country level, looking specifically at what factors in the two sets of data commonly result in spatial clusters. Rather than entering the debate on the primacy of absolute geography or institutions as determinants of economic performance, we want to see how each of these phenomena interacts with the other in a broader context. This paper does not try to address the causality between institutions and economic development but rather provide a descriptive overview of the spatial patterns.

The rest of the paper is organised as follows. Section 2 gives a brief overview of related literature. Section 3 describes the empirical methodology and the data used. Section 4 explains the results and the last section concludes the paper.

## 2. Related Literature

### 2.1. Institutions and Economic Development

Literature on institutions and economic growth and development has regained popularity over the last two decades. The predominant discourse in this literature states that institutions that ensure freer working of markets (read as the least amount of government intervention) as well as strong property rights protection provide the best environment for economic development (Chang 2011). According to the current literature, "good institutions" create an environment for providing the "right" incentives to agents in the economy. These incentives lead to learning and innovation, investment in human and physical capital as well as capabilities. These factors lead to higher growth rates in an economy. An improper or a bad institutional set up, on the other hand, does not incentivise such activities. Instead, it leads to corruption, rent-seeking and other non-productive or growth repressing activities.

There are numerous studies based on the institutions hypothesis. "Core" papers in this area of research include Acemoglu et al. (2002, 2005), Rodrik et al. (2004) Easterly and Levine (2003), Hall and Jones (1999) etc., among others. All these studies examine how various institutions effect economic growth and development outcomes, concluding that *institutions matter*.

Acemoglu, Johnson and Robinson (2002), use settler mortality rates of the colonisers in the colonies as an instrument for institutional quality during the colonial period. They hypothesise that Europeans took their institutions to 'settler colonies', while they set up different 'extractive' institutions in colonies where the prime intention was extraction of wealth. Thus, colonies where they settled got better institutions and those where they had an extraction policy ended up with bad institutions. These historical conditions further influenced the quality and type of current institutions. They find a strong and significant influence of historical institutions from the colonial era on current institutions as well as of current institutions on per capita income. Hall and Jones (1999), use "distance from equator" and the "extent of to which Western languages are spoken in the country" as instruments to find a strong correlation between output per worker with respect to social infrastructure (which is an average of an institutions and openness of economy index). Kauffman et al. (1999) also use "extent of to which Western languages

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<sup>10</sup> 'Absolute location' and 'relative location' are often referred to as 'first nature' geography and 'second nature' geography of a country.

are spoken in the country” to find a positive and significant impact of the quality of institutions on growth. Other cross-country studies like Mauro (1995), Easterly and Levine (2003), Dollar and Kraay (2003) also support the hypothesis that institutions generate development. In fact, there are but a few studies that do not find any significant effect<sup>11</sup>.

The proponents of the institutional hypothesis agree that institutions have evolved endogenously, depending on the country’s geographic conditions, among other factors. Examples of such studies include Hall and Jones (1999), Acemoglu et al. (2001), Rodrik et al. (2004). These studies have made empirical efforts to explain the possible linkage between geography and institutions. Hall and Jones (1999) hypothesise that Western Europeans preferred to live in places that resembled their own, and thus indirectly use geography as an explanatory variable. Engerman and Sokoloff (1997) suggest that the climatic conditions either ‘lent themselves’ to plantation agriculture or small farm agriculture. This in turn meant that the plantation economies led to less democratic power relations and small farms, by empowering a larger section of society led to more democratic institutions and thus to more development. Rodrik et al. (2004) and Easterly and Levine (2003) find that geography influences economic growth development only via its impact on institutions.

Much of this literature has not been sensitive towards the individual development experiences of countries. Most of these theories “have been rooted in the historical and social experiences of a few Western industrialized countries” (Brohman 1995). Policy prescriptions of growth have thus been a set of generalised recommendations, irrespective of their applicability to culture or the varying historical conditions of each country (that are most often very different from the Western European conditions). While it is important to understand growth at a more general level, policies made towards encouraging growth and development need to be made at the country level, catering to the specific conditions of the economy. The failure of the Washington Consensus has further proved that we need to look beyond the “one size fits all” approach.

## **2.2 Geography and Economic Development**

The geography hypothesis is based on the fact that not all the areas in the world are endowed in the same fashion. The geography of a country determines characteristics such as soil quality which directly affects agricultural productivity, natural resources which contribute to wealth as well as provide the raw material base for industrial activity, topography which contributes to costs of transportation, climate that affects the productivity of workers, and the disease environment which also directly affects the productivity of workers (Acemoglu 2009). No access to rivers, as well as land-locked geography, affects the growth of the country negatively. The proponents of this view argue that during and after colonisation the poor countries have remained poor. There has been no reversal of fortunes and what has remained the same is the geographical position of these countries (Sachs (2001) and Bloom and Sachs (1998)). Thus, it is primarily geography, which determines the economic situation of the country.

There have been many empirical studies carried out to determine the importance of geography as a determinant of growth. The latitude of the country is a popular variable in testing the geography-development hypothesis. Sala-i-Martin (1997 a, b), Bloom and Sachs (1998), Easterly and Levine (2001) are among some of those studies that find a positive and significant impact of the latitudinal position of a country on its growth levels. The numbers of frost days in a year, availability of arable land, the length of the coastline, rainfall, and temperature have been other variables used to study the effect of geographical position of the country on its growth rates. Some of the papers that test these variables empirically are Masters and Sachs (2001) and Bloom et al. (2003). All these find a positive and significant effect of the first three variables on growth, while the last two variables are found to have a negative and significant effect. That is to say, lesser and more unpredictable rainfalls as well as high temperatures directly affect the productivity as well as output negatively. Landlocked economies have been tested to find a negative impact on growth (Easterly and Levine (2001), Gallup and Sachs, (1999)). Easterly and Levine (2003), and Sachs (2003) also use measures such as the proportion of the population at the risk of malaria, life expectancy at birth, infant mortality rate etc., to find a significant and negative impact of disease ecology on growth. McArthur and Sachs (2001), concludes that institutions and geographically-related variables affect the GNP per capita of countries.

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<sup>11</sup> For example, Dollar and Kraay (2003) find a positive and insignificant effect between “rule of law” and growth, while Sala-i-Martin (1997 a) finds ethno-linguistic fractionalisation on growth as insignificant.

The results of the empirical studies mentioned above find that the geography does indeed have an impact on the country's growth statistics. As mentioned earlier the geography-development hypothesis is mainly based on the 'absolute location' of a country. That is, they consider those characteristics of a country's geography which are exogenous, time-invariant (except for some disease variables) and are not influenced by its 'relative location' vis-à-vis its neighbours and their socio-political and economic conditions.

### 2.3. Spatial econometrics and Economic Development

The impact of the 'relative location' of a country on the quality of institutions and thus economic growth has been given relatively less attention. How does the institutional quality of a country get affected by the institutional quality of its neighbours? A large literature on spatial dependence in the field of economic growth can be found in the regional convergence literature. Regional income convergence on intra-national scale, as well as regional scale, has resulted in strong consensus on income convergence among these geographical units. The theories of technology diffusion and factor mobility have strong spatial components. For example, Verspagen (2010), López-Bazo et al. (1998, 2004) study the technology diffusion and growth among European regions. Similarly Rey and Montouri (1998) study spatial patterns in income across the states of USA. Other studies in this literature include Quah (1997), Cheshire and Magrini (2008), Fingleton, and López-Bazo (2006), etc.

Spatial dependence with respect to institutions and governance has been addressed in a couple of studies. Ward and Gleditsch (2008) study the spatial spillover effect of democracy at a cross-country level. They find southern, and western Africa, as well as India, are unusual situations where in democracy in their country is not explained by the situation in their neighbouring countries. Examining if the governance structures in an economy are influenced by their neighbouring countries could help unbundle institutions in a more effective way. They find a positive impact of democracy of neighbouring countries. Leeson and Dean (2009), Sobel and Leeson (2007), etc., also study the effects of democracy on neighbouring countries, with a spatial or a temporal lag (Hosseini and Kaneko 2012).

## 3. Data and Methodology

Institutional quality, geography, economic performance and the financial structure of a country are all multi-dimensional in nature. Using single variables to describe these phenomena can bias understanding of how they influence each other<sup>12</sup>. In this paper, we want to better understand how the geography of a country (its 'absolute location'), its economic performance and its financial structure, each in turn, are related to the institutional set up of a country (given its relative location). In order to understand the role of 'relative geography' of countries, we introduce an alternate method of *spatial principal component analysis* and *spatial canonical correlation analysis*. We would like to study the dependence of one latent variable on the other, given the relative location of the observations, i.e., we would like to account for the spatial dependence of observations in one country on its neighbours<sup>13</sup>.

Similar to the Principal Component Analysis (PCA), canonical correlation analysis (CCA) is a dimensionality reduction method. PCA transforms a set of probably correlated variables into a smaller set of uncorrelated variables. This is done by constructing a new set of latent variables that are orthogonal (uncorrelated) to each other. In other words, the new variables are weighted linear combinations of the original variables, which maximise the variance of the new latent variables in the data set, called principal components. While the PCA does this for one set of variables, the CCA finds the relationship between two sets of multiple variables X and Y, for which we obtain two sets of latent vectors. These are called canonical components. The weights are obtained in such a way that they not only reduce the number of variables in each data set, but also maximise the correlation between the corresponding new components in each dataset (i.e., the first component in data set 1 is maximally correlated to the first component in data set 2 and so on. Each pair of components is together called a canonical function)<sup>14</sup>. The residual variance is explained by each successive canonical function that is, the first function explains the most amount of variance in

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<sup>12</sup> Verspagen, B., (2012), explores the relationships between governance, institutions and economic development measuring them multi-dimensionally.

<sup>13</sup> For a detailed explanation on the methodology used see (Bhupatiraju et al.2013)

<sup>14</sup> This is different from the PCA in that the correlations are found within one set of data and not the inter-correlations between two sets of data.

the data and consecutive ones explain the maximum of residual variance. The highest number of components you can have is determined by the number of original variables in the smaller data set.

The analysis results in following results for PCA and CCA respectively: (i) *factor loadings* (or *canonical loadings*) for both sets of data (X and Y), for each common pattern that exists in the two sets (for each canonical function). These weights correspond to each of the variables in the data sets, determining how they weigh in on the identified common pattern. With the factor loadings we can identify the structural pattern underlying the data (Clark 1975). These loadings are obtained from the correlation matrix, by the means of Eigen value decomposition. (ii) *Factor scores* (or *canonical scores*) for each of the data sets (X and Y). These scores explain how each country fares in the common pattern. This, is therefore, a good indication of the spatial patterns underlying the data. The scores are obtained by pre-multiplying the loadings with the standardized raw data. (iii) *Canonical correlation coefficient* (*Moran coefficient*) is the correlation coefficient between the latent variables of both sets of data (for each canonical function). It can be understood as the Pearson r coefficient between the two latent variables. The spatial correlation between the two factor score vectors is equal to the square root of the corresponding Eigen values.

We want to maximize the *correlation coefficient* obtained from the PCA and CCA to explain a maximized overall spatial pattern. We call this the *spatial correlation coefficient*. In order to do this, we introduce spatial weights (a *connectivity matrix*) that allow us to define the ‘relative location’ of the countries in the data sets<sup>15</sup>. We first calculate the *spatial lag* of one set of variables. A *spatial lag* of observation *i* of variable *y* ( $y_i$ ) is the linear combination of values of its neighbouring countries and is given by  $\sum_j^n w_{ij}y_j$ , where  $w_{ij}$  is the spatial weight matrix. This is the weighted average of the observation *i*’s neighbouring countries (*j*). In other words, a spatial lag introduces a diffusion process such that the variables in the data set are influenced by their neighbours. This method decomposes a spatially weighted matrix, in order to give it an explicit spatial perspective. Bhupatiraju et al. (2013) explains this methodology in detail. We perform a spatial PCA on the institutional data in order to reduce the number of institutional variables, which we further use for a spatial CCA along with the other data sets.

In order to obtain the spatial lag, we choose a set of geographic distance weights for the connectivity matrix. We use an exponential decay to obtain the weights matrix, given by the formula,  $w_{ij} = e^{-0.0015d_{ij}}$  where  $w_{ij}$  is the spatial weight between countries *i* and *j*, and  $d_{ij}$  is the bilateral distance between the centroids of the two countries. The data of bilateral distances are taken from the CEPII gravity dataset<sup>16</sup>. This specific distance decay has been chosen after having experimented with a few other weights, the details of which are presented in Appendix A. It is an arbitrary choice, but reflects a rapid decay of weights given the distance between the countries. This ( $n \times n$ ) matrix is row-standardized so as to take into account that all countries are -at some distance- neighbours of each other and, therefore, is not symmetric. It is also important to note that the weights are non-stochastic and are exogenous to the model.

The analysis is based on four datasets, which we will briefly present. The first dataset Institutional Profiles Database, 2009 version (IPD)<sup>17</sup> provides us with the data on institutional characteristics of 123 countries. The IPD data is divided into four institutional sectors and nine institutional functions. The categories will be presented in Appendix B. For our analysis we use the two-digit aggregation level which has 93 variables.

The data on physical geographic factors of countries are taken from the Gallup, Mellinger and Sachs geography dataset<sup>18</sup>. The dataset contains information on infectious diseases, general measures of geography and agricultural measures. This particular data set has been divided into two different sets for our analysis, one describes the physical geographic characteristics of countries (GEOAREA) and the second describes the soil quality related variables (GEOSOIL), mainly based on the Köppen-Geiger climate zones. The information on infectious diseases has been dropped out of this analysis (since they are time-varying and are affected by policy and is not necessarily exogenous as noted in the previous section).

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<sup>15</sup> For a detailed explanation refer to Wartenberg (1985)

<sup>16</sup> Bilateral distances and common (official) language come from the CEPII distance database (<http://www.cepii.fr/anglaisgraph/bdd/distances.htm>). Mayer, T. & Zignano, S., (2011), "Notes on CEPII's distances measures: The GeoDist database", CEPII Working Paper 2011-25, Paris: CEPII.

