

Influence of transportation infrastructure on the relationship between institutions and economic performance

Influence of
transportation
infrastructure

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Abstract

Purpose – This study aims to analyse the observation that the economics of many countries have boomed after the input of substantial investments into physical and social infrastructures.

Design/methodology/approach – A structural equation model is formulated to examine the effect of transportation infrastructure on the relationship between institutions and gross domestic product per capita (GDPPC). This study further differentiates between developed and developing economies.

Findings – The study identifies the different roles of transportation infrastructure in mediating the relationship between institutions and average income in these two types of economy. Institutions and transportation infrastructure positively influence GDPPC, whereas institutions positively influence transportation infrastructure. In addition, the results found indirect influence of institutions on GDPPC via transportation infrastructure.

Originality/value – This study provides new insights into international business studies based on institutional theory and factor-mobility theory.

Keywords Business location decisions, Institutional theory, Factor-mobility theory

Paper type Research paper

1. Introduction

Within a country or an economy, an institution is established according to a wide range of institutional factors such as capital, information and materials. Movements of these institutional factors are observed across an economy, and the efficient movements of these factors in an economy are often assumed to occur without question. In the literature related to institutions, it is generally accepted that the influence of transport is well established.

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In memoriam: Miss Mei Chi Wong passed away peacefully on August 31, 2019, at the age of 36. She was born in Hong Kong on January 24, 1983. Her expertise included transport research, transport policy studies and spatial analysis. Miss Wong held BSc in International Shipping and Transport Logistics (First Class Honors), Department of Logistics, the Hong Kong Polytechnic University (2005-2007), Master of Arts in Transport Policy and Planning, The University of Hong Kong (2010-2012) and Master of Science in Geomatics – Geographic Information Systems (Distinction), Department of Land Surveying and Geo-Informatics, the Hong Kong Polytechnic University (2016-2019). She published two journal papers and authored one book entitled “Low Carbon Logistics.” Her conference paper won the Best Paper Award in 2011.



However, although the flows of institutional attributes in an economy are multidirectional, the relationship between transport and institutions has yet to be thoroughly examined and verified by empirical research.

It has been shown that an institution has a positive effect on the performance of an economy. The attributes of institutions include much more than just the tangible or physical factors, with the intangible factors also being important. We argue that institutional factors, in general, are relatively immobile factors of economic production, certainly in the short run but likely to be so even in the medium run. In light of these circumstances, an international enterprise will normally wish to find an adequate pool of the required types of institutional attributes already existing in a prospective business location. There may often be a steady domestic movement of institutional factors, but it is likely that the movement will only partially influence the relationship between institutional attributes and economic performance (or average income). The performance of companies in an institution with emergent transportation infrastructure is more diversified than that without such infrastructure, and people will correspondingly suffer economic disparity.

Although some economies have similar institutions, differences in economic performance are observed between these economies. For example, in former British colonies, some have grown more quickly than others (Acemoglu *et al.*, 2001). Scholars have attempted to explain different economic performances in terms of infrastructural development. For instance, Bosworth and Collins (2008) compared the development paths of China and India in terms of their infrastructural development and uncovered the supply-side sources of output change for each of these two economies. Such studies indicate the need to understand any omitted relationship between the institution and economic performance. Many developing economies emphasize investments in transportation infrastructure as a facilitator for economic growth, although developed economies tend to emphasize human resources. Even when the link between the development of infrastructure and economic performance appears relatively obvious, the influence is unevenly distributed across the world and within any particular economy. Furthermore, not all economies rise or fall at the same time. This observation leads to the need to investigate the role of transportation infrastructure in influencing national economic growth.

Our perspective is that “transportation infrastructure” is not part of a country’s or economy’s institutions but does have direct and indirect (mediating) effects on the relationships between institutional attributes and average income. The attribute of “transportation infrastructure” enhances the interactions among institutional attributes and the mobility of those factors or attributes. While we have acknowledged the influence of institutions on economic performance in certain circumstances, we have also recognized the role of factor-mobility in enhancing the relationship between institutional attributes and economic performance. Despite the publication of a number of studies examining the role of transport development and institutional attributes in determining economic performance, most studies in the domain of economic institutions have focused on the institutions with respect to an external economic context while implicitly assuming efficient transport. In this paper, we develop a model and empirically test it by applying both the institutional theory and the factor-mobility theory.

We argue that the development of transportation infrastructure has direct and/or indirect (mediating) effects on the average income per person and on business performance in an economy. Furthermore, we argue that the development of transportation infrastructure has a mediating effect on the relationship between institutions and economic performance. Hence, we shift the argument that economic performance is at least in part a result of

institutional aspects and transportation infrastructure from an isolated view to a more complementary approach.

The main research objectives of our study are as follows:

- to determine the relationship between institutions and transportation infrastructure; and
- to quantify the role of transportation in mediating the effect of institutions on average income.

If we suppose that “transportation infrastructure” or “physical infrastructure” in general speeds up the evolution to institutional equilibrium, then such transportation infrastructure is not part of the institutional system itself. With poor transportation infrastructure, the institutional system will evolve toward equilibrium more slowly. The attribute of transportation infrastructure reduces the transaction costs of factor-mobility and enhances the institution as a whole.

The present investigation is relevant to the study of international business for two main reasons. First, institutional change generates uncertainties for the international firms that operate in the corresponding institution. The institutional setting affects the selection of the business locations of international firms and their behaviors. Second, the new understanding of the role of transportation in institutions developed in the present study supplements existing international business studies. Location selection is the process that enterprises undergo when exploring market opportunities both across and within nations. The location selection of a firm can be a determinant of its success or failure because the institutions of economies are relatively immobile. Entrepreneurs are able to exploit opportunities that vary from location to location with respect to different institutions, and enterprises, therefore, often make decisions of location selection that are influenced by the distribution and level of institutions and transportation infrastructure. However, the relationship between institutions and transportation infrastructure has not been examined empirically and rigorously.

