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FORMAL INSTITUTIONS AND NATIONAL INNOVATION CAPABILITIES: EVIDENCE FROM A MULTI-COUNTRY STUDY

PhD DISSERTATION

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APPROVAL PAGE

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PLAGIARISM PAGE

I hereby declare that all the information in this thesis has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work; otherwise I accept all legal responsibility. 08.06.2020

Ömer Faruk ALADAĞ

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ABSTRACT

Formal Institutions and National Innovation Capabilities: Evidence From A Multi-Country Study

Innovation has been recognized as a key ingredient for transformational change in national economies. It has also been dubbed as essential for the development of nations and even for tackling global scale impediments to prosperity as described in the United Nation's sustainable development goals. Although there is an agreement on the critical role of innovation, significant cross-national variation exists in terms of its prevalence. This study aims to explore how formal institutions are related to national innovation capability in different country contexts. In order to achieve this end, a panel dataset that observes 121 countries from high, upper-middle, lower-middle and low income groups over an eleven-year time period between 2007-2017 is utilized. This study provides three types of contributions to the literature. First, it evaluates innovation capability with a comprehensive measure that includes both inputs and outputs of the innovation process. Second, it builds and tests several models with a method that is robust to heteroscedasticity, autocorrelation, cross-sectional dependence and spatial dependence. Thus it obtains reliable results from which to theorize. Thirdly, it tests the relationship between innovation capability and formal institutions in different country groups based on income. Important policy implications for each country group are derived as a result of this methodological decision.

Keywords: Innovation capability, formal institutions, institutional theory, comparative institutionalism, panel data analysis

ÖZET

Resmi Kurumlar ve Ulusal İnovasyon Yetenekleri: Çok Ülkeli Bir Çalışmadan Bulgular

İnovasyon ulusal ekonomilerin dönüşümü için kritik bir faktör olarak görülmektedir. Ayrıca ülkelerin kalkınması ve küresel sürdürülebilir kalkınma hedeflerine ulaşmak için inovasyon temel öneme sahiptir. İnovasyonun kritik önemi üzerine bir konsensus var olmasına rağmen ülkeler arasında önemli inovasyon seviyesi farkları bulunmaktadır. Bu çalıma, resmi kurumların farklı ülke bağlamlarında inovasyonu nasıl etkilediğini araştırmaktadır. Bu amaçla 2007-2017 yıllarını kapsayan ve farklı gelir gruplarından 121 ülkenin bulunduğu bir panel veri seti oluşturulmuştur. Bu çalışma yazına üç tür katkı sağlmaktadır. İlk olarak inovasyon yeteneklerini, inovasyonun girdi ve çıktılarını bir arada ölçen kapsamlı bir ölçüm aracı kullanılmıştır. İkinci olarak, mekan bağımlılığını da dikkate alan farklı modeller kullanılmıştır. Son olarak resmi kurumların inovasyon yeteneklerine olan etkisi farklı gelir grubundan ülke grupları için modellenmiş ve her ülke grubu için politika önerileri geliştirilmiştir.

Keywords: İnovasyon yetenekleri, resmi kurumlar, kurumsal kuram, karşılaştırmalı kurumsalcılık, panel veri analizi

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1. INTRODUCTION

Innovation has been recognized as a key ingredient for transformational change in national economies. It has also been dubbed as essential for the development of nations and even for tackling global scale impediments to prosperity as described in the United Nation's sustainable development goals (Le Blanc, 2015). For instance, Christensen et al. (2019) stresses that market-creating innovations provide the shortest path to prosperity for poverty ridden countries. And innovation based approaches also offer creative solutions for grand challenges such as climate change (Pinkse & Kolk, 2010; Rodima-Taylor, Olwig & Chetri, 2012), environmental protection (Melville, 2010; Ekins, 2010) and global inequalities (Aghion et el., 2019). As a result, there is an increasing scholarly interest on what makes some countries more innovative than others.