<sup>17</sup> <http://www.cepii.fr/anglaisgraph/bdd/institutions.htm>

<sup>18</sup> <http://www.cid.harvard.edu/ciddata/geographydata.htm>

The data on economic variables are taken from the Penn World Table<sup>19</sup> (PWT). We use a broader set of economic indicators to measure economic performance. These take into account not only the size of the economy (the initial level of GDP) and how fast it is growing (average annual growth rate of GDP per capita over the period of 2000-2007), but also some indicators of its expenditures which include investment, government spending, and consumption. We also include an indicator of the economy's trade openness as well as the log of population all using the definitions as in PWT. While GDP per capita is generally used as the measure of economic development/performance, we feel that these additional variables allow us to measure different dimensions of a country's economic situation. By including other aspects of the economy that leads to higher levels of growth in a country, the aim is to go beyond the simple measure of GDP per capita as a measure of economic development/performance.

The financial data is obtained from the Financial Structure database distributed by the World Bank<sup>20</sup> (FINANCE). This is a database of 31 indicators that describe the financial development and structure of countries. We use data for the year 2009. The variables in the data measure the "size, activity and efficiency of financial intermediaries and markets" (Beck et al. 2000). Variables that measure the size and activity of non-bank financial institutions (insurance, private bond market and stock markets), international debt and remittances, as well as liquid liabilities of countries, have missing data for our set of countries. Due to this lack of data, we have dropped these 12 variables from the dataset<sup>21</sup>. We use 19 variables that give details of the banking sector across countries. The details of these variables are given in Appendix C.

## 4. Empirical Results

### 4.1. First stage results

The IPD database contains 367 "elementary items" that are aggregated to 133 "three digit level" variables and further aggregated to 93 "two digit level" variables. For our analysis, we use the two-digit aggregation level which has 93 variables. Because there are very few degrees of freedom when we use the 93 variables for 118 countries, we would like to further aggregate these before our second step of the analysis. We use a pre-defined categorisation (of the 4 sectors) to obtain new latent variables for each of the sectors. Sector A which constitutes institutional variables related to public institutions, and civil society contains 36 two-digit level variables. Sector B which constitutes variables related to the goods and services markets contains 28 variables. Sector C constitutes 13 variables describing the capital market, and Sector D constitutes 16 variables describing institutional variables related to the labour market. We first do a spatial PCA on each of sectors of IPD. We select the new latent variables by looking at the scree plot of the Eigen values. Out of the components we obtain; we choose to work with 12 components (four from Sector A, three from Sector B, two from Sector C and three from Sector D). We discuss the results for some of these components before proceeding to the next step of the analysis.<sup>22</sup>

We call the first PC of Sector A, A1. This component gives the highest positive weights to 'Social Inclusion' (A93), 'democracy, legality & freedom (A10)', and 'political proximity to an EU country'. 'Change and innovation' and 'political proximity to Japan' have strong negative loadings. This component in general can be interpreted as representing a '*socially inclusive democracy*' with political proximity to an EU country. In other words, we can see that countries that function similar to the non-Anglo Saxon Western European economies obtain a higher score than others. It is interesting to note the Algeria and Libya also get a high score along with Canada. These are the only countries, not in the geographical region of Western Europe, which have a high score.

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<sup>19</sup> We use PWT (7) of the table.

<sup>20</sup> Thorsten Beck, Asli Demirgüç-Kunt and Ross Levine, (2000), "A New Database on Financial Development and Structure," World Bank Economic Review 14, 597-605.

<sup>21</sup> These are: other financial institutions assets / gdp (ofagdp), liquid liabilities (in mil. 2000 usd) (ll\_usd), life insurance premium volume / gdp (inslife), non-life insurance premium volume / gdp (insnonlife), stock market capitalisation / gdp (stmkcap), stock market total value traded / gdp (stvaltraded), stock market turnover ratio (stturnover), no. of listed companies per 10k population (listco\_pc), private bond market capitalisation/gdp(prbond), public bond market capitalisation / gdp (pubond), international debt issues/gdp (intldebt), loans from non-resident banks (net) / gdp (intldebtnet), remittance inflows / gdp, (remit).

<sup>22</sup> The loadings for the first-stage are given in the Appendix D.

The second PC of Sector A is called A2 here. The variables that load high and positively in the second component are 'Change and Innovation', 'Security of transactions & contracts', and 'political proximity to Japan'. 'Institutional capacity', 'domestic public security & control of violence' and 'emulation of neighbouring countries' are some other variables that have relatively high weights. 'Governance of public administration & the justice system'<sup>23</sup>, 'government capacity to reform', 'autonomy in operation & creation of organisations' and 'decentralisation' have strong negative loadings. The eastern part of the world has the highest scores in this component, along with Northern European countries. Africa and Latin America have the lowest scores along with Mediterranean Europe. This component can be interpreted as one that stresses on '*society's responsiveness to change and innovation*'.

The third PC of Sector A (A3) has high and positive loadings on 'change & innovation', 'governance of public administration & the justice system', 'domestic public security & control of violence', 'traditional solidarity', 'political proximity to China', 'social inclusion', and 'cooperative behaviour in society'. It has negative loadings on 'government capacity to reform' (which has the strongest loading), 'national cohesion', 'decentralisation', 'subsidies on commodities' and 'democracy, legality & freedom'. This component could be interpreted as stressing on the "*strong presence of the government*".

The last component that we consider from Sector A is A4. This constitutes of 'security of transactions & contract', 'capacity of state to co-ordinate stakeholders', 'institutional capacity', 'autonomy in creation and operation of organisations', and 'decentralisation' which have positive loadings. Those variables that load negatively include 'social inclusion', 'political proximity to an EU country', 'governance of public administration & the justice system', 'control of state violence by NGO's', 'strategic capacities' as well as 'subsidies on commodities'. While 'government capacity to reform' is the strongest negative loading on A3, 'political proximity to an EU country' along with 'social inclusion' is the strongest negative loadings in A4 and 'security of transactions' has the highest positive loading in A4. Although it is hard to give a straight forward meaning to the fourth component, it gives the highest scores to economies that guarantee a security of transactions but are not necessarily socially inclusive. We notice a strong Mediterranean cluster. This component could be interpreted as stressing on the '*security of contracts*'.

From Sector B, that has variables representing the goods and services market, we take three components. The first one, B1 loads positive on variables such as 'land tenure- security of ownership', 'joint ventures', 'technical environment', 'privatisations', 'nationalisations' and 'land tenure- demand for land'. It loads strongly negative on 'non-national access to land', 'rural land tenure- traditional property rights', 'consideration of public interest in government- business relationships' as well as 'government recognition of various land tenure rights systems'. From this, it is obvious that the most important aspect of the goods & services market pertains to '*security and enforcement of property rights laws*' in a country. From the scores, we find that the developed countries have the highest scores. Kazakhstan and Turkey also obtain a high score and countries in Sub-Saharan Africa get the lowest scores.

In the second component of Sector B, B2, the 'importance of economic zones', 'technical environment', 'land tenure- security of ownership', 'considerations of public interest in government-business relations', 'shareholder weights – weight of the government' and 'openness to business' have positive weights. 'Non-national access to land', 'information on shareholders', 'ease of starting a business', 'density of sub-contracting relations', 'public aid for R&D', 'rural land tenure- traditional property' and 'land tenure- development policies' load negatively. From the variables that load high -either positively or negatively- we see that the most important functions in this component are those pertaining to '*strong presence of government regulation and active economic policies*' (in the goods and services market). This component could be understood as representing strong regulation by the government and having active economic policies pertaining to economic zones. Countries that score high on this factor include the Middle East, Central and South Asia as well a few African countries.

The last component of Sector B, B3, loads high and positive on 'privatisations', 'information on share-holders', 'land tenure- demand for land', 'free movement of people and information', 'shareholders- weight of government' and 'land tenure- security of ownership'. Variables that load negatively on the component include 'competition on the good & services market', 'importance of economic zones', 'governance of natural resources', 'rural land tenure-

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<sup>23</sup> Defined as the efficient public administration (which includes transparency in public accounts, economic policy and public procurement contracts, effective control of corruption) and an independent justice system (this includes the effectiveness of the fiscal system, justice system and of urban governance.) (de Crombrughe, Farla, Meisel, de Neubourg, Ould Aoudia, Szirmai (2009))

public property' as well as 'consideration of public interest in government-business relations'. Although it is hard to label this component based on the loadings, we find that the Americas along with Southern Africa and China get the lowest scores. Thus we label this component 'strong competition in the goods market'

We choose to retain only two components from Sector C. C1 constitutes variables like 'regulation of competition in banking', 'importance of venture capital', 'monitoring and auditing in banking', 'financial openness', 'nationalisation of the financial sector' as well as 'freedom in allocation of loans' which load positively. 'Micro lending', 'financial information', 'sovereign wealth fund policy' and 'competition within the banking system' have a negative weight on the component. This component stresses on a '*well developed free and open financial sector*'.

C2, the second component of Sector C, is almost a mirror image of the first component<sup>24</sup>. Of those variables that load positively in C1, 'regulation of competition in banking', 'importance of venture capital', 'financial openness' and 'freedom of allocation of loans' load negatively in C2. Of those variables that load negatively in C1, we find that 'micro lending', 'sovereign wealth fund policy' and 'competition within the banking system' show up positively in C2, along with 'competence of bank executives'. This component stresses on a financial sector that is more or less controlled and regulated by the government, yet has a well-developed structure. We refer to this component as '*government regulated financial sector*'. While the first factor emphasizes openness of the financial sector, the second one emphasizes strong government control over the financial sector. It is interesting to note that in both factors most of Africa gets low scores while Australia and Canada get high scores. While 'monitoring and auditing in banking' influences the first component, competence of bank executives influence the second.

From Sector D, we retain three components. The first one, D1, loads positively high on 'freedom of association & trade union pluralism', and 'distribution of income' and negatively on 'low incidence of child labour', 'social mobility', 'management of labour', 'weak employment contract rigidity' as well as 'retraining and re-skilling measures'. Lack of social mobility and incidence of child labour clearly dominate this factor. This component stresses on a '*non-meritocratic weak labour market*' where there is discrimination based on gender, ethnicity etc., and one in which social mobility is based on connections rather than on merit. We find that most African countries, along with Peru, Bolivia, Paraguay, India and Nepal score the highest.

The second component D2 loads positively on 'low incidence of child labour', 'weak employment contract rigidity', 'social mobility: young higher education graduates', 'quality of the supply of public goods', 'strikes and wage bargaining at the individual level'. It loads negatively on 'freedom of association & trade union pluralism', 'flexibility of the labour market', 'adaptive education system' and 'management of labour'. This component stresses on a '*flexible and adaptive labour market*'.

The last component from this sector, D3 loads high and positive on 'low incidence of child labour', 'strikes', 'management of labour', 'weak segmentation of the labour market', and 'freedom of association & trade union pluralism' and negatively on 'quality of supply of public goods', 'social mobility', 'distribution of income' and 'social mobility: young higher education graduates'. This component stresses on a '*weakly segmented labour market*'.

Looking at these factor loadings and factor scores, we find that among the first components, A1, B1 and C1 move in the same direction with very similar scores for each country while D1 moves in the opposite direction. Using these 12 components from the IPD data set which we use as indicators of institutional quality, we now perform the spatial canonical correlation analysis along with a set of 7 economic variables (PWT). In the analysis that follows these 12 components will be called the IPD variables.

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<sup>24</sup> Since the two latent variables have to be orthogonal.

**Table 1: Labels for the first stage IPD components<sup>25</sup>**

Description	Variable code
'socially inclusive democracy' (with political proximity to an EU country)	<i>A1</i>
'society's responsiveness to change and innovation' (with political proximity to Japan)	<i>A2</i>
'strong presence of the government'	<i>A3</i>
'security of contracts'	<i>A4</i>
'security and enforcement of property rights laws'	<i>B1</i>
'strong government regulation and active economic policies' (in the goods and services market)	<i>B2</i>
'strong competition in the good market'	<i>B3</i>
'well developed free and open financial sector'	<i>C1</i>
'government regulated financial sector'	<i>C2</i>
'non-meritocratic weak labour market'	<i>D1</i>
'flexible and adaptive labour market'	<i>D2</i>
'weakly segmented labour market'	<i>D3</i>

<sup>25</sup> These labels are used to refer to each of the components. It should be noted however that these labels are not all encompassing in describing the details of the components. The reader might want to look at the details of the loadings provided in the Appendix.



widely accepted correlation between institutions and level of GDP per capita. The relative position of the country clearly has an impact on its score.

Figure 1b shows the factor scores of institutional quality for the 118 countries. In general, there is a high level of clustering. The cluster with the highest scores is the developed country cluster. The cluster with the second highest set of scores is Latin America, Eastern Europe and Russia as well as some countries in North Africa (which could be due to their loadings on the variable ‘political proximity to the EU’). The next cluster constitutes the Middle East, South and South East Asia and four Latin American countries. The least institutional scores are given to Sub-Saharan Africa. From a strictly spatial perspective, Australia and New Zealand are the outliers. Figure 1c shows the scores of economic performance which more or less corresponds to the institutional variable scores. The maps show that countries like Australia, New Zealand, the Indian sub-continent and Northern Africa have better institutions relative to their economic performance. Countries like Japan and South Africa have a better economic performance given relative to their institutional set up. In other words, the institutional scores capture the western European model of institutions for this function.