Transportation infrastructure has been commonly used in some previous studies as a determinant of location selection by enterprises. [Chen and Chen \(1998\)](#) examined the importance of network linkages and location choice to foreign direct investment (FDI). Those authors concluded that network linkages are strong drivers of FDI, as investors can access strategic assets in a foreign country via network connections and can overcome entry barriers and reduce transaction costs in such countries. [Bel and Fageda \(2008\)](#) developed a system of equations to examine the cause-and-effect relationship between the availability of direct non-stop flights and the location choice of large firms’ headquarters across European cities. Those authors found that the presence of direct intercontinental flights is a major determinant in the location choices of large firms’ headquarters, as the availability of direct flights is associated with the communication costs of information exchanges between different cities. Well-established transportation infrastructure not only enables physical accessibility but also lowers the costs of information exchanges and connection networks.

The remainder of this paper is divided into four sections. Section 2 reviews the relevant literature on institution theory and factor-mobility theory. Section 3 contains a discussion of the model used in this study, including a presentation of the methodology and data sources. Section 4 presents the findings. Section 5 discusses the business implications and concludes the paper.

2. Literature review

The foundation of our research framework comprises two elements: institutional theory and factor-mobility theory. Institutional theory is an economic concept that aims to explain the organization of numerous attributes in an economy. Various studies, as discussed below,

have been conducted to analyze economic performance in terms of the possible effect of different institutions. During the past two decades, institutional theory has emerged as a powerful explanation to account for the influence of internal institutions on organizational decision-making and outcomes.

[Baker et al. \(2005\)](#) added a component of comparison into the framework of discovery, evaluation and exploitation entrepreneurship constructed by [Shane and Venkataraman \(2000\)](#). [Baker et al. \(2005\)](#) highlighted the important role of institutional structures in differentiating the opportunities (and costs) of entrepreneurship across nations. Institutions include the legal system, the financial system and the labor system, and these institutions influence the value of entrepreneurial opportunities and the potential for business success or failure. The decisions of entrepreneurs further affect national economic development, as entrepreneurs contribute to economic activity through the production of goods and services.

[Aidis et al. \(2008\)](#) explored the relationship between institutions and the development of entrepreneurial activity in Russia. They found that institutional weakness induces lower levels of entrepreneurial development in transitional economies. However, the business network of a firm can partly offset the influence of institutions on entrepreneurial activity in emerging markets.

Many studies have shown that entrepreneurial activity contributes to economic performance. For example, [Bowen and de Clercq \(2008\)](#) investigated the types of entrepreneurial activity in the institutional environment contributing to national economic growth by conducting an empirical study based on [Whitley \(1999\)](#)'s national business system. Those authors proposed four dimensions of the institutional environment, on the basis of which they showed that the financial and educational activities of economies positively affect entrepreneurial allocation and ultimately contribute to the economic growth of economies.

Transaction costs also underpin economic performance. [Vanberg \(2012\)](#) highlighted that world economic development is driven in large part by technological and political–institutional factors. Transportation and communication technologies lower transaction costs, and political–institutional features remove trade barriers and increase the mobility of capital. Institutions affect national competitiveness indirectly by reducing (or increasing) the costs of production and directly by providing a more (or less) attractive environment for the mobility of human and economic resources. [Vanberg \(2012\)](#) examined the role of states in defining and enforcing institutions (especially with regard to the implications of globalization for the state's power to tax and regulate) separately to its citizens and non-citizens.

The creation of wealth is a prerequisite for increasing national economic competitiveness ([Choi, 2012](#)). In particular, entrepreneurs are an important driver of wealth creation through exploiting profitable opportunities. Therefore, policies addressing economic prosperity should be formulated based on whether they are likely to enhance entrepreneurship. [Choi \(2012\)](#) evaluated various schemes and policies directed at cultivating industries for enhancing national competitiveness and also argued that freedom and protection are essential for the development of entrepreneurship.

[North \(1994\)](#) argued that institutions constitute formal and informal rules that shape the economic environment. Institutions are the rules of the game, while entrepreneurs are the players. Institutions and entrepreneurs interact in such a way as to shape economic changes and development. However, particular formal rules of developed economies adopted by developing economies have not enhanced the economic growth of those developing economies, whereas informal rules/cultures and adaptive entrepreneurs are keys for long-term growth in such economies. [Whitley \(1999\)](#) proposed four major groups of institutional factors related to the economic behavior of organizations.

[Acemoglu et al. \(2005\)](#) discussed the role of institutions in promoting economic performance. A broad base of literature provides theoretical support for the role of infrastructural investment in enhancing economic competitiveness. For example, because of its weak and deteriorating infrastructure, India places emphasis on the service economy, while China's excellent infrastructure has led that nation to excel in manufacturing. In contrast, Japan's world-leading infrastructure does not appear to have enabled sustained economic growth to occur.

In transport-restricted institutions, firms cannot acquire all the benefits of their own operation in business because some of these institutional attributes accrue to other firms or sectors. Transportation infrastructure allows institutional attributes to spread and diffuse freely from one place to another. Transportation infrastructure also encourages groups of institutions to engage in rent-seeking behavior at different locations within an economy. Therefore, investment in transportation infrastructure generates a better allocation of institutional attributes and an increase in the returns of economic production for economies that make such investment and benefits firms that conduct business in the institutions of economies.

Factor-mobility theory accounts for the flows of production factors in a network consisting of materials, people and information. The coordination and integration of these flows within an economy and between different economies are critical to achieving effective economic production. We argue that because the inter-related nature of many attributes is involved, efficient allocations exist. Therefore, we extend institution theory and incorporate factor-mobility theory to provide mediating effects on the relationship between institutional attributes and economic performance ([Figure 1](#)). In addition, it is a tenet of factor-mobility theory that an efficient allocation of institutional attributes in an economy must be developed and maintained. As a result, achieving better economic performance requires the proper transfer of institutional attributes throughout an economy. This important notion forms the basis of our research context, from which we develop a model demonstrating the pathways in which the mobility of production factors is applied in mediating the relationship between institutions and economic performance.