Although there is an agreement on the critical role of innovation, significant cross-national variation exists in terms of its prevalence. Research has attributed these differences to various factors such as income level (Galindo & Mendez, 2014), development trajectories, social norms (Xu & Chi, 2009) or historical processes (Arora, Romijn & Caniels, 2014). In many studies on cross-national variation in terms of innovation, institutional dimensions stand out as critical influences (e.g. Wang, 2013; Gans, Hsu & Stern, 2008; Leger, 2005; Unger, 2000)

Institutions have various definitions in the literature. In one of the most commonly used definitions, North (1991) states that institutions are "humanly devised constraints that structure political, economic and social interaction" (p.97). Institutions have both informal and formal components. While the formal side is manifested in written rules and regulations, informal side is represented by social norms, traditions or codes of conduct. There are common elements in different definitions of instituttions: 1) they are devised by humans, 2) they constrain and enable social behavior, 3) they bring meaning and order to social life. Taking place in the sphere of social human activity, innovation is also subject to institutional influences. Since institutions provide the framework in which economic and social activity occurs, innovation is affected by the institutional context (Alcorta & Peres, 1998; Ervits & Zmuda, 2016). Considering that each country presents a unique context in terms of institutional arrangements, political and economic institutions are likely to shape country level innovation capabilities in significant ways.

This study aims to explore how formal institutions are related to national innovation capability in different country contexts. Formal institutions refer to the written rules, regulations and their enforcement. National innovation capability is the ability to engage in and obtain profitable results from innovation activities at the country level. As will be described in the literature review chapter, a large body of research has accumulated on the relationship between institutions and innovation in the recent years. Although many facets of innovation were explored in these studies, only a few of them measured innovation as a process that includes both inputs and outputs (e.g. Aguilar-Barcelo & Higuera-Cota, 2019, Boudreaux, 2017). In addition, current literature paid insufficient attention to the changes in the institutions-innovation relationship in groups of countries from different income levels. Furthermore, most studies did not take spatial correlation into account while conducting statistical analyses.

Answers to two research questions are explored throughout the study in order to extend the literature and provide insights to policy makers:

1) What is the relationship between formal institutions and national innovation capabilities?
2) Do institutions have the same effect on innovation in countries from different income groups?

In order to achieve this end, data was collected from different sources such as the World Bank and the World Economic Forum. The panel dataset observes 121 countries from high, upper-middle, lower-middle and low income groups over an eleven-year time period between 2007-2017. After running necessary tests and controlling for possible biases, the data was analyzed by Stata 16 software package and significant results were obtained.

This study provides three types of contributions to the literature. First, it evaluates innovation capability with a comprehensive measure that includes both inputs and outputs of the innovation process. Second, it builds and tests several models with a method that is robust to heteroscedasticity, autocorrelation, cross-sectional dependence and spatial dependence. Thus it obtains reliable results from which to theorize. Thirdly, it tests the relationship between innovation capability and formal institutions in different country groups based on income. Important policy implications for each country group are derived as a result of this methodological approach.

The rest of the study is structured as follows. A comprehensive and systematic literature review on the topic will be provided in the next chapter. Methodological decisions of the study and data analysis results will be elaborated in chapter 3. Discussion of the findings, limitations of the study and directions for future research are provided in chapter 4. The last chapter includes a brief conclusion that summarizes the overall study.

2. LITERATURE REVIEW

In this chapter, a comprehensive literature review is provided. Congruent with the research questions, the literature on institutional context and innovation at the country level is examined in a systematic method and gaps are identified. Then, the same method is applied to the literature on institutional context and innovation, pertaining to the second research question.

The systematic literature review methodology described by Denyer & Tranfield (2009) and Tranfield, Denyer & Smart (2003) is utilized in this chapter. Systematic literature review has been recognized as a reliable method because of its numerous advantages over unstructured traditional literature reviews. It adopts a replicable and transparent process that minimizes bias and errors (Tranfield et al. 2003). Moreover, systematic literature review is a widely adopted approach in recent studies published in high-quality journals. Because of these reasons, systematic literature review was selected as the best method for this study.

For article selection, a query was followed for institutions and innovation in the Scopus database. Only empirical articles that examine institutional factors at the country level were targeted. Book chapters, grey literature and non-English material were excluded from the search. The time horizon was set as the last 30 years, in other words between 1990-2020.