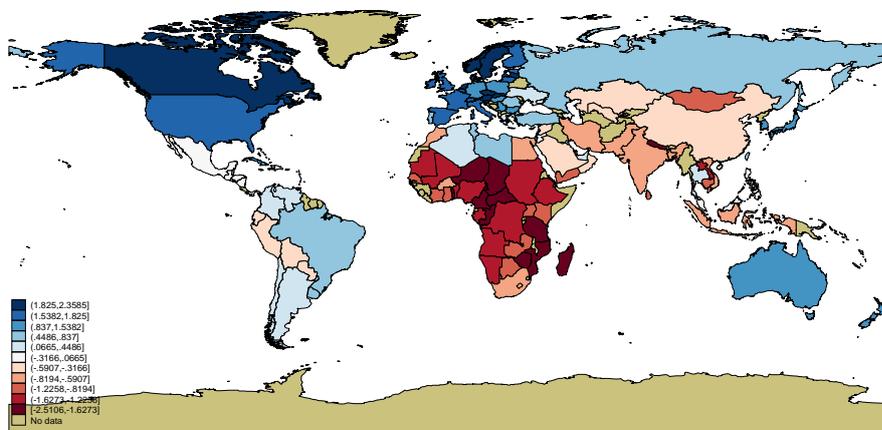


Figure 1b: IPD scores Factor 1 (IPD-PWT)

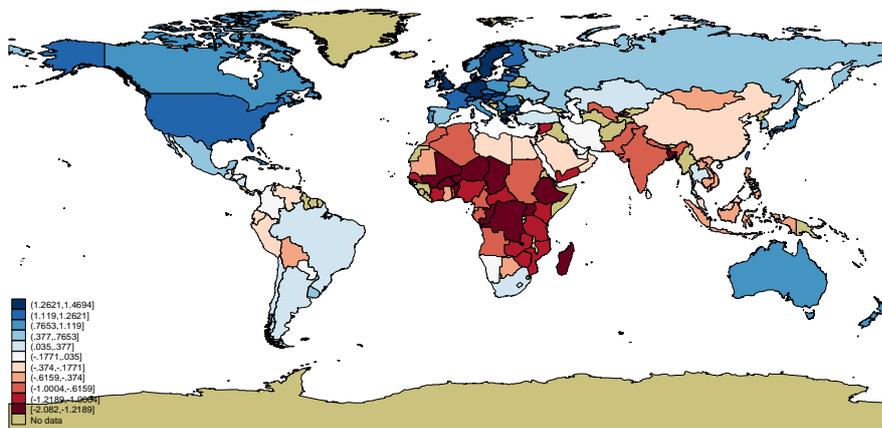
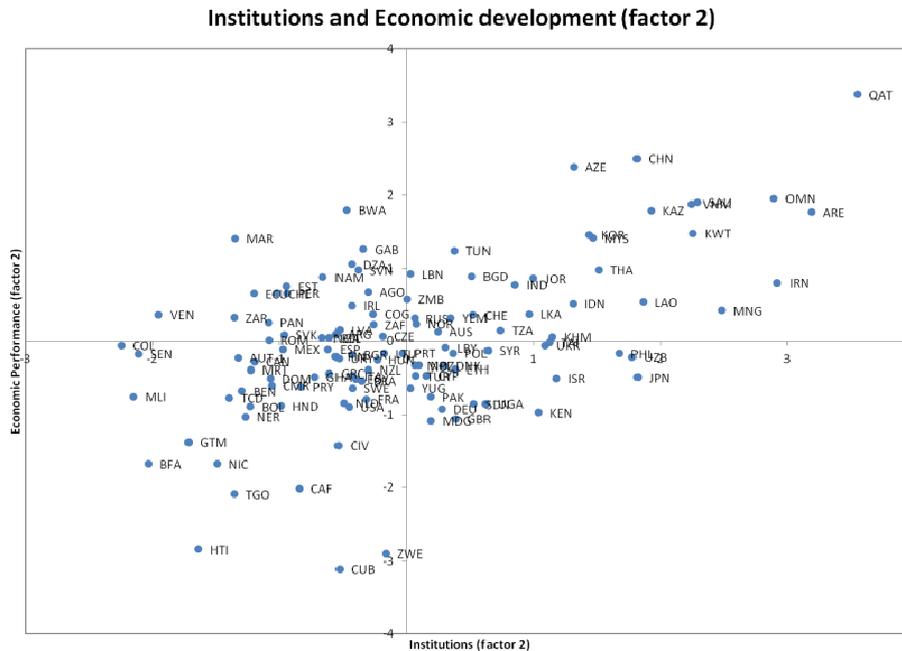


Figure 1c: PWT scores Factor 1 (IPD\_PWT)

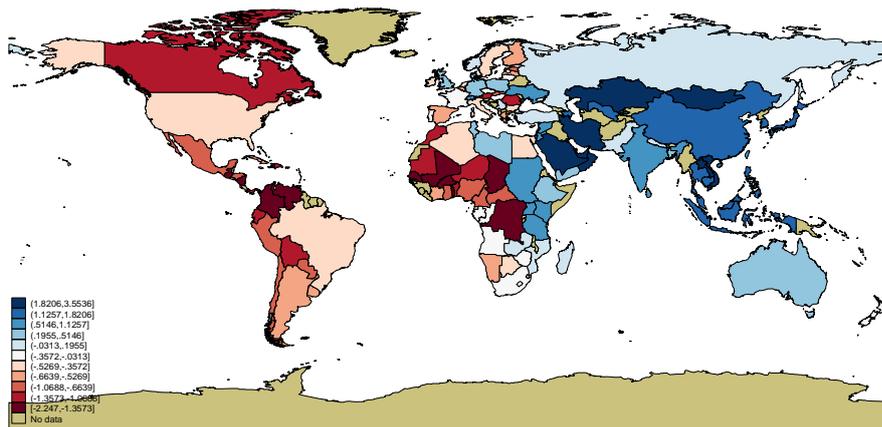
The spatial correlation for the second canonical function (0.48) is significantly smaller than the first. On the IPD side, ‘security and enforcement of property rights laws’ (B1), ‘strong government regulation and active economic policies’ (B2) and ‘flexible and adaptive labour market’ (D2) are among those that load positively and ‘socially inclusive democracy’ (A1) loads strongly negative. The PWT data loads strongly positive on growth rate and investment. It loads negatively on the initial level of GDP, consumption and government spending. Openness is positive but with a relatively low weight. Initial level of GDP has a negative weight along with government

spending. We can say that this component identifies “catching-up” countries, with a market steering government. Figure 2a shows the scatter plot of the scores for 2<sup>nd</sup> function. We see that there are spatial clusters but not as strong and clear as in the first factor. We find countries like Qatar, China, Oman, etc., at the higher end of the plot and most African countries, Haiti and Cuba at the lower end.

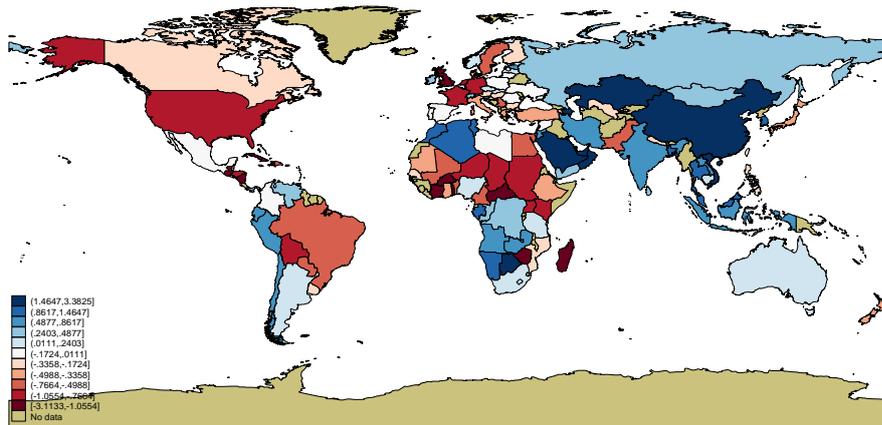


**Figure 2a:** Spatial correlation between institutions and economic performance (factor 2)

Figure 2b maps the institutional scores and Figure 2c maps the scores of economic performance. From the two maps, we can see that there is very close spatial correspondence between the two sets of scores in the Eastern part of the world. This is not the case among African, Western European and Latin American countries between the two sets of scores.



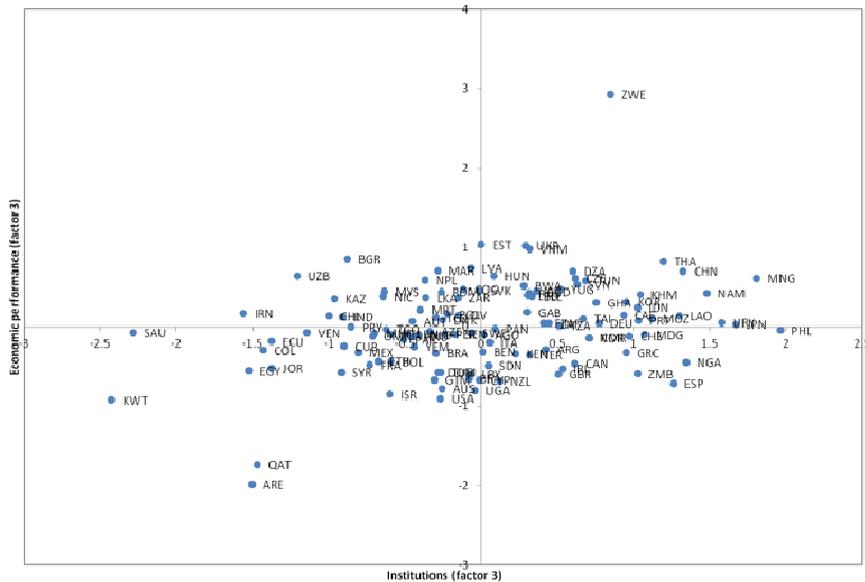
**Figure 2b:** IPD scores Factor 2 (IPD-PWT)



**Figure 2c:** PWT scores Factor 2 (IPD-PWT)

The variables that have high positive loadings in the third loadings vector of IPD are ‘*security of contracts*’ (A4), ‘*strong presence of the government*’ (A3) and ‘*weakly segmented labour market*’ (D3). The variables that have high negative loadings include ‘*strong competition in the goods market*’ (B3), ‘*well developed free and open financial sector*’ (C1) and ‘*government regulated financial sector*’ (C2). It is the political institutions and the financial institutions that are the most important ones in this factor. The only PWT variables that load positively but low are openness and investment. The highest negative loadings are on the initial level of GDP and population growth rate. The spatial correlation for the third component is 0.33. Zimbabwe is clearly an outlier here.

**Institutions and Economic development (factor 3)**



**Figure 3a:** Spatial correlation between institutions and economic performance (factor 3)

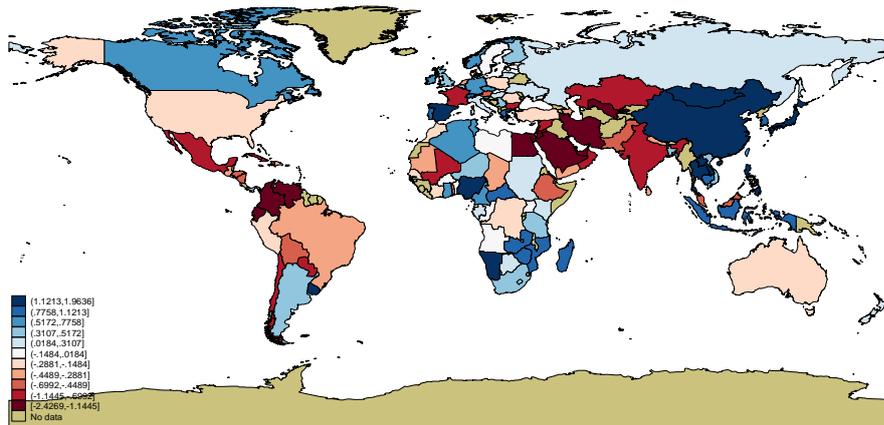


Figure 3b: IPD scores Factor 3 (IPD-PWT)

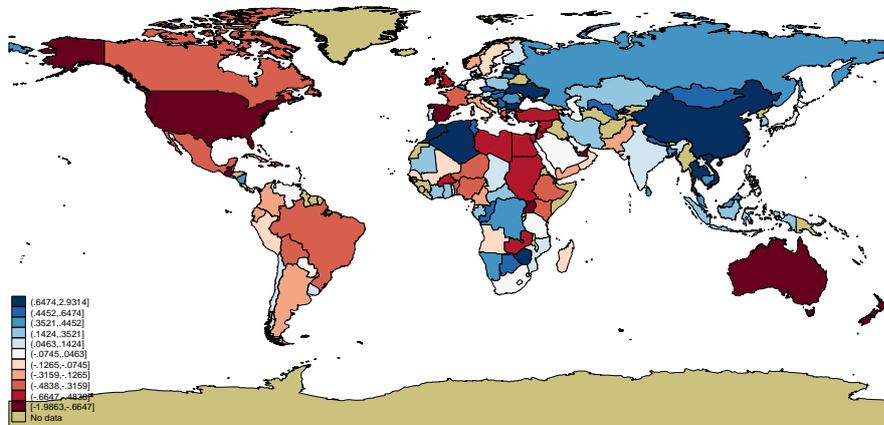


Figure 3c: PWT scores Factor 3 (IPD-PWT)

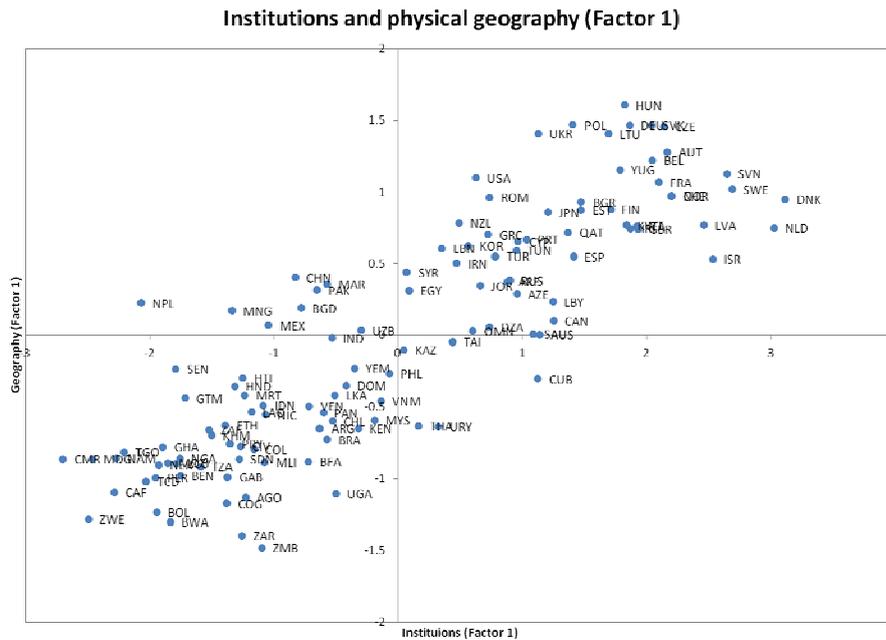
## B. Institutions and Geography

The absolute geographic location and the endowments that countries have, are often used in studies as an ultimate source of growth. While some studies incorporate variables such as the latitude of the country as having a direct impact on growth, others use variables such as the number of frost days in a year (which are essential for creating a rich top soil, thus making it more agriculturally productive) as an indirect source. The absolute geography variables that are used for both types of studies are a large and varied set. Rather than picking out one single variable, we divide the Gallup et al. (1999) data set into three different groups namely, (i) soil quality and climate zones, which contains – indicators referred to as GEOSOIL (ii) attributes of physical geography, which contains – indicators referred to as GEOAREA and (iii) the disease ecology of countries. In this study, we use only variables of GEOSOIL and GEOAREA since these are the invariable over time.