The literature on location selection indicates that the methods for selecting business locations can be categorized into qualitative and quantitative approaches. [Papadopoulos \(1988\)](#) reviewed different statistical approaches (e.g. market segmentation and market estimation) and found that most small- and medium-sized enterprises (SMEs) and even large multinational corporations (MNCs) do not select location using a rational screening process. SMEs consider that statistical analyses for the purpose of screening are too complicated to carry out, while MNCs do not consider screening processes to be cost effective. [Papadopoulos \(1988\)](#) suggested that information published by international organizations can be used to allow comparability for inter-country data and that various methods may be combined to provide cross-validity.

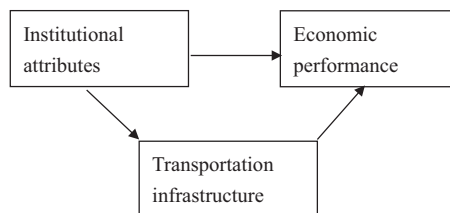


Figure 1. Conceptual diagram of the modelling approach used in the study

We argue that the institutions of economies (or of countries) in the long run are immobilized or stagnant (in the absence of transportation infrastructure). Entrepreneurs exploit opportunities in a way that is strongly influenced by the different institutional environments that exist in different economies. [Cantwell et al. \(2010\)](#) examined the co-evolution of enterprises responding to the institutional environment. They found that the various institutions of different economies are treated as attractors to those economies and as exogenous advantages. Enterprises cope with these different institutional environments with different forms of engagement, such as avoidance, adaption or co-evolution, and make decisions through the process of location selection.

[Baker et al. \(2005\)](#) concluded that institutional differences influence the characteristics and level of economic development of a nation as well as the opportunities for individuals. Baker et al. cited Silicon Valley as an example of regional agglomerations that provide easy access to specialized resources through a nation’s institutional supports.

Based on the above literature, we argue that institutional factors retain their influence through economic systems because once these factors have been adopted in an economy, they evolve continuously. However, internal forces, no matter how strong they are, will have no effect on the development of an economy without first affecting some factors within the economy. We argue that transportation infrastructure will enhance the mobility of factors of production and further argue that infrastructural investment mediates the relationship between economic performance and institutional factors. Our theoretical framework is grounded in the proposition that institutional factors affect economic performance after being mediated by infrastructural investment.

3. Research model and hypotheses

3.1 Development of hypotheses

We assume that the economic system is efficient, which means that the performance of certain economies is maximized. [Figure 1](#) portrays our conception of the institutions, factor-mobility and economic performance. We examine both the direct effect of institutions on economic performance and the mediating effect of transportation infrastructure on the relationship between institutions and economic performance. Based on our theoretical proposition that transportation infrastructure mediates the effect of institutions on economic performance, we construct a research model and propose four hypotheses ([Figure 2](#)) as discussed below.

3.2 Institutional factors

Institutions are normally defined as the “rules of the game” and include governing structures, laws, rules and norms ([North, 1994](#)). We view an institution as a fundamental and essential interaction for a company to engage in and to take advantage of the benefits created by the institutional setting. [Nelson \(2008\)](#) used a broader definition that extends to

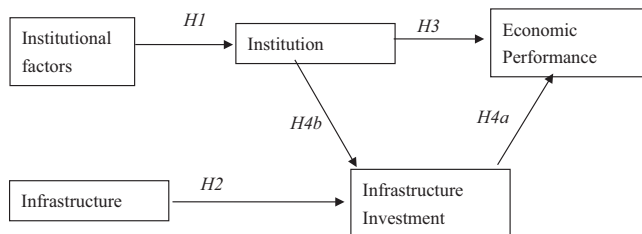


Figure 2.
Theoretical model
of hypotheses

the technological advance of an innovation system. Technology is broadly divided into two groups: physical technology, such as the road network, port infrastructure and other hardware for enhancing communication; and social technology, such as labor training/upskilling and collaboration in research and development. Nelson (2008) argued that physical technology is easier to build but that social technology is harder to borrow.

In the present study, we concur with Nelson's (2008) view that institutions not only are limited to laws and governing structures but also include education and training. Nelson and Nelson (2002) pointed out the important role of institutional structures in supporting and molding efforts to advance technology. Those authors suggested a broader definition of the concept of "institution" such that an institution not only is limited to a set of factors that mold and define human interactions but also includes a process of technological advance that should be incorporated into an analysis of institutions. Those authors also viewed "physical technology" as the hardware, including transportation infrastructure, that can be used for opening up the possibilities of a larger market, whereas "social technology" refers to the education and collaboration that enable these physical technologies to be implemented. The innovation system of Nelson and Nelson (2002) explains the interdependencies between the evolutions of physical and social technologies, which play the leading role in the process of economic growth.

The importance of technological advance has often been overlooked as a key driving force behind economic growth. Nelson (2008) pointed out that the role of institutions and of institutional change in economic growth can be understood only when they are linked to technological change. Nelson argued that a nation's ability to design and control institutions is limited essentially to designing new physical technologies, which would explain why economic growth is significantly weaker with respect to social technologies compared with physical technologies.

Therefore, in our study, institutions are denoted by three latent variables, namely:

- (1) the training and education system (with the variable "talent" as proxy);
- (2) the legal and customs system (with the variable "customs" as proxy); and
- (3) the fiscal and financial system (with the variable "finance" as proxy).

Our hypotheses for the influence of institutional factors are as follows:

H1a. There is a positive relationship between talent and the level of institution.

H1b. There is a positive relationship between customs and the level of institution.

H1c. There is a positive relationship between finance and the level of institution.

3.3 Infrastructure factors

Given the importance of transportation infrastructure in an economy, governments are motivated to invest in such infrastructure. We selected three indicators as components of the latent variable of "transportation infrastructure." The indicators, which represent the communication and connectivity between places are road transport infrastructure, port infrastructure and air transport infrastructure. Other factors, for example, railway transportation infrastructure, are excluded, as they are not so common worldwide and/or suffer from missing data. Our hypotheses regarding transportation infrastructure are:

H2a. There is a positive relationship between the quality of roads and the level of transportation infrastructure investment.