The remainder of this chapter is organized in two parts. In the first part, the results of literature analysis on institutions and entrepreneurship is provided. In the following part, the literature on institutions and innovation is reviewed.

2.1. Institutions and Innovation

According to many, innovation is the main driver of economic growth (Trott, 2017). Schumpeter (1943) identified innovation as “the fundamental impulse that sets and keeps the capitalist engine in motion” (p.10). Intergovernmental bodies such as United Nations, OECD and European Union address the importance of innovation by drawing roadmaps, policies and strategies relating to the topic. Having a more innovative economy is one of the top concerns for many countries. However, the potential to engage in innovative activities are path-dependent at the national level. In other words, some countries have acquired innovative capabilities ahead of others in history through knowledge accumulation (Dicken, 1998). Despite the intensive efforts to promote innovativeness on a global scale, significant

cross-country differences persist. Therefore, the question of why some countries are more innovative than others still remain as an important inquiry for both researchers and policy makers.

In order to explain cross-national variation in innovative activity, institutions have been one of the most examined factors (Wang, 2013). Since institutions set the rules of the game for businesses (North, 1991), they have an overarching impact on innovative activity. Although there is a wide agreement on the positive impacts of innovation on national economies, innovation has been mostly treated as an organizational issue until recently (Trott, 2017). But studies on institutions and innovation picked up pace especially after 2000s and produced a considerably large literature.

To review the literature on institutions and innovation, the first step was drawing a conceptual boundary in line with the research questions (Denyer, Tranfield & Van Aken, 2008). This was a difficult task for the innovation concept because innovation is a complex multi-faceted process that includes various elements. Therefore, the elusive nature of the innovation concept introduces difficulties in its definition and measurement. This situation leads to a lack of consensus on the definition and measurement of innovation (Baregheh, Rowley & Sambrook, 2009). For example, the Oslo Manual (OECD, 2018) distinguishes between innovation and innovative activity and defines innovation as "a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)" (p.32) and innovative activity as "all developmental, financial and commercial activities undertaken by a firm that are intended to result in an innovation for the firm" (p.33). Similarly, Gault (2018) prioritizes outcomes in his definition: "An innovation is the implementation of a new or significantly changed product or process." (p.619). On the other hand, Baregheh, Rowley & Sambrook (2009) advocate for a process definition of innovation: "Innovation is the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace" (p.1334). Trott (2017) also defines innovation as a process rather than an outcome: "Innovation is the management of all the activities involved in the process of idea generation, technology development, manufacturing and marketing of a new (or improved) product or manufacturing process or equipment" (p. 16). In this study, a process definition of innovation is adopted for capturing different phases of the innovation process. As a result, innovation

is defined as a multiphase process in which organizations transform ideas into new or improved products or services. Therefore, the literature review included articles about different stages of the innovation process, its inputs and outputs.

In line with the definition provided above, a query targeted articles on institutions and innovation in the Scopus database with the following search terms: ‘institution and innovation’, ‘institution and R&D’, ‘institution and technology transfer’, ‘institution and new product’, ‘institution and new technology’, ‘business system and innovation’, ‘varieties of capitalism and innovation’, ‘national innovation system’. The initial search returned 3672 articles. Then, empirical studies that include country-level innovation as the dependent variable was identified through a careful examination of abstracts and full texts. After the elimination process, 223 articles remained for the review. After excluding the articles that focus on informal institutions, 207 articles remained in the sample. These articles were classified according to different features such as methodology, findings, dependent and independent variables. Details on the selected articles may be viewed in Appendix 1.

After selecting the articles, the literature was classified according to categories such as journals, year of publication, research topic and methodology. The following sections of the literature review reports findings on these categories.

2.2.General Considerations About Journals and Year of Publication

This section reports the findings on the distribution of the selected articles according to journals and year of publication. First of all, as noted in Table 1, Research Policy contains the highest number of articles on innovation and institutions (n=24). Technological Forecasting and Social Change and Technology Analysis and Strategic Management follow with 6 articles. 79 of the 117 journals in the sample published only 1 article on the topic of interest.