### IPD-GEOAREA

The IPD variables that load high in the first factor are ‘socially inclusive democracy’ (with political proximity to an EU country) (A1) ‘security and enforcement of property rights laws’ (B1), and ‘society’s responsiveness to change and innovation’ (with political proximity to Japan) (A2). It is again the political institutions and a positive market attitude that are important here. The geography variables that load high and positive are the latitude of country centroid, mean distance to the nearest coastline (km), and percentage of land area within 100 km of ice-free coast, while mean distance to nearest coastline or sea-navigable river (km), percentage of land area within 100 km of ice-free coast and percentage of land area in geographical tropics load negatively on the factor. The correlation we

obtain here is 0.84. From the loadings, we can see that the most important features are the latitude of the country, easy access to ice-free coasts and easy access to coastline or sea-navigable river (km). The scores of the factor are plotted in Figure 4a. Here again, we find most African countries have the lowest scores and European countries along with Canada and Australia score among the highest. Figure 4b maps the institutional scores and Figure 4c maps the GEOAREA variables. The GEOAREA clusters are tighter than clusters of institutional scores. Central and South Africa has the largest cluster, scoring the lowest, while Northwestern and Eastern Europe have the highest scores. USA and New Zealand are outliers. The institutional clusters are much smaller and more scattered.



**Figure 4a:** Spatial correlation between institutions and physical geography (factor 1)

This canonical function captures the geography hypothesis that institutional development is highly correlated to a certain set of geographic conditions (often proxied by latitude and access to waterways and coastline) which are considered favourable for economic development. What we see is that the geography scores clearly set apart Sub-Saharan Africa whereas the institutional scores are more varied. Similarly, we see that Western European institutional scores are slightly more varying than the geography clusters for the same region. Spain, for example, has an institutional score closer to the other European countries, but has a geography score closer to North Africa. Similarly the Neo-European countries have institutional score closer to the European ones than their geographic scores.

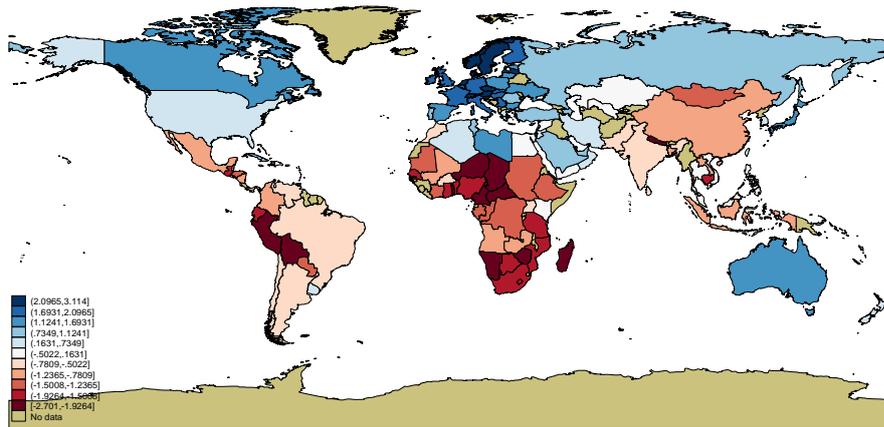


Figure 4b: IPD scores Factor 1 (IPD-GEOAREA)

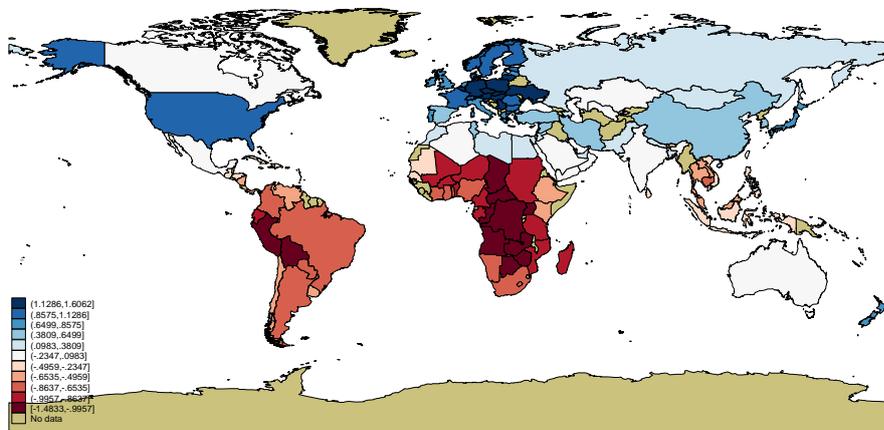
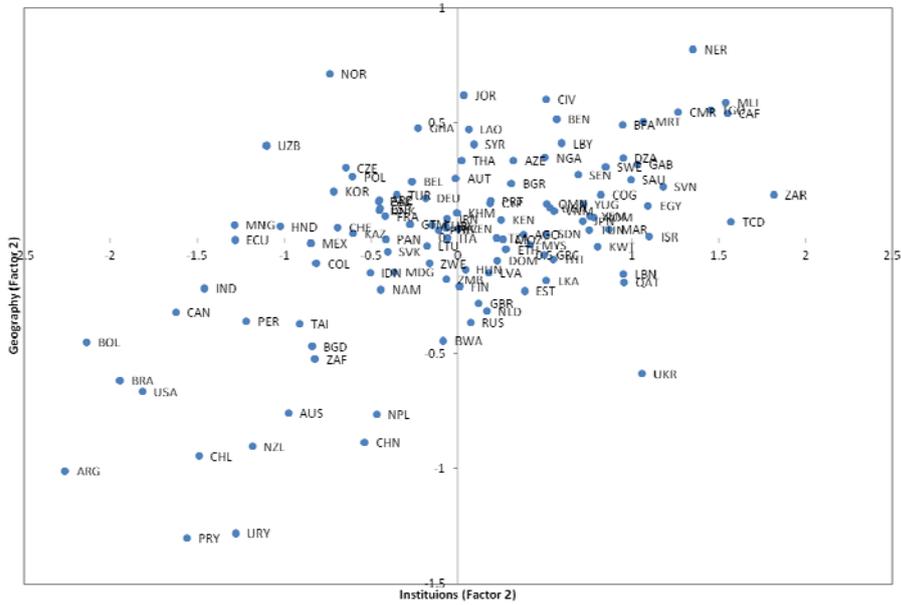


Figure 4c: GEOAREA scores Factor 1 (IPD-GEOAREA)

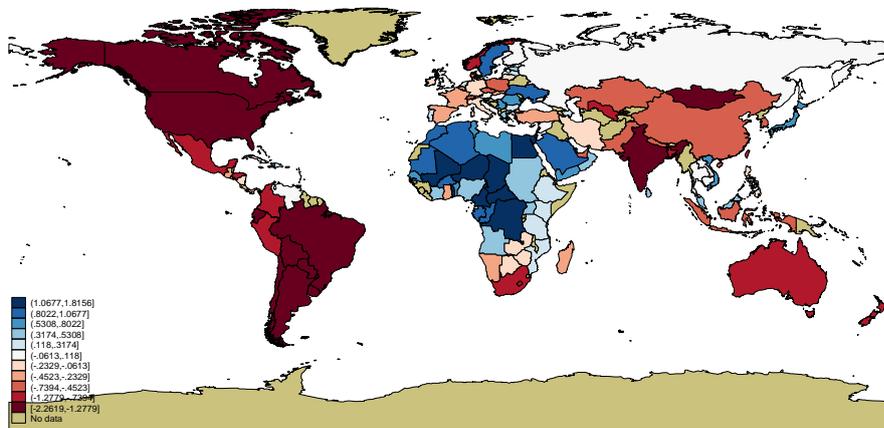
The second canonical component has a spatial correlation is 0.60. The second factor loads positively on ‘*strong competition in the good market*’ (B3), ‘*government regulated financial sector*’ (C1), and ‘*weakly segmented labour market*’ (D3) and strongly negatively on ‘*security and enforcement of property rights laws*’ (B1), and ‘*security of contracts*’ (A4). This factor stresses on the functioning of the Goods & Services market sector. The geographic variables that load strongly positive are mean distance to nearest coastline or sea-navigable river (km) and latitude of country centroid, and negatively on mean distance to nearest coastline (km) and percentage of land area within 100 km of ice-free coast. This shows that availability of water transport matter the most, as in the first factor. Figure 5a shows the factor scores of this canonical function.

**Institutions and Physical Geography Factor2**



**Figure 5a:** Spatial correlation between institutions and physical geography (factor 2)

Figure 5b and 5c map the scores for institutions and geography respectively, for the second canonical function. Here we find that the institutional clusters are larger than the geography clusters. Here we find no clear differentiation between developed and developing countries. Rather we find that large countries have the least institutional as well as geography scores, excepting those in the African continent and Russia.



**Figure 5b:** IPD scores Factor 2 (IPD-GEOAREA)

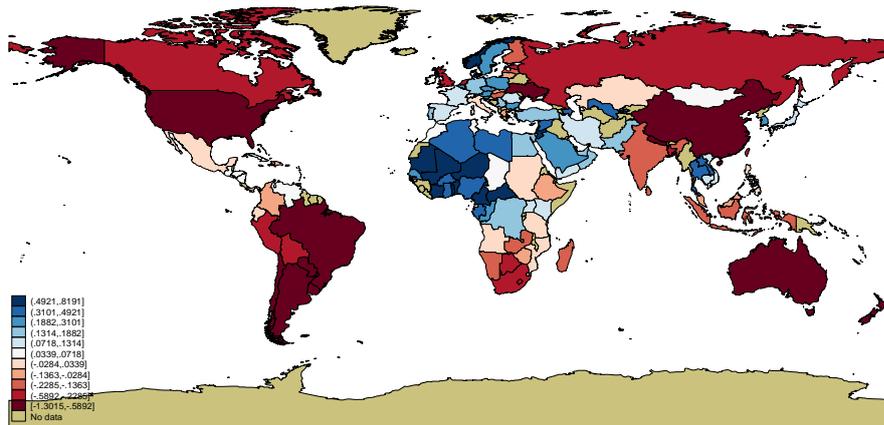


Figure 5c: GEOAREA scores Factor 2 (IPD-GEOAREA)

The third canonical component has a spatial correlation is 0.37. This factor loads positively on ‘socially inclusive democracy’ (with political proximity to an EU country) (A1), and ‘society’s responsiveness to change and innovation’ (with political proximity to Japan) (A2). It loads strongly negative on ‘strong government regulation and active economic policies’ (B2), ‘security and enforcement of property rights laws’ (B1), and ‘strong presence of government’ (A3). The geographic variables that load strongly positive are distance from centroid of country to nearest coast (km) and to the nearest sea-navigable river and percentage of land area within 100 km of ice-free coast. It loads negatively on mean distance to nearest coastline or sea-navigable river (km). On the institutional side, we see that countries that have a strong presence of government have the lowest scores. Here again, we see that the institutional clusters are quite different from the geographical clusters.