H2b. There is a positive relationship between the quality of ports and the level of transportation infrastructure investment.

H2c. There is a positive relationship between the quality of air transport and the level of transportation infrastructure investment.

3.4 Economic performance

Business investment adds to the wealth creation and economic development of an economy. Such investment can be better cultivated in a stable environment through the establishment and enforcement of institutions. Under a fairly narrow definition, institutions exist in the form of regulations, laws, rules, values and culture, amongst others. Such institutions can be represented in various forms; for example, an institution could be government policies that represent or instill the direction of economic development. In a broader definition, institutions include technological advances as forms of system innovation, for example, social technologies.

Institutions may increase/decrease the transaction costs that hinder/favor business development. In other words, favoritism can be interpreted as lowering the threshold for such business development and increasing profitability, whereas penalties can be interpreted as setting a higher threshold for the business and protecting the existing industrial operators. From a microeconomic point of view, institutions may create opportunities for business investment, for example, taxation exemptions or talent training to favor the development of a specific industry. Institutions may also provide constraints on individual businesses or on business development, for example, strict requirements on providing services or a lack of resource restricting training in a specific industry. From a macroeconomic perspective, institutions protect and encourage business investment for creating national wealth. It is hypothesized that well-developed institutions provide fundamental support for economic development. We presume that the separation of developing and developed economies will show comparatively comprehensive and healthy institutions in the latter type of economy.

Institution theory suggests that the profit levels of individual businesses will be affected by institutions. The definition of the economic performance of an average business's profit varies among scholars. Early studies used gross domestic product per capita (GDPPC) as a measure of the average income per person in an economy or as a proxy for the average income of enterprises. GDPPC is the production value of the economy allocated to every individual and can, therefore, be seen as the assessment of the average individual wealth of the inhabitants of an economy. An obvious advantage of using GDPPC is that the values of GDPPC are widely and accurately reported by economies. Therefore, we selected GDPPC as a proxy indicator of economic performance in this study.

We, therefore, propose our third hypothesis:

H3. Institutions are positively associated with economic performance.

3.5 Mediation

The mediating effect denotes how a variable affects or changes the relationships that exist between other variables. We argue that transportation infrastructure enhances the mobility of resources so that such resources can be reallocated to higher-productivity activities and locations. There exists a partial mediation process such that institutional attributes have both direct and indirect effects on economic performance. Transportation infrastructure

partially mediates the cause-and-outcome effect of institutional attributes on economic performance. In other words, in the absence of transportation infrastructure, the economic outcome is still generated by institutional attributes. In the modelling, a prior requirement of the mediating effect is the statistically significant relationships between individual variables. In the present case, the mediating effect of transportation infrastructure may exist if the relationships between transportation infrastructure and institutions and between transportation infrastructure and economic development are statistically significant. By using structural equation modelling (SEM), we then decompose the direct and indirect effects of institutional attributes on economic performance, with the indirect effects being interpreted as the mediating effects of transportation infrastructure.

From an organizational learning perspective, the economy has been described as a race, and the developed economy that learns how to race best dominates the global competition (Acemoglu *et al.*, 2005). This presumes that the objective of infrastructure is the acquisition of a competing economy's specific attributes rather than access to it. Such acquisition of institutional attributes is often transparent and is interpreted as being competitive, rather than collaborative, in nature.

Transportation infrastructure is a means of providing a link from one place to another, and it facilitates the implementation and enforcement of institutions. Various aspects of the planning and operations of transportation infrastructure are derived from different institutions. Transportation infrastructure involves huge investment cost, which is enduring and irreversible. Such infrastructure also involves diplomacy and relationships with other economies, for example, port alliances on handling environmental protection issues.

A government influences the planning and operations of transportation infrastructure through national policy, which originally derives from different institutions. Because transportation infrastructure provides links between locations both within and between nations, national governance is important. Such governance might include, for example, a seaport authority with a free-port policy by exempting the taxation of imported goods or a closed-port policy by restricting the import and export of goods. Another example might be air transportation infrastructure enabling people to travel freely from one economy/nation to another, which may involve tourism policy.

Well-developed transportation infrastructure facilitates communications and connectivity, locally and globally, by lowering transaction (transport) costs and encouraging collaboration and interactions between people and goods. Accessibility furthers the development of both trading and tourism, thereby bringing economic benefits to the economy and further stimulating economic growth. We, thus, propose:

H4a. Infrastructure is related positively to economic performance.

An institution provides an external environment for business investment, wealth creation and, ultimately, economic growth. An institution needs the support of transportation infrastructure in providing a linkage from one place to another and by doing so to enable the physical movements of goods and people (trade and tourism). Trade and tourism, in turn, foster economic growth. In other words, transportation infrastructure acts as a catalyst or mediator on the linkage between institutions and economic performance.

In short, transportation infrastructure fosters economic development by supporting institutional enforcement. It is considered that well-developed transportation infrastructure augments the relationship between institutions and economic development:

H4b. Transportation infrastructure enhances the influence of institutions on economic performance (positive indirect effect).

4. Data and analysis

4.1 Data collection

Based on the above four hypotheses, we develop a conceptual framework and further identify 24 measurement indicators, which are presented in an SEM. The SEM consists of two components: a measurement model and a structural model. The measurement model includes the components of institutions (law, finance and education) and the items of the corresponding components (indicators). The structural model indicates the directions and strengths of the relationships between the variables.

The extensive academic literature available on the subject of institutions and economic performance has used surveys conducted by various authorities. An established method of gathering research data is the analysis of existing databases and of data obtained from previous studies. Such data sets are well defined and accessible for the purposes of the present study, and the measurement indicators contained in them adequately cover all the relevant factors of institutions and infrastructure.