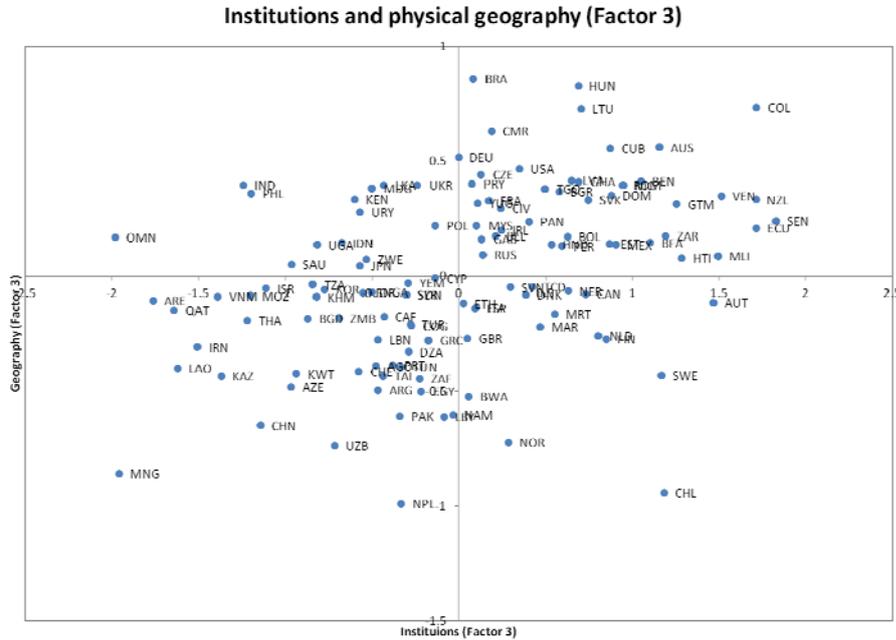


Figure 6a: Spatial correlation between institutions and physical geography (factor 3)

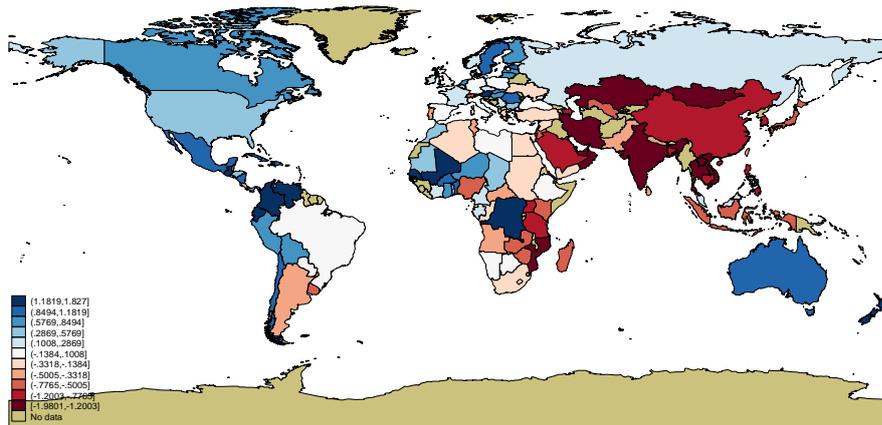


Figure 6b: IPD scores on factor 3 (IPD-GEOAREA)

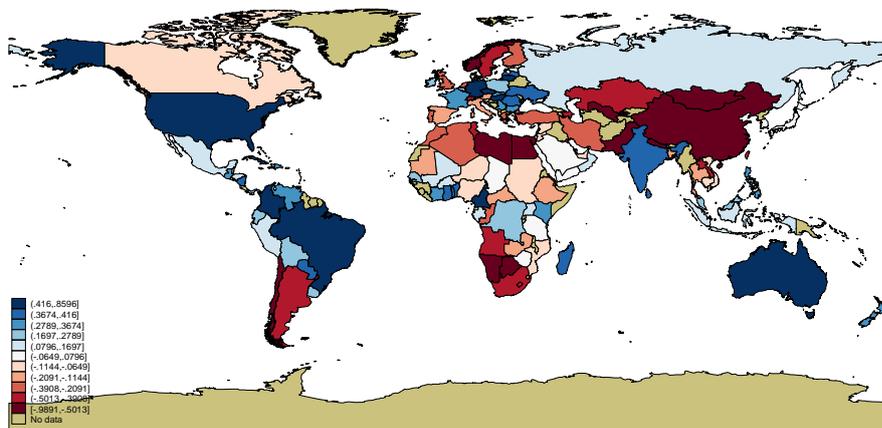
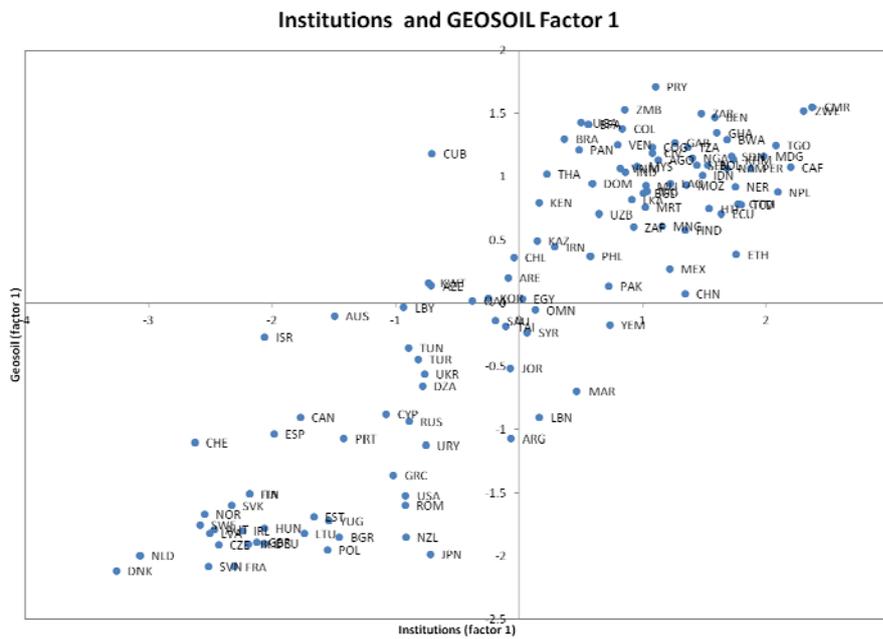


Figure 6c: GEOAREA scores on factor 3 (IPD-GEOAREA)

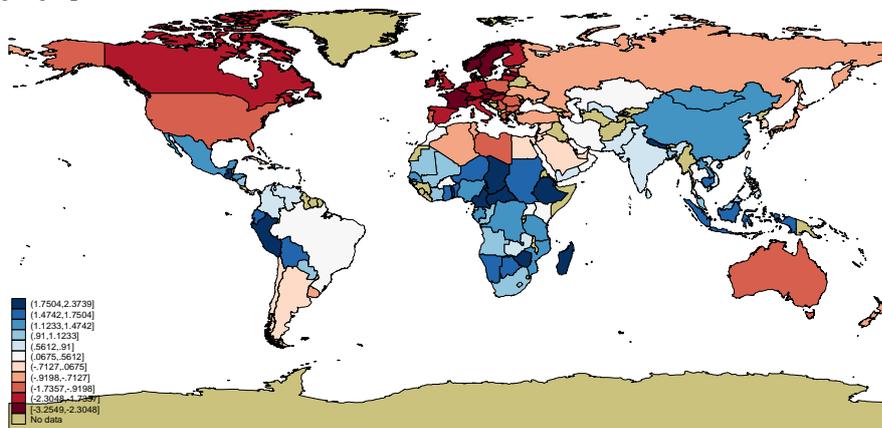
## IPD-GEOSOIL

The first canonical function of IPD-GEOSOIL has a correlation of 0.83. The most significant loadings are given to 'socially inclusive democracy' (with political proximity to an EU country) (A1) and 'security and enforcement of property rights laws' (B1) both of which are strongly negative while 'non-meritocratic weak labour market' (D1) loads moderately positive. On the geography side, we find that percentage of land cultivated in the Köppen Geiger zones of humid temperate, cold climate with moist winter and warm climate with dry summers load strongly negative. Very suitable-mean soil suitability (soilsui1) also loads moderately negative. Steppe climate, savannah climate, and moderately suitable-mean irrigation suitability (irrsuit2) load moderately positively. Figure 7a shows clear clusters of countries, with Africa and South & South East Asia on the one hand and Western Europe, North America, North Africa and Australia on the other. We see that this component again captures the emerging consensus that institutional development has been shaped by geography. This stylized fact has been popularized by economists such as Jeffery Sachs, Jared Diamond, etc.



**Figure 7a:** Spatial correlation between institutions and soil (factor 1)

From the spatial maps in Figure 7b and 7c we can see that those climatic conditions found in Western Europe that are considered good for overall economic development, which is in turn related to institutional development are also the ones that are most emphasized in the literature. Japan and New Zealand are the only other countries that score similar to Western Europe in Figure 7c. What is interesting to note here is that in Figure 7b we see that China scores low on institutions while Australia scores high. However, in Figure 7c, we see that both countries have similar geographic conditions.



**Figure 7b:** IPD scores Factor 1 (IPD-GEOSOIL)

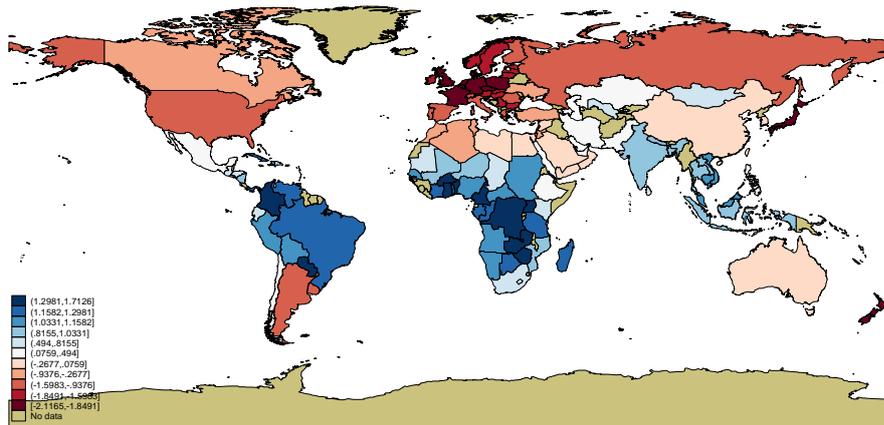


Figure 7c: GEOSoil scores Factor 1 (IPD-GEOSoil)

In the second factor, ‘society’s responsiveness to change and innovation’ (with political proximity to Japan) (A2) has the largest loading which is strongly negative. ‘Strong presence of government in the goods and services market’ (B2) and ‘security and enforcement of property rights laws’ (B1) also load negative, while ‘strong presence of the government’ (A3) loads positively. The geography variables that load high and positive include the percentage of land cultivated in the Köppen- Geiger zones of warm temperate climate with a dry summer, steppe climate, tropical savannah with dry winter and snow climate-fully humid and moderately suitable-mean soil solubility (soilsui2). The spatial correlation for this canonical function is 0.63. Figure 8a shows the scatter plot of the factor scores.

#### Institutions and GEOSoil Factor 2

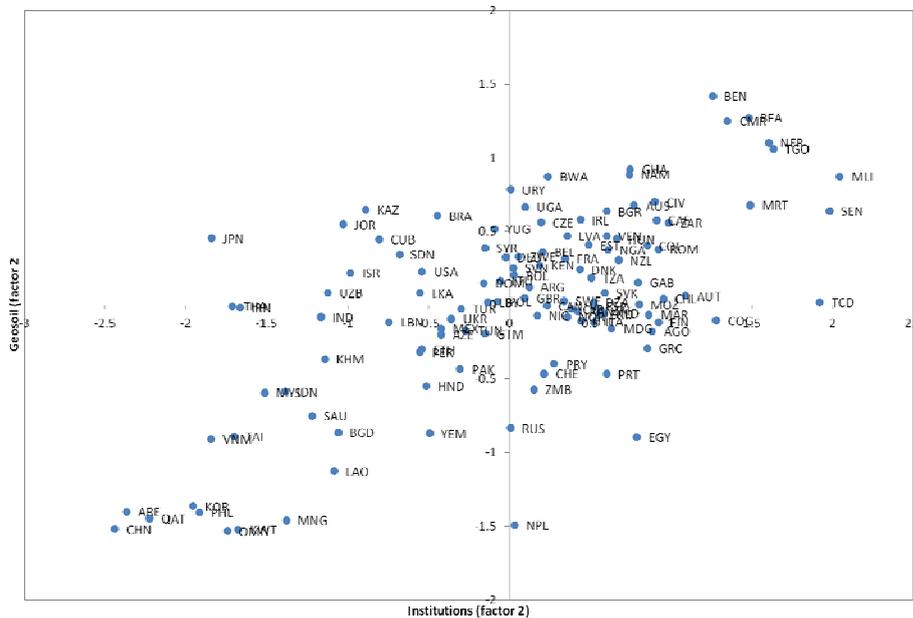


Figure 8a: Spatial correlation between institutions and soil (factor 2)

Here again, like in the second Figures 6b and 6c, we find that the institutional clusters are larger than the geography clusters, especially for Europe and Africa. These second factors show that geography is not necessarily destiny.



Institutions and GEOSoil Factor 3

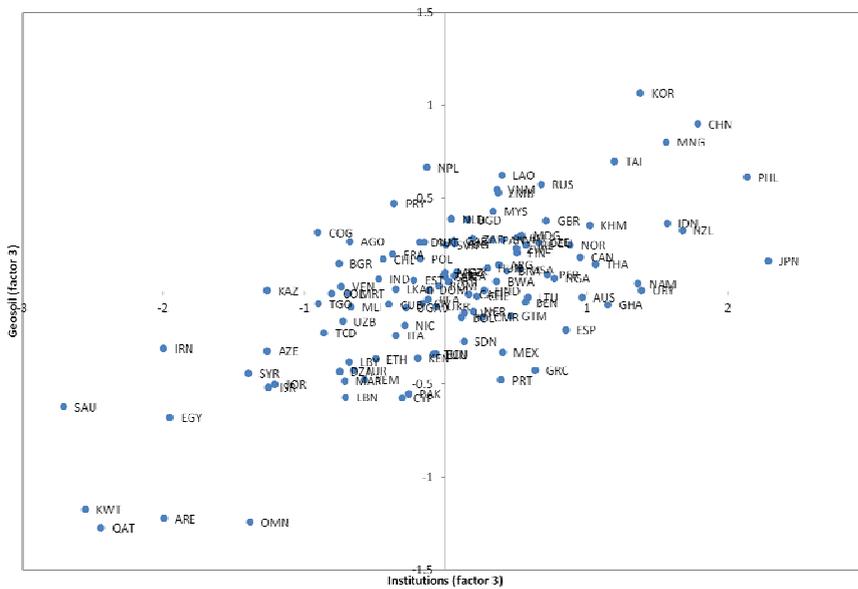


Figure 9a: Spatial correlation between institutions and soil (factor 3)