We searched existing data sets from reliable sources and identified the database of Global Competitiveness Index (GCI) as suitable for the present study. The GCI database comprises a survey of closed questions. The questionnaire uses a seven-point Likert scale for responses with answer choices ranged typically from (1) the worst to (7) the best. The data have been collected by the World Economic Forum (WEF). Their annual Executive Opinion Survey captures the opinions of about 14,000 business leaders in more than 140 economies in the first half of the year before publishing (e.g. January to June 2011 for the 2011-2012 report). The survey has achieved around about a 90 per cent response rate in recent years; for example, in the 2014-2015 report, more than 14,000 surveys were sent out, and over 13,200 were returned. To increase the response rate, the survey is translated into more than 40 languages, and it is able to be distributed and completed through the internet.

The questions contained in the survey require simple responses easily made with a sound knowledge of the attributes. The annual survey is conducted through WEF's network of 160 partner institutes worldwide with the assistance of survey consultancies. After collecting the data, WEF edits the data carefully by excluding problematic responses, such as question completion rates of < 50 per cent. After a multivariate test is conducted using the Mahalanobis distance method, a univariate outlier test is applied at the economy level for each question of each survey. Every individual response carries the same weighting.

Although the survey covers more than 140 economies (about 95 per cent of worldwide GDP) and a wide range of indicators, there are some issues with data coverage and completeness. We checked and removed economies in cases where there were too many missing or incomplete values. This deletion criterion resulted in a data set of 125 economies for further analysis.

We also reviewed the definition of "institution" in the literature of institutional theory and selected various indicators out of a total of 114 identified. We verified whether the selected indicators matched with our methodological design by using factor analysis in SPSS version 24. The objective of principal factor analysis (PFA) is to verify the foreground of the factorial structure. The PFA conducted showed that the measurement of institutions consists of 3 latent variables with 14 indicators and that the measurement of transportation infrastructure consists of 3 indicators.

Multi-group analysis was used to study the potentially different mediating effects of transportation infrastructure on the relationship between institutions and economic performance among developing economies and developed economies. Economies were divided into two data groups (developed economies and developing economies) using the k-means clustering method with respect to the values of GDPPC.

4.2 Initial analysis using SPSS

Although due care was taken while developing all of the measurement indicators, post hoc statistical analyses were conducted on the selected data for the purpose of validation. Specifically, PFA techniques were used to validate all the constructs under investigation. PFA is well established in the SEM literature for the validation of latent constructs (Anderson and Gerbing, 1988). The analyses were performed using SPSS version 24.

Several tests were conducted to evaluate measurement validity. First, internal consistency and convergent validity were assessed. Factor loadings, construct reliabilities, average variance extracted and Cronbach’s alpha of the selected 17 indicators are reported in Table I. The factor loading of each item ranges from 0.62 to 0.96, and all loadings are statistically significant ($p < 0.000$). The values of construct reliability and Cronbach’s alpha exceed 0.4, and the average variance extracted exceeds 0.5, all of which are acceptable (Fornell and Larcker, 1981).

The PFA results (Table I) highlight satisfactory construct reliability and convergent validity for all the constructs under investigation. In summary, all the computed construct reliabilities are above the minimum threshold of 0.70 (Hair et al., 1995), and all indicators load significantly onto the relevant constructs as hypothesized at $p < 0.05$ (Byrne, 1994). The reliability of the data set is, therefore, acceptable.

Indicators	Factor loading	Cronbach’s alpha	Construct reliability	Average variance extracted (AVE)
<i>Institution – Education and training system (five indicators)</i>				
		0.93	0.94	0.75
University–industry collaboration in R&D	0.96			
Availability of scientists and engineers	0.94			
Local availability of specialized research and training services	0.84			
Quality of primary schools	0.79			
Quality of management schools	0.77			
<i>Institution – Legal and Customs System (three indicators)</i>				
		0.95	0.82	0.61
Efficiency of legal framework in settling disputes	0.85			
Efficiency of legal framework in challenging regulations	0.83			
Transparency of government policy-making	0.65			
<i>Institution – Financial and Fiscal System (six indicators)</i>				
		0.95	0.87	0.57
Availability of financial services	0.92			
Affordability of financial services	0.86			
Ease of access to loans	0.72			
Regulation of securities exchanges	0.68			
Strength of auditing and reporting standards	0.68			
Prevalence of foreign ownership	0.62			
<i>Transportation Infrastructure (three indicators)</i>				
		0.93	0.93	0.81
Quality of roads	0.90			
Quality of port infrastructure	0.90			
Quality of air transportation infrastructure	0.90			

Table I.
Construct reliability and validity analysis (principal factor analysis using SPSS)

The results of a Kolmogorov–Smirnov test (not reported here) show that most of the indicators are not normally distributed ($p > 0.05$). Therefore, we used the “bootstrapping with bias corrected” method for correcting/offsetting error or bias in the estimation of SEM. As bootstrapping is used, the raw data are needed for the analysis.

4.3 Structural equation modelling using AMOS

After satisfactory reliability and validity had been established for the constructs, we conducted structural analysis (Anderson and Gerbing, 1988) to test all the hypothesized causal relationships. Specifically, in view of the large number of indicators involved, path analysis was used to perform the analysis (Banerjee et al., 2003). Path analysis is performed by computing the composite scores for all the constructs and using the composite reliabilities to fix the error variances of these constructs (Ganesan, 1994, for details). All the estimated path coefficients and relevant fit statistics derived from the path analysis are shown in Figure 3 and reported in Table II.