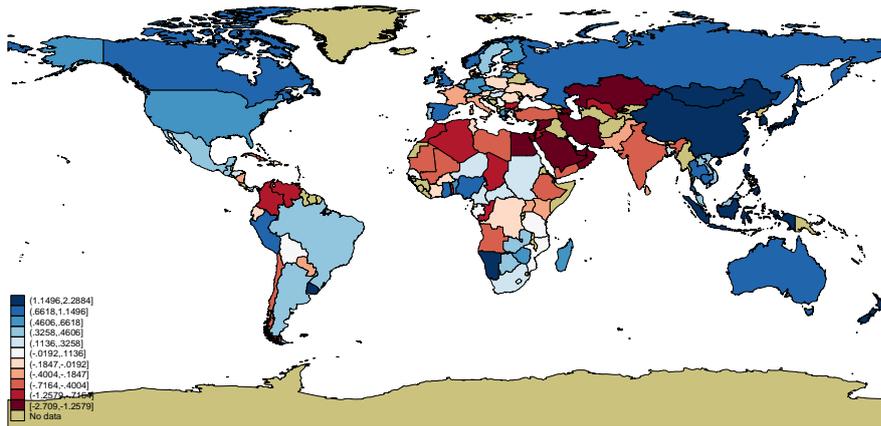


Figure 9b: IPD scores Factor 3 (IPD-GEOSoil)

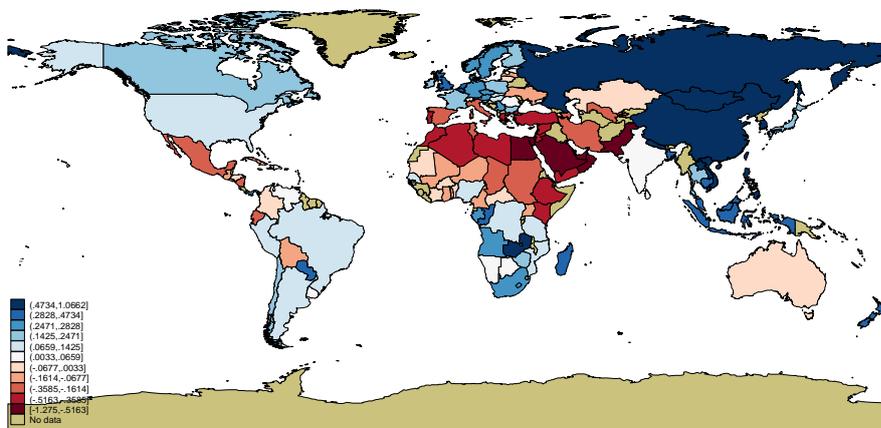


Figure 9c: GEOSoil scores on factor 3 (IPD-GEOSoil)

### C. Institutions and Financial Development (IPD-FINANCE):

Finally, we have a look at the interactions between institutional variables and finance variables. Figure 10a shows the scatter plot of the first set of scores from IPD and FINANCE plotted against each other. The spatial correlation here is 0.70. For the IPD data, we find that the first component loads positively high on 'government controlled financial sector' (C2) and 'non-meritocratic weak labour market' (D1) and negatively on 'society's responsiveness to change and innovation' (A2), 'strong presence of the government' (A3), 'enforcement of property rights laws' (B1) and 'competition in the good market' (B3). It is interesting to note that the political institutional environment that was very important in determining the economic environment of the country is not as important a determinant for the first factor.

The FINANCE data loads positively high on the ratio of bank deposits to GDP (bdgdp) and private credit by deposit money banks / gdp (pcrdbgdp). The ratio of deposit money bank assets (dbagdp) and ratio of financial system deposits to GDP (fdgdp) load strongly negative. Fdgdp and bdgdp measure the absolute size of the financial sector (Beck et al 2009). While fdgdp measures the lending activities of the entire financial sector, bdgdp measures deposits of deposit monetary institutions. Since they are perfectly correlated, we find that if one variable loads positively, the other has to and does load negatively. Dbagdp and pcrdbgdp measure financial depth in the economy. King and Levine (1993) and Levine et al. (2000) find that countries where deposit money banks or commercial banks play a bigger role in financial intermediation than central banks, there is a higher level of financial development. This is captured by the first component. Fdgdp is stock indicator of resources available to the financial sector for its lending activities, which is one indication of the size of the financial system. From the first component we see that those countries with a higher level of income have a higher fdgdp ratio. Those countries which have a low ratio of private credit from both deposit money banks and other financial institutions to GDP, lower ratio of bank deposits to GDP and ratio of overhead costs to GDP are mainly low income countries. From the first component we see that the size of the banking and financial sector in the economy as well as the magnitude of private financial sector is what matters for development. The other variables have relatively negligible weights in all the factors.

Figure 10b maps the IPD scores of the first factor. From the figure we see clear clusters in the Americas and Asia (except for the Indian subcontinent). In Europe and Africa we find more variation. Figure 10c maps the Finance scores, from which we find smaller clusters, more varied across the map.

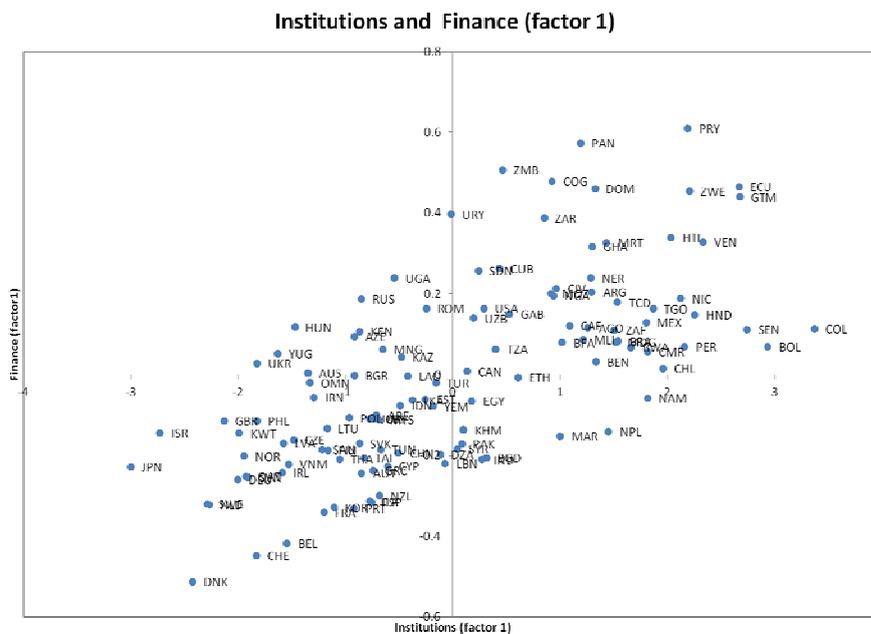


Figure 10a: Spatial correlation between institutions and financial development (factor 1)

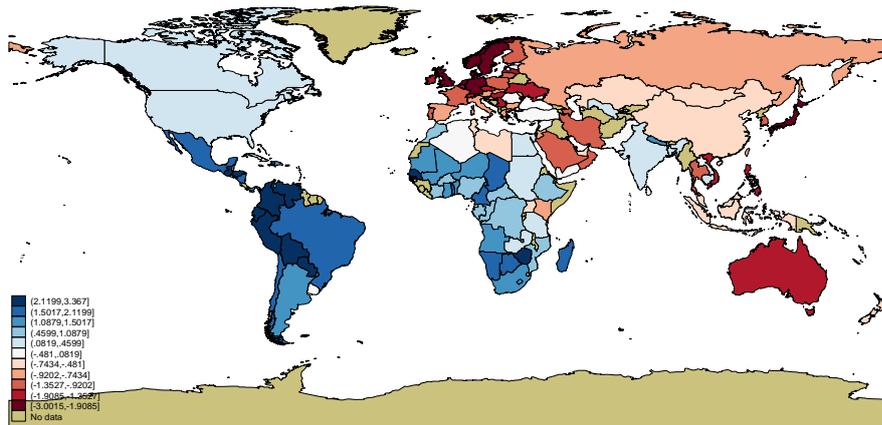


Figure 10b: IPD scores Factor 1 (IPD-FINANCE)

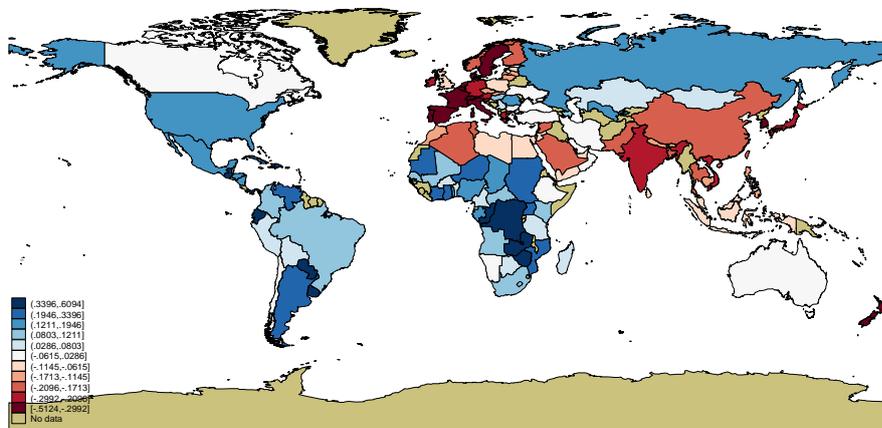
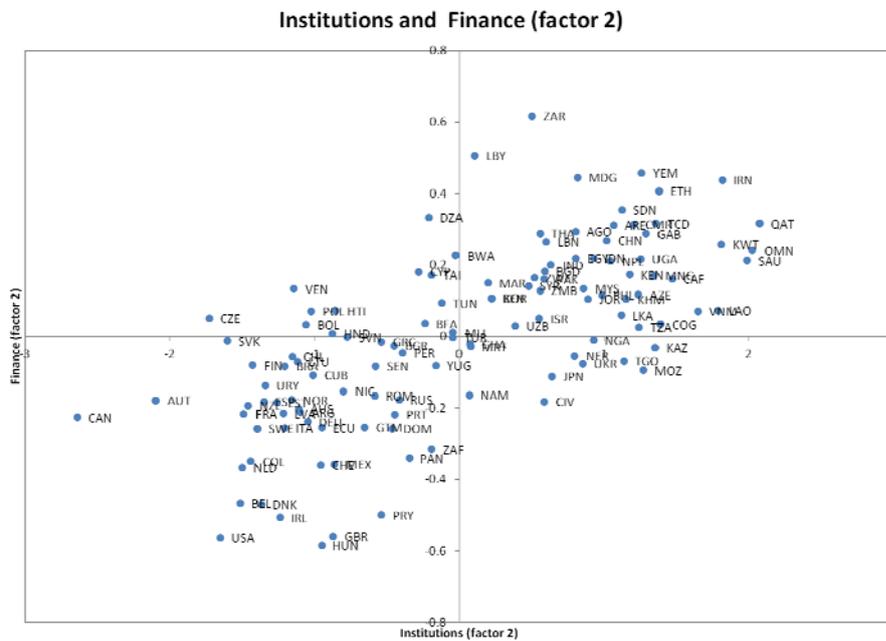


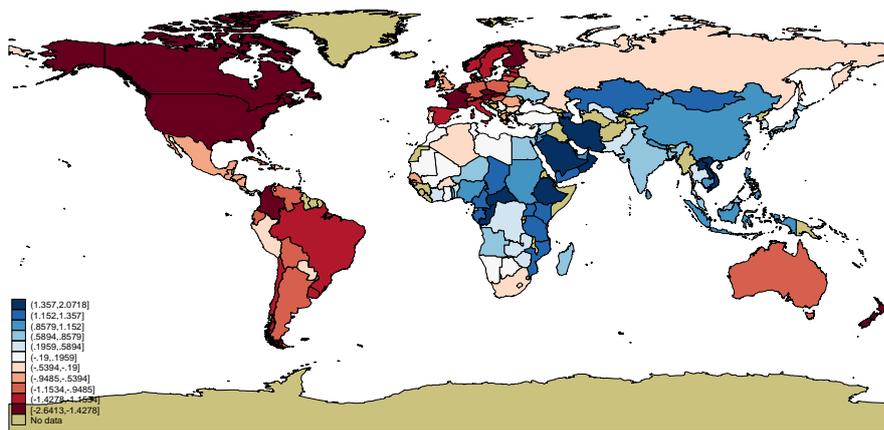
Figure 10c: FINANCE scores Factor 1 (IPD-FINANCE)

The spatial correlation of the second set of factors for the IPD-FINANCE data is 0.64. From the IPD data we see that 'strong presence of the government' (A3) and 'non-meritocratic weak labour market' (D1) load positively while 'socially inclusive democracy' (A1) highly negative (-0.8402) and the fourth factor of sector A (A4) has a weight of -0.2284. We see that in this factor 'Public institutions and civil society' is the most important sector of institutions. However the variable 'socially inclusive democracy' has the largest loading. The loadings on the financial structure variables show that the ratio of financial system deposits to gdp (fdgdp) and the ratio of private credit by deposit money banks to gdp (pcrdbgdp) are positive and the ratio of bank deposits to GDP (bdgdp) are negative. No financial variables from the IPD are captured in this component, unlike in the case of the first factor.



**Figure 11a:** Spatial correlation between institutions and financial development (factor 2)

The map of the IPD scores, Figure 11b shows a cluster of North and South America along with Western Europe. Australia and New Zealand also belong to this cluster and are geographically outliers. We find small clusters in Africa and Asia as well. The map of finance scores shows more variety in South America as against the IPD scores. Africa and Asia however have larger clusters. With respect to the IPD-Finance analysis, we find that a larger financial sector goes hand-in-hand with a higher level of GDP in a country and that a more open financial sector leads to higher growth. We also find that countries with a lower level of democracy are also those which have a lower financial depth.