The proposed hypotheses were built in SEM form and tested in AMOS. Various model-fit indexes derived from the analysis are given in the lower part of Table II. Most of the model-fit-index-derived χ^2 statistics are statistically significant at $p < 0.05$, which indicates an inadequate fit of the measurement models (Hair et al., 1995). However, given that the χ^2 statistic is highly sensitive to sample size (Bagozzi and Foxall, 1996; Byrne, 1994; Doney and Cannon, 1997), other more powerful fit indexes such as the comparative fit index (CFI), normed fit index (NFI), goodness-of-fit index (GFI) and root mean square error of approximation (RMSEA) were also computed. The values of these indexes all meet the threshold requirements (CFI and NFI > 0.90; GFI > 0.90; RMSEA < 0.1) as suggested by psychometric researchers (Browne and Cudeck, 1993; Hair et al., 1995). To further assess the discriminant validity of the constructs, we follow Fornell and Larcker’s (1981) suggested guideline by examining whether the correlation estimate between any pair of constructs is significantly different from 1.0. The application of this guideline did not detect any

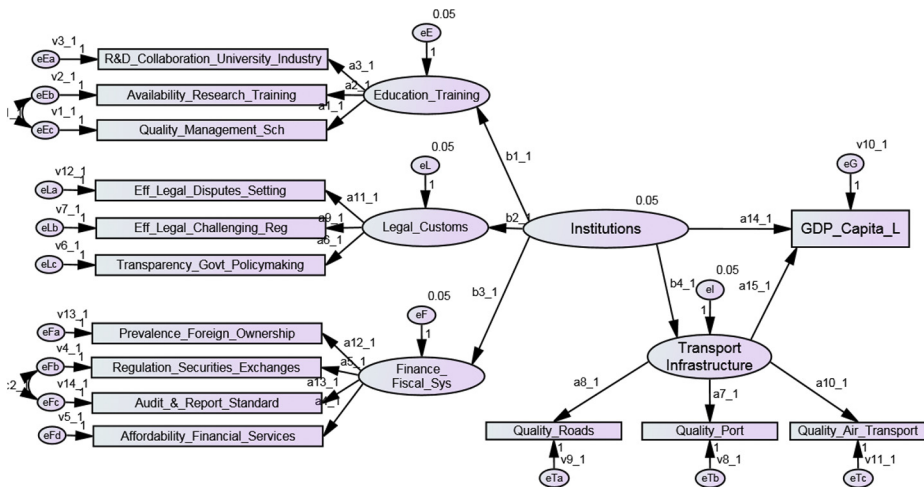


Figure 3. Structural equation modelling

Notes: Summary of fit indices: χ^2 proposed model = 1048.109; df = 210; CFI = 0.956; NFI = 0.945; GFI = 0.893; RMSEA = 0.058

Model Fit	Target value	Value
χ^2	Small	1048.109
DF		210
χ^2/df	>2 and <5	4.991
GFI	>0.9	0.893
AGFI	>0.9	0.84
RMR	<0.08	0.023
SRMR (only ava if plug-in)	<0.08	–
RMSEA	<0.08	0.058
NFI	>0.9	0.945
NNFI (TLI)	>0.9	0.942
CFI	>0.9	0.956
RFI	>0.9	0.929
IFI	>0.9	0.956
PNFI	>0.5	0.727
PGFI	>0.5	0.596
CN (HOELTER 0.05)	>200	280

Table II. Model fit using AMOS (all economies)

anomalies. Overall, the CFA results demonstrate satisfactory reliability and validity for all the constructs under investigation.

Model fit can be evaluated by using the χ^2 goodness-of-fit statistic and/or other absolute- or relative-fit indices (Hu and Bentler, 1999). The results indicate that the Chi-square statistic (χ^2) is 1,048.109 ($p = 0.000$), with 210 degrees of freedom (df). The value of χ^2/df is 4.991, which is lower than the accepted threshold of 5. Kelloway (1998) suggested that cutoffs for χ^2/df should range from <5 to <2. Overall, the findings provide evidence for a satisfactory fit of the proposed model.

As recommended by Hu and Bentler (1999), we use a two-index strategy, namely, the MLE-based Tucker–Lewis Index (TLI) and the CFI, as well as the RMSEA. In our study, TLI is 0.942, CFI is 0.956 and RMSEA is 0.058. Both CFI and TLI have values of >0.9 and RMSEA is less than 0.08. Other fit indexes, including the incremental fit index (0.95), also indicate that a good fit exists between the model and the data (Hulland, 1996). Concerning hypothesis testing, standardized path estimates derived from the path analysis provide support for all the proposed hypotheses ($H1$ to $H4$) at $p < 0.05$.

Finally, we tested discriminant validity using the approach suggested by Fornell and Larcker (1981). The square root of the average variance extracted correlated to each construct is higher than the correlation between each pair of latent variables (Table III). Therefore, our measures exhibit the desired discriminant validity. Overall, the measurement model displays satisfactory properties.

The SEM results are summarized in Table IV and Figure 3.

Variables	1	2	3	4
1. Legal and customs system	0.942			
2. Education and training system	0.752	0.915		
3. Transportation infrastructure	0.778	0.866	0.900	
4. Financial and fiscal system	0.820	0.847	0.848	0.877