**Figure 11b:** IPD scores Factor 2 (IPD-FINANCE)

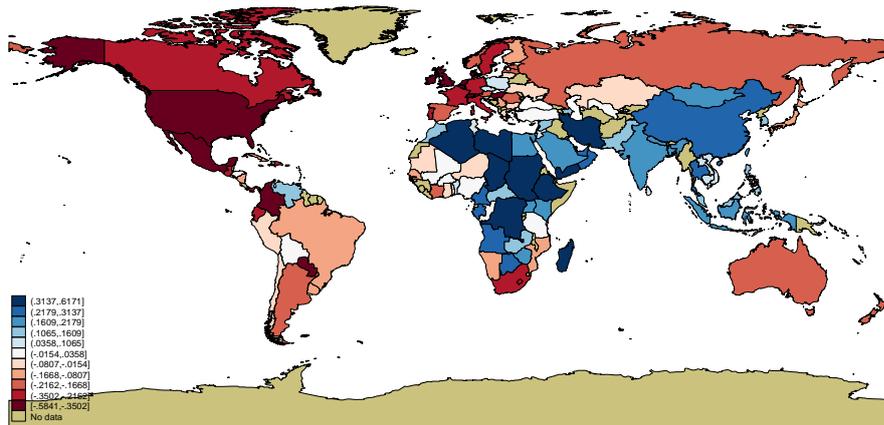


Figure 11c: FINANCE scores Factor 2 (IPD-FINANCE)

The spatial correlations for the third set of factors is relatively lower (0.44). The institutional variables that load high and positive are 'strong presence of the government' (A3) and 'competition in the good market' (B3). Those that load strongly negative include 'society's responsiveness to change and innovation' (with political proximity to Japan) (A2), 'security and enforcement of property rights laws' (B1), and 'non-meritocratic weak labour market' (D1). From this we see that the goods and services market sector of IPD is relatively more important in this factor. We don't see the financial sector of the IPD having any impact on the factor. The finance variables that load high and positive are the ratio of deposit money bank assets to GDP, and bank deposits to GDP. The ratio of financial system deposits to GDP has a strong negative loading. Here again a competitive and open financial sector, which is relatively privatized is what seems to determine a high score for countries. Here too, the institutional clusters are stronger.

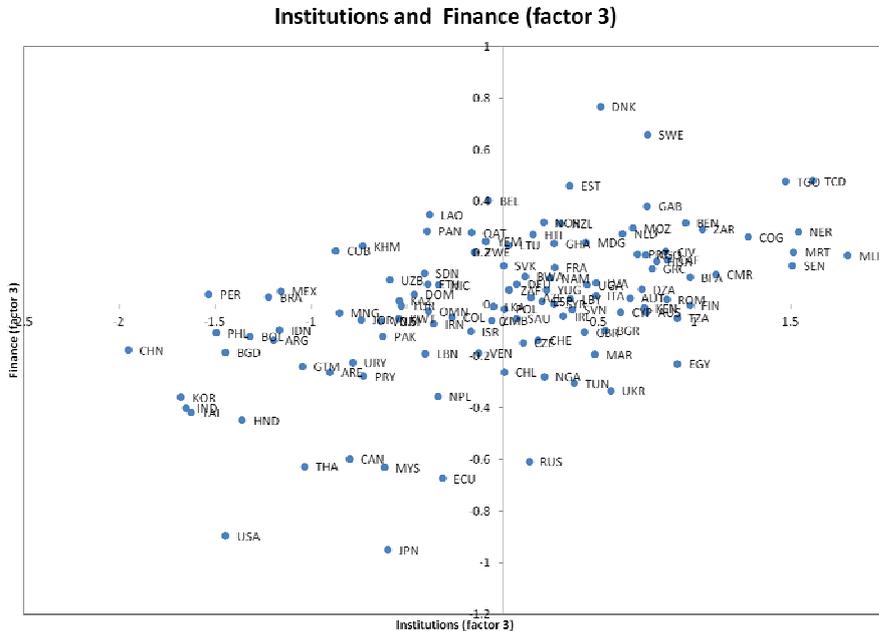


Figure 12a: Spatial correlation between institutions and financial development (factor 3)

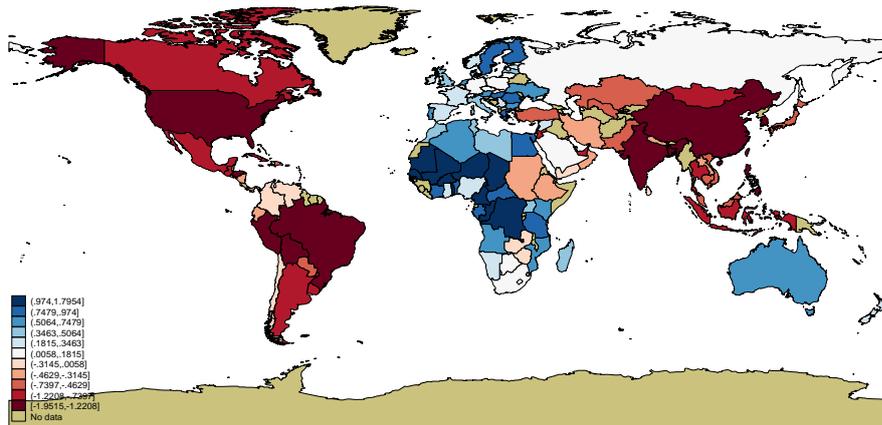


Figure 12b: IPD scores Factor 3 (IPD-FINANCE)

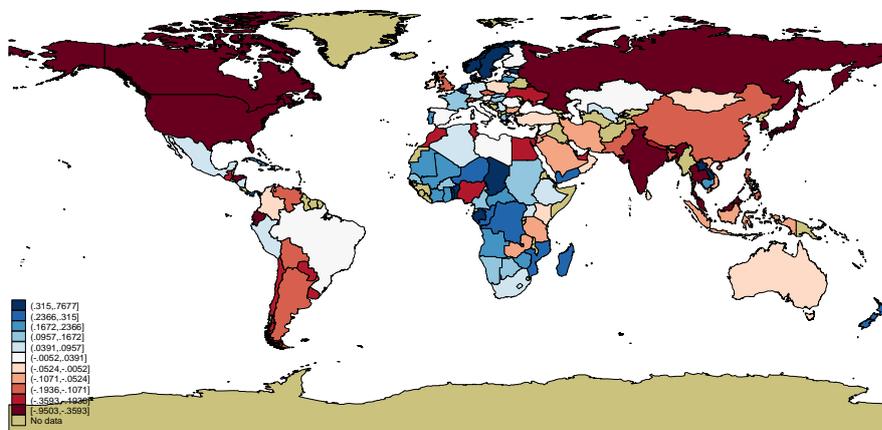


Figure 12c: FINANCE scores Factor 1 (IPD-FINANCE)

## 5. Conclusion

This paper analyses institutional quality and economic performance through the lens of a spatial PCA and a spatial CCA. From the first canonical components of each spatial CCA we find results that conform to current literature. First, our analysis reiterates the institutional hypothesis that institutional quality of a country is strongly related to its level of GDP per capita. The more developed a country is, the better its institutional quality and vice versa, characterized by a high level of democracy, strong enforcement of property rights etc. (as seen in Figure 1b and 1c). We also get results that are consistent with the geography hypothesis. We find that higher institutional quality is strongly related to 'favourable' geographic conditions, both in the case of physical geographic conditions and soil quality conditions in a country (Figure 4b, 4c, 7b and 7c). Further, we find that a larger financial sector is strongly correlated to a higher level of GDP in particular and a higher level of economic performance in general (Figure 10b and 10c). These results show that the influence of institutions varies across the levels of economic performance and financial performance.

Looking at the second canonical functions (Factor 2), we find other stylized facts. Firstly, we find that catching up based growth is related to market steering (Figure 2b and 2c). Secondly, we find that geography does not necessarily define the institutional structure of countries. We find that relative influences of neighbouring countries matters and need not be directly related to similar geographic conditions (Figure 5b, 5c, 8b and 8c). In other words, geography is not destiny. Thus unlike what most studies on the relationship between geography and economic performance say, countries do have a choice in developing and fostering any kind of institutional set up, though they are likely to be influenced by their neighbours to an extent. Both relative location as well as common historical backgrounds could

define the institutional set up of countries. For example, Australia and New Zealand are often in the same cluster as Western Europe when looking at institutional quality, but not necessarily when we consider their economic performance, and especially when we consider geographic similarities.

In this study, the causality of these relationships is not touched upon. This is one apparent disadvantage of the canonical correlation analysis. Further, the validity of these conclusions is based on the quality of the data resulting from a survey. It is important to keep in mind that biases are inherent to perceptions indices. However, one can still conclude, given the above correlations, that there is no single/global solution to address under-development and growth. The role of institutions in the economic performance of a country needs to be addressed at regional and country specific levels. Another drawback of this study is that it uses a cross-section of data. Institutions evolve over long periods of time, and are highly dependent on the historical socio-political and economic events of a country. To analyse the quality of institutions at a single point in time can be limiting. For example, the under-development of certain parts of the world in the process of the development of Europe in the colonial era cannot be discounted in understanding growth processes today. However, the lack of time-series data limits us to looking at a snap-shot picture of the current institutional set up across countries.

These results show us that we need to first understand the multi-dimensional nature of institutions before understanding their impact on or by the other factors discussed above. We find that similar geographic environment can lead to different institutional environment and also to different economic performance. Furthermore, there is a need to understand them in a spatial context as seen from the above results. While there is a lot of empirical work in the area, there is also a need for more theoretical understanding of this multi-dimensionality of institutions. Most theoretical attempts until now have been based in a very Europe-centric framework. In order to fully understand economic growth and development in the context of institutional quality, we need to look beyond theories that explain the development of the now developed countries. Our results show that spatial clusters are not always based on the level of economic development of countries. This is one major drawback which hinders current policy effectiveness.

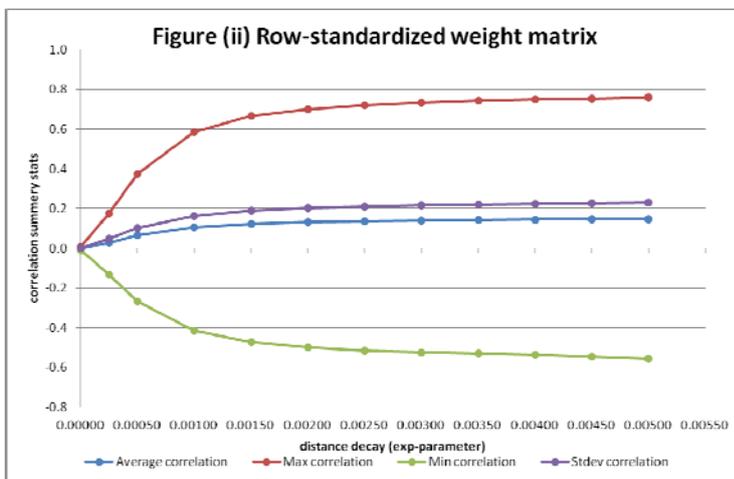
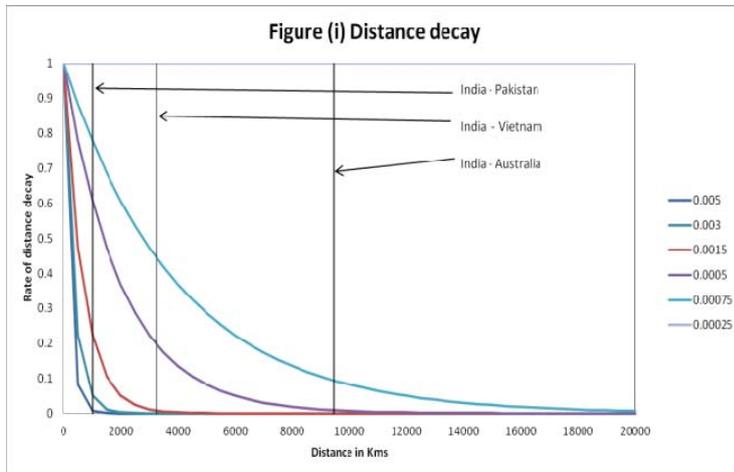
## Appendix A: Weights matrix

We choose a set of geographic distance weights for the connectivity matrix. We use an exponential distance decay function to obtain the weights matrix, given by the formula,  $w_{ij} = e^{-0.0015d_{ij}}$  where  $w_{ij}$  is the spatial weight between countries  $i$  and  $j$ , and  $d_{ij}$  is the bilateral distance between the centroids of the two countries  $i$  and  $j$ . The choice of the connectivity matrix has implications on the results obtained from the empirical analysis (Ward and Gleditsch 2007). Other types of connectivity matrices include binary contiguity matrices, bilateral trade matrices etc.<sup>26</sup>.

We describe our choice using the Example of India. India's immediate neighbours (those that share a border with it) include: Pakistan, China, Nepal, Bhutan, Bangladesh, Myanmar (Burma), Sri Lanka and Afghanistan (in the disputed area). Tajikistan, Thailand, Iran, Vietnam etc. are further away. The question then becomes one of how much weight should Thailand and Vietnam get, to depict the influence they exert on India. We choose that distance decay measure that gives importance to immediate neighbours. The weights given to Vietnam are significantly lower and those give to Australia get an insignificant weight. Figure (i) shows the decay in graphical terms for India with respect to Pakistan, Vietnam and Australia. The steeper the fall of the curve, the higher is the decay, i.e., relatively closer countries also exert lesser influence on the given country. In our case, we find that the nearest neighbours already have a fairly low weight. Since we consider distance between centroids of countries we note that larger countries tend to give lower weights to neighbours than smaller countries. Figure (ii) shows the effect of each of these distance decay values have on the summary statistics on the spatial lag, and in turn on the spatial correlation of a row-standardized weights matrix.

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<sup>26</sup> For more details on connectivity matrices and their effects on weight matrices and in turn on the empirical results can be found in Ward and Gleditsch 2007.