Table III. Results of discriminant validity

Note: The square root of AVE is on the diagonal

Table IV.
Structural equation
modelling
standardized
estimates

Construct/Indicator	All economies		Developed economies		Developing economies	
	Standardized estimates	(p-value)	Standardized estimates	(p-value)	Standardized estimates	(p-value)
Institutions → GDPPC	0.382 (0.001)**		0.522 (0.001)**		-0.11 (0.518)	
Education and Training System ← Institutions	0.941 (0.001)**		0.867 (0.001)**		0.935 (0.001)**	
University-industry collaboration in R&D	0.925 (0.001)**		0.916 (0.001)**		0.818 (0.001)**	
Local availability of specialized research and training services	0.943 (0.002)**		0.913 (0.001)**		0.832 (0.001)**	
Quality of management schools	0.863 (0.001)**		0.777 (0.001)**		0.805 (0.001)**	
Legal System ← Institutions	0.838 (0.001)**		0.923 (0.001)**		0.77 (0.001)**	
Efficiency of legal framework in settling disputes	0.972 (0.001)**		0.979 (0.001)**		0.951 (0.001)**	
Efficiency of legal framework in challenging regulations	0.98 (0.001)**		0.979 (0.001)**		0.952 (0.001)**	
Transparency of government policymaking	0.877 (0.001)**		0.902 (0.001)**		0.708 (0.001)**	
Financial System ← Institutions	0.948 (0.001)**		0.919 (0.001)**		0.959 (0.001)**	
Prevalence of foreign ownership	0.712 (0.001)**		0.663 (0.001)**		0.666 (0.001)**	
Regulation of securities exchanges	0.912 (0.001)**		0.895 (0.001)**		0.894 (0.001)**	
Strength of auditing and reporting standards	0.927 (0.001)**		0.946 (0.001)**		0.832 (0.002)**	
Affordability of financial services	0.918 (0.001)**		0.89 (0.001)**		0.859 (0.001)**	
Transportation infrastructure ← Institutions	0.928 (0.001)**		0.854 (0.002)**		0.855 (0.001)**	
Transport → GDPPC	0.424 (0.001)**		0.273 (0.011)*		0.527 (0.001)**	
Quality of roads	0.858 (0.002)**		0.801 (0.001)**		0.766 (0.001)**	
Quality of port infrastructure	0.917 (0.001)**		0.91 (0.002)**		0.795 (0.001)**	
Quality of air transportation infrastructure	0.938 (0.001)**		0.92 (0.001)**		0.896 (0.001)**	
Direct Effect (Institutions → GDPPC)	0.382 **		0.522 **		-0.11	
Indirect Effect (Institutions → Transport → GDPPC)	0.393 **		0.233 **		0.450 **	

Notes: * $p < 0.05$; ** $p < 0.01$

5. Discussion

5.1 Theoretical contributions

By empirically validating a theoretical model, this study offers three major contributions to the literature on international business studies. First, as a novel contribution, we have investigated the extent to which “infrastructure” mediates the effects of institutions on economic performance. Second, recognizing the inherent multidimensionality of the concept of “institutions,” we have conceptualized the construct at a refined level by discriminating between developed and developing economies. Third, we have extended prior research on institutions and infrastructure investment in both developed and developing economies.

We found significant relationships between 1) transportation infrastructure and institutions and 2) transportation infrastructure and GDPPC, which means that transportation infrastructure acts as a mediator (rather than a moderator) between institutions and economic performance. The empirical tests of the proposed model support its validity for representing institutions. Our findings indicate that an institution can be represented by three attributes, which are represented by 14 factors.

Economic performance and advancement do not consist only of the discrete importance of separate institutional attributes and transportation infrastructure. To advance an economy, an entire institution is radically changed. With the aid of transportation infrastructure, institutional attributes can circulate easily within a developing economy. For developed economies, economic growth has become increasingly dependent on intangible attributes as a source of growth. Economic advancement can scarcely be further achieved through simply shifting attributes but rather by a more intensive use of institutional attributes and greater institutional sophistication.

We divided the data set into developed and developing economies according to GDPPC (a proxy for individual business performance) and used the SEM to determine the heterogeneous effects between these two types of economy. Overall, the SEM estimates of the two groups were similar, meaning that institutional attributes have similar relationships to GDPPC for both groups. Nevertheless, transportation infrastructure shows different patterns for developed and developing economies, while $H3$ is not statistically significant for developing economies (Figure 2). Developed economies, with better transportation infrastructure compared with developing economies, tend to have a better transfer of institutional attributes. This reflects the fact that the development of transportation infrastructure leads to relatively low transport costs. Our empirical evidence shows that the effect of transportation infrastructure is more pronounced in developing economies than in developed economies.

Our findings enrich the theory on national economic competitiveness by confirming that infrastructural investment is a significant factor in the competitiveness of developing economies. However, the effect of infrastructural investment on competitiveness disappears when an economy reaches the state of ‘middle-income trap.’

5.2 Managerial implications

Our findings suggest that business location decisions should rely not only on the institutions of an economy but also on transportation infrastructure. Our study provides empirical evidence for how transportation infrastructure mediates the effect of institutions on economic performance, especially in developed economies; therefore, international corporates should evaluate transportation infrastructure to harness the best from the particular institutions. The underlying concepts of factor-mobility and institution are identified as key challenges for management in attempting to convert the macro business environment into business potential.

We note that transportation infrastructure has different effects for developed and developing economies. For business managers, transportation infrastructure is a critical element for location decisions when they consider developing economies because the institutional attributes of developing economies cannot function efficiently without transportation infrastructure. Rather than simply locating a firm with respect to better institutional settings and advanced transportation infrastructure, it is important to first identify the economic performance (GDPPC) of the economy before formulating an effective strategy. As a result, a small firm operating in developing economies can reap significant competitive advantages through leveraging transportation infrastructure.

In terms of firm location selection, both institutions and transportation infrastructure are important factors, and their combined effects are distinct in developing and developed economies. In developing economies, institutions rely on transportation infrastructure to operate, but effective transportation infrastructure cannot be assumed. In developed economies, transportation infrastructure enhances the effect of institutions, and the effectiveness of transportation infrastructure can be considered after that of institutional attributes. Therefore, transportation infrastructure is critical in the consideration of firm location selection, especially if a developing economy is a candidate location.

6. Conclusions

Our investigation into institutional attributes and transportation infrastructure contributes to the analytical and methodological aspects of research in the field of institutional theory. In the absence of a widely accepted way of measuring institutions, we defined institutions empirically in terms of three attributes, namely:

- (1) the education and training systems;
- (2) the legal and customs system; and
- (3) the fiscal and financial system.

The findings of the study broaden and deepen our understanding of institutional dynamics in both developed and developing economies.

We tested the mediating effect of transportation infrastructure on the relationship between institutions and economic performance. In other words, this study investigated how transportation infrastructure facilitates the effects of institutions on economic performance. When firm location selection is considered, decision-makers and managers need to understand that transportation infrastructure has different roles in developing and developed economies. Our study provides evidence that institutions in developing economies cannot function without transportation infrastructure and that institutions in developed economies are enhanced in the presence of transportation infrastructure.

Future avenues for research could aim to overcome some of the limitations of our study or to extend the investigation into particular sectors or industries. Our investigation focused on the international business environment, and caution should, therefore, be exercised in generalizing the findings to the contexts of particular businesses or types of business activity. Our results may differ from those of previous studies for particular sectors because we used different factors to define institutional attributes and infrastructure. Therefore, future investigations could be made of particular industries affected by different institutional attributes and types of infrastructure.

References

- Acemoglu, D., Johnson, S. and Robinson, J.A. (2001), "The colonial origins of comparative development: an empirical investigation", *American Economic Review*, Vol. 91 No. 5, pp. 1369-1401.
- Acemoglu, D., Johnson, S. and Robinson, J. (2005), "The rise of Europe: Atlantic trade, institutional change, and economic growth", *American Economic Review*, Vol. 95 No. 3, pp. 546-579.
- Aidis, R., Estrin, S. and Mickiewicz, T. (2008), "Institutions and entrepreneurship development in Russia: a comparative perspective", *Journal of Business Venturing*, Vol. 23 No. 6, pp. 656-672.
- Anderson, J.C. and Gerbing, D.W. (1988), "Structural equation modelling in practice: a review and recommended two-step approach", *Psychological Bulletin*, Vol. 103 No. 3, pp. 411-423.
- Bagozzi, R.P. and Foxall, G.R. (1996), "Construct validation of a measure of adaptive-innovative cognitive styles in consumption", *International Journal of Research in Marketing*, Vol. 13 No. 3, pp. 201-213.
- Baker, T., Gedajlovic, E. and Lubatkin, M. (2005), "A framework for comparing entrepreneurship processes across nations", *Journal of International Business Studies*, Vol. 36 No. 5, pp. 492-504.
- Banerjee, S.B., Lyer, E.S. and Kashyap, R.K. (2003), "Corporate environmentalism: antecedents and influence of industry type", *Journal of Marketing*, Vol. 67 No. 2, pp. 106-122.
- Bel, G. and Fageda, X. (2008), "Getting there fast: globalisation, intercontinental flights and location of headquarters", *Journal of Economic Geography*, Vol. 8 No. 4, pp. 471-495.
- Bosworth, B. and Collins, S.M. (2008), "Accounting for growth: comparing China and India", *Journal of Economic Perspectives*, Vol. 22 No. 1, pp. 45-66.
- Bowen, H.P. and de Clercq, D. (2008), "Institutional context and the allocation of entrepreneurial effort", *Journal of International Business Studies*, Vol. 39 No. 4, pp. 747-768.
- Browne, M.W. and Cudeck, R. (1993), "Alternative ways of assessing model fit", *Sociological Methods and Research*, Vol. 21 No. 2, pp. 230-258.
- Byrne, B.M. (1994), *Structural Equation Modelling with EQS and EQS/Windows: Basic Concepts, Applications, and Programming*, Sage Publications, Thousand Oaks.
- Cantwell, J., Dunning, J.H. and Lundan, S.M. (2010), "An evolutionary approach to understanding international business activity: the co-evolution of MNEs and the institutional environment", *Journal of International Business Studies*, Vol. 41 No. 4, pp. 567-586.
- Chen, H. and Chen, T.J. (1998), "Network linkages and location choice in foreign direct investment", *Journal of International Business Studies*, Vol. 29 No. 3, pp. 445-467.
- Choi, Y.B. (2012), "Institutions for economic prosperity: an entrepreneurial perspective", in *Institutional Economics and National Competitiveness*, Y.B., Choi (Ed), Chapter 4, 63-83.
- Doney, P.M. and Cannon, J.P. (1997), "An examination of the nature of trust in buyer-seller relationships", *Journal of Marketing*, Vol. 61 No. 2, pp. 35-51.
- Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50.
- Ganesan, S. (1994), "Determinants of long-term orientation in buyer-seller relationships", *Journal of Marketing*, Vol. 58 No. 2, pp. 1-19.
- Hair, J.F., Anderson, R.E., Tatham, R.L. and Black, W.C. (1995), *Multivariate Data Analysis with Readings*, Prentice Hall, Englewood Cliffs, NJ.
- Hu, L. and Bentler, P.M. (1999), "Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives", *Structural Equation Modeling: A Multidisciplinary Journal*, Vol. 6 No. 1, pp. 1-55.
- Hulland, J., Chow, Y.H. and Lam, S. (1996), "Use of casual models in marketing research: a review", *International Journal of Research in Marketing*, Vol. 13 No. 2, pp. 181-197.
- Kelloway, E.K. (1998), *Using LISREL for Structural Equation Modelling: A Researcher's Guide*, p. 145.

- Nelson, R.R. (2008), "What enables rapid economic process: what are the needed institutions?", *Research Policy*, Vol. 37 No. 1, pp. 1-11.
- Nelson, R.R. and Nelson, K. (2002), "Technology, institutions, and innovation systems", *Research Policy*, Vol. 31 No. 2, pp. 265-272.
- North, D.C. (1994), "Economic performance through time", *American Economic Review*, Vol. 84 No. 3, pp. 359-368.
- Papadopoulos, N. (1988), "Inventory, taxonomy and assessment of methods for international market selection", *International Marketing Review*, Vol. 5 No. 3, pp. 38-51.
- Shane, S. and Venkataraman, S. (2000), "The promise of entrepreneurship as a field of research", *Academy of Management Review*, Vol. 25 No. 1, pp. 217-226.
- Vanberg, V.J. (2012), "Competition among governments: the state's two roles in a globalized world", *Institutional Economics and National Competitiveness*, Y.B., Choi (Ed), Chapter 2, pp. 24-43.
- Whitley, R. (1999), *Divergent Capitalisms: The Social Structuring and Change of Business Systems*, Oxford University Press.

Further reading

- Child, J. and Tse, D.K. (2001), "China's transition and its implications for international business", *Journal of International Business Studies*, Vol. 32 No. 1, pp. 5-21.

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