## Appendix B- IPD categories

	A. Public Institutions & Civil Society	B. Goods and Services Markets	C. Capital Markets	D. Labour Markets & Labour Relations				
1 - Political Institutions	Democracy, Legality and Freedom	a10		Freedom of association and trade union pluralism	d10			
	Political stability and Legitimacy	a11						
	Decentralization	a12						
2 - Security, Law and Order	Domestic public security and Control of violence	a20						
	Control of State violence by NGOs	a21						
	External security	a22						
3 - Functioning of Public Administrations	Governance of public administration and the justice	a30	Ease of starting a business	b30				
	Autonomy of public policies	a31	Importance of the Economic	b31				
	Donors' influence	a32	Consideration of public interest in government-	b32				
	Autonomy in operation and creation of organizations	a33	Governance of natural resources	b33				
	Government capacity to reform	a34						
	Fiscal exemptions	a35						
4 - Free Operation of Markets		Privatizations	b40	Privatizations in the financial sector	c40	Flexibility in the labour market	d40	
		Nationalizations	b41	Nationalizations in the financial sector	c41	Retraining and reskilling measures	d41	
		Governance of privatizations	b42	Freedom in the allocation of loans	c42			
		Performance of public organizations	b43					
		Freedom of prices	b44					
		Single exchange rate	b45					
5 - Coordination of Stakeholders and Strategic visions	Capacity of the State to coordinate stakeholders	a50	Technological environment	b50	Competence of bank executives	c50	Adaptive education system	d50
	Strategic capacities	a51	Public aid for R&D	b51	Importance of venture capital	c51		
	Government's arbitration capacity	a52	Density of sub-contracting relations	b52	Sovereign wealth fund policy	c52		
	Institutional capacity	a53						
	Government political capacity	a54						
	Change, Innovation	a55						
	Cooperative behaviour in society	a56						
Outlook of young people	a57							
6 - Security of Transactions and Contracts	Security of transactions and	a60	Information on G&S markets	b60	Financial information	c60	Respect for workers' rights	d60
	Government respect for contracts	a61	Rural land tenure: traditional property	b61			Weak employment contrat rigidity	d61
	Frequency of bankruptcy	a62	Rural land tenure: public	b62				
	Enforcement of bankruptcy law	a63	Diversity of land tenure rights systems	b63				
			Government recognition of diversity of land tenure rights	b64				
			Land tenure: security of	b65				
			Land tenure: demand for land	b66				
		Land tenure and large	b67					
7 -Market regulation, Social Dialogue			Competition on G&S markets	b70	Competition within the banking system	c70	Wage bargaining at the individual level	d70
			Shareholders: weight of the government	b71	Regulation of competition in banking	c71	Strikes	d71
			Information on shareholders	b72	Monitoring and auditing in banking	c72	Management of labour	d72
			Land tenure: development	b73	Reform of financial regulations	c73		
8 - Openess to the Outside World	Free movement of people and information	a80	Openness to business	b80	Financial openness	c80	Openness to employment of non-nationals	d80
	Political proximity with big		Joint Ventures	b81				
	Emulation with neighboring	a82	Non-national access to land	b82				
9 - Social Cohesion	National sense of identity	a90		Micro lending	c90	Quality of the supply of public goods	d90	
	National cohesion	a91				Weak segmentation of the labour market	d91	
	Strengthening of middle classes	a92				Low incidence of child labour	d92	
	Social inclusion	a93				Social mobility	d93	
	Traditional solidarity	a94				Social mobility: young higher education graduates	d94	
	Subsidies on commodities	a95f				Distribution of income	d95	

## Appendix C: Description of Variables

Variable	Description	Dataset
LY00	GDP per capita, 2000, in intl. dollars	PWT
GR	GDP per capita, annual average growth rate 2000-2007	PWT
I	Investment share of PPP converted GDP per capita	PWT
G	Government expenditure share of PPP converted GDP per capita	PWT
OP	Net exports share of PPP converted GDP per capita	PWT
LPOP	Population, average over the period 2000-2009	PWT
C	consumption share of PPP converted GDP per capita	PWT
areakm2	land area (km2)	GEOAREA
cen_lat	latitude of country centroid	GEOAREA
elev	mean elevation (meters above sea level)	GEOAREA
distr	mean distance to nearest coastline or sea-navigable river (km)	GEOAREA
distc	mean distance to nearest coastline (km)	GEOAREA
distr	mean distance to nearest inland navigable river (km)	GEOAREA
cen_c	distance from centroid of country to nearest coast (km)	GEOAREA
cen_cr	distance from centroid of country to nearest coast or sea-navigable river km)	GEOAREA
lc100km	% Land area within 100 km of ice-free coast	GEOAREA
lcr100km	% Land area within 100 km of ice-free coast (or navigable river)	GEOAREA
tropicar	% Land area in geographical tropics	GEOAREA
soilsui1	mean soil suitability 1, very suitable (%)	GEOAREA
soilsui2	mean soil suitability 2, moderately suitable (%)	GEOAREA
irrsuit1	Mean irrigation suitability, very suitable (%)	GEOAREA
irrsuit2	Mean irrigation suitability, moderately suitable (%)	GEOAREA
cultmaf	% cultivated land in Köppen-Geiger Af zone	GEOSOIL
cultmam	% cultivated land in Köppen-Geiger Am zone	GEOSOIL
cultmaw	% cultivated land in Köppen-Geiger Aw zone	GEOSOIL
cultmbs	% cultivated land in Köppen-Geiger Bs zone	GEOSOIL
cultmbw	% cultivated land in Köppen-Geiger Bw zone	GEOSOIL
cultmcf	% cultivated land in Köppen-Geiger Cf zone	GEOSOIL
cultmcs	% cultivated land in Köppen-Geiger Cs zone	GEOSOIL
cultmcw	% cultivated land in Köppen-Geiger Cw zone	GEOSOIL
cultmdf	% cultivated land in Köppen-Geiger Df zone	GEOSOIL
cultmdw	% cultivated land in Köppen-Geiger Dw zone	GEOSOIL
cultme	% cultivated land in Köppen-Geiger E zone	GEOSOIL
cultmh	% cultivated land in Köppen-Geiger H zone	GEOSOIL
dbacba	Deposit Money Bank Assets / (Deposit Money + Central) Bank Assets	FINANCE
llgdp	Liquid Liabilities / GDP	FINANCE
cbagdp	Central Bank Assets / GDP	FINANCE
dbagdp	Deposit Money Bank Assets / GDP	FINANCE
pcrdbgdp	Private Credit By Deposit Money Banks / GDP	FINANCE
pcrdbofgdp	Private Credit By Deposit Money Banks And Other Financial Institutions / GDP	FINANCE
bdgdp	Bank Deposits / GDP	FINANCE
fdgdp	Financial System Deposits / GDP	FINANCE
bcbd	Bank Credit / Bank Deposits	FINANCE
overhead	Bank Overhead Costs / Total Assets	FINANCE
netintmargin	Net Interest Margin	FINANCE
concentration	Bank Concentration	FINANCE

Variable	Description	Dataset
roa	Bank ROA	FINANCE
roe	Bank ROE	FINANCE
costinc	Bank Cost-Income Ratio	FINANCE
zscore	Bank Z-Score	FINANCE
nrbloan	Loans From Non-Resident Banks (Amt Outstanding) / GDP	FINANCE
offdep	Offshore Bank Deposits / Domestic Bank Deposits	FINANCE

## Appendix D: Factor Loadings on IPD variables (First Stage)

### Sector A

	Variable Description	A_mspc1	A_mspc2	A_mspc3	A_mspc4
A10	Democracy, Legality and Freedom	0.3152	-0.044	-0.2097	0.0212
A11	Political stability and Legitimacy	-0.1679	0.1504	-0.0952	0.0314
A12	Decentralisation	0.1112	-0.1891	-0.2707	0.1913
A20	Domestic public security and Control of violence	-0.028	0.1732	0.2465	0.1358
A21	Control of State violence by NGOs	0.023	0.0969	0.051	-0.2903
A22	External security	-0.0576	-0.1279	0.0236	0.0985
A30	Governance of public administration and the justice system	0.1334	-0.3579	0.2562	-0.2996
A31	Autonomy of public policies	-0.0692	0.1265	0.1068	-0.0114
A32	Donors' influence	0.0365	-0.0311	0.0169	0.0915
A33	Autonomy in operation and creation of organisations	-0.0644	-0.2088	0.1485	0.1997
A34	Government capacity to reform	0.1149	-0.2476	-0.4647	-0.1155
A35	Fiscal exemptions	0.0893	0.0013	-0.0245	0.0402
A50	Capacity of the State to coordinate stakeholders	0.0764	0.0946	0.1469	0.2406
A51	Strategic capacities	-0.1537	-0.1231	-0.0242	-0.223
A52	Government's arbitration capacity	-0.0538	0.0861	0.0775	0.0947
A53	Institutional capacity	0.037	0.1769	0.1357	0.2138
A54	Government political capacity	0.0443	-0.0729	-0.0072	-0.118
A55	Change, Innovation	-0.2244	0.4501	0.2883	0.1008
A56	Cooperative behaviour in society	-0.0932	0.0186	0.1724	-0.0716
A57	Outlook of young people	-0.0432	0.0061	0.1432	0.1307
A60	Security of transactions and contracts	-0.1139	0.2703	-0.0983	0.3528
A61	Government respect for contracts	0.0136	-0.0536	-0.0899	0.0086
A62	Frequency of bankruptcy	0.0502	-0.1086	-0.052	0.0425
A63	Enforcement of bankruptcy law	0.0277	-0.0805	0.0141	-0.0074
A80	Free movement of people and information	-0.0589	0.0358	-0.0988	0.1371
A8010	Political proximity with USA	0.0104	0.1287	0.0758	-0.0382
A8011	Political proximity with an EU country	0.3398	-0.3352	0.0075	-0.3613
A8012	Political proximity with Japan	-0.1893	0.2258	0.0432	0.0569
A8013	Political proximity with China	-0.0872	0.0055	0.2162	0.1288
A82	Emulation with neighbouring countries	0.0206	0.1615	-0.0019	-0.0139
A90	National sense of identity	-0.0189	0.0857	-0.0563	0.125
A91	National cohesion	-0.0543	-0.111	-0.2794	-0.0754
A92	Strengthening of middle classes	0.0381	-0.0169	0.1111	0.003
A93	Social inclusion	0.6866	0.0348	0.1784	-0.3662
A94	Traditional solidarity	-0.1157	0.0572	0.2386	-0.0754
A95f	Subsidies on commodities	0.2017	-0.1924	-0.2161	-0.1719

**Sector B**

IPD Variable	Variable Description	B1	B2	B3
B30	Ease of starting a business	0.1493	-0.2875	0.134
B31	Importance of the Economic zones	-0.0581	0.3448	-0.291
B32	Consideration of public interest in government-business relations	-0.1657	0.2344	-0.1635
B33	Governance of natural resources	0.0596	-0.0041	-0.1982
B40	Privatisations	0.2403	-0.1203	0.2834
B41	Nationalisations	0.2046	-0.1175	0.0058
B42	Governance of privatisations	-0.0012	-0.1228	0.1439
B43	Performance of public organisations	0.1198	0.0989	0.0031
B44	Freedom of prices	0.0926	-0.1119	-0.0488
B45	Single exchange rate	-0.0281	-0.0955	0.1305
B50	Technological environment	0.249	0.3117	0.0456
B51	Public aid for R&D	-0.0651	-0.2377	0.1204
B52	Density of sub-contracting relations	0.1326	-0.2395	0.0017
B60	Information on G&S markets	0.2	0.031	0.1038
B61	Rural land tenure: traditional property	-0.3423	-0.2251	0.0548
B62	Rural land tenure: public property	-0.1466	-0.0065	-0.1727
B63	Diversity of land tenure rights systems	0.1445	0.0081	-0.061
B64	Government recognition of diversity of land tenure rights systems	-0.1606	-0.0675	-0.1109
B65	Land tenure: security of ownership	0.3153	0.2348	0.1814
B66	Land tenure: demand for land	0.1838	-0.0004	0.2013
B67	Land tenure and large investors	-0.0805	0.1109	-0.0997
B70	Competition on G&S markets	-0.132	0.0535	-0.6298
B71	Shareholders: weight of the government	0.0345	0.2188	0.1918
B72	Information on shareholders	0.0755	-0.3091	0.2116
B73	Land tenure: development policies	0.1072	-0.1641	0.1125
B80	Openness to business	-0.0083	0.1836	0.2
B81	Joint Ventures	0.306	0.1094	-0.0458
B82	Non-national access to land	-0.4915	-0.3394	-0.1356

**Sector C**

IPD Variable	Variable Description	C1	C2
C40	Privatisations in the financial sector	0.0595	-0.0467
C41	Nationalisations in the financial sector	0.1985	-0.0939
C42	Freedom in the allocation of loans	0.1531	-0.3117
C50	Competence of bank executives	0.1356	0.2854
C51	Importance of venture capital	0.368	-0.3331
C52	Sovereign wealth fund policy	-0.1862	0.5076
C60	Financial information	-0.3638	-0.0751
C70	Competition within the banking system	-0.1536	-0.0024
C71	Regulation of competition in banking	0.4207	0.2234
C72	Monitoring and auditing in banking	0.3515	0.3023
C73	Reform of financial regulations	0.0707	-0.0965
C80	Financial openness	0.3052	0.2545
C90	Micro lending	-0.4364	0.4699

**Sector D**

IPD Variable	Variable Description	D1	D2	D3
D10	Freedom of association and trade union pluralism	0.2443	-0.4614	0.1625
D40	Flexibility in the labour market	-0.0765	-0.3393	-0.0836
D41	Retraining and reskilling measures	-0.1675	-0.003	-0.0593
D50	Adaptive education system	0.0027	-0.2803	0.0394
D60	Respect for workers' rights	-0.0871	0.0819	0.0529
D61	Weak employment contract rigidity	-0.1747	0.3401	-0.0011
D70	Wage bargaining at the individual level	0.0235	0.2155	-0.1371
D71	Strikes	-0.0806	0.2255	0.3431
D72	Management of labour	-0.2551	-0.1942	0.2904
D80	Openness to employment of non-nationals	-0.1283	-0.1238	-0.1059
D90	Quality of the supply of public goods	0.0617	0.226	-0.3641
D91	Weak segmentation of the labour market	-0.1874	-0.1019	0.2309
D92	Low incidence of child labour	-0.6413	0.4341	0.4832
D93	Social mobility	-0.5463	0.0561	-0.3529
D94	Social mobility: young higher education graduates	0.0135	0.2443	-0.2891
D95	Distribution of income	0.1754	0.0892	-0.3149

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