Secondly, most of the journals have a focus on business related topics (n=72). It is followed by journals focused on economics (n=39). And the remaining few journals are focused on country and sector specific studies (n=6). This shows research on the institutional antecedents to innovation has been published mainly in journals with a general focus on business on economics rather than sectoral focus. Future studies may benefit more from sector specific problematization while examining country level innovativeness.

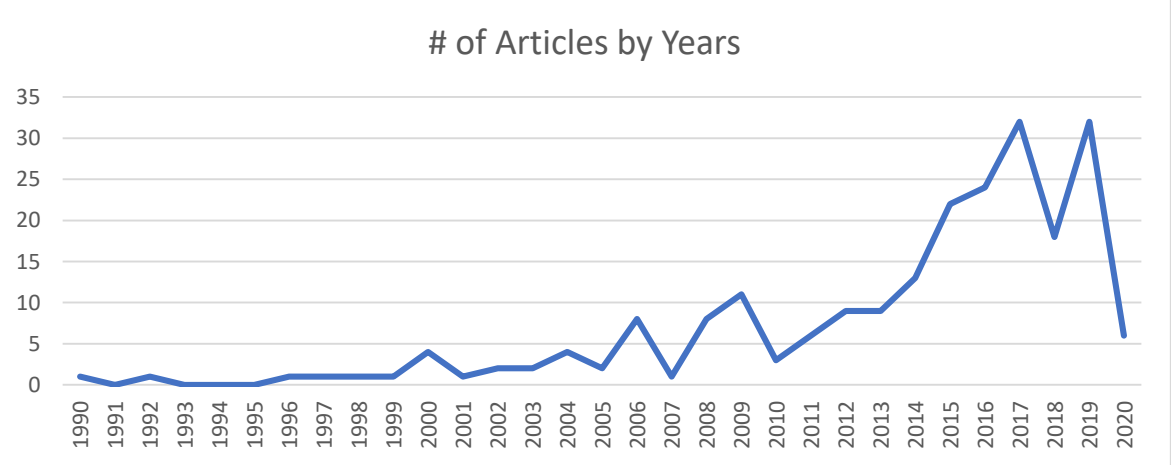
Table 1: Number of articles by journals

Name of the Journal	*# of Articles*	*Focus*
Applied Economics	2	Economics
Business and Politics	2	Business
Business Strategy and the Environment	2	Business
Cambridge Journal of Economics	3	Economics
China and World Economy	2	Economics
Chinese Management Studies	3	Business
Economic Modelling	2	Economics
Economics Bulletin	2	Economics
Emerging Markets Finance and Trade	2	Economics
Global Strategy Journal	3	Business
Industrial and Corporate Change	5	Business
Industry and Innovation	5	Business
International Business Review	5	Business
International Journal of Innovation Management	3	Business
Journal of Business and Industrial Marketing	2	Business
Journal of Business Research	5	Business
Journal of Business Venturing	2	Business
Journal of Cleaner Production	3	Business
Journal of Comparative Economics	2	Economics
Journal of Development Economics	2	Economics
Journal of International Business Studies	5	Business
Journal of International Management	3	Business
Journal of Policy Modeling	2	Economics
Journal of Technology Management and Innovation	2	Business
Journal of the Knowledge Economy	2	Economics
Journal of World Business	4	Business
Management Decision	3	Business
Management International Review	4	Business
Management Science	2	Business
Multinational Business Review	2	Business

Name of the Journal	*# of Articles*	*Focus*
Organization Studies	3	Business
R and D Management	2	Business
Research Policy	24	Business
Technological Forecasting and Social Change	9	Business
Technology Analysis and Strategic Management	6	Business
Technology in Society	3	Business
Technovation	6	Business
World Development	5	Economics
Other Journals	59	Business and Economics

Thirdly, the number of articles over the years shows an increasing trend in general as illustrated in Figure 1. The trend is especially apparent in the last decade. Although the concept of innovation was born more than fifty years ago, research on its relationships with institutions has shown considerable growth in the selected time period. This shows that there is an increasing interest on the area in the recent years. As the concepts evolved in time, research on institutions and innovation has developed over the years, introducing new issues, new contexts and new dimensions.

Figure 1: Number of articles by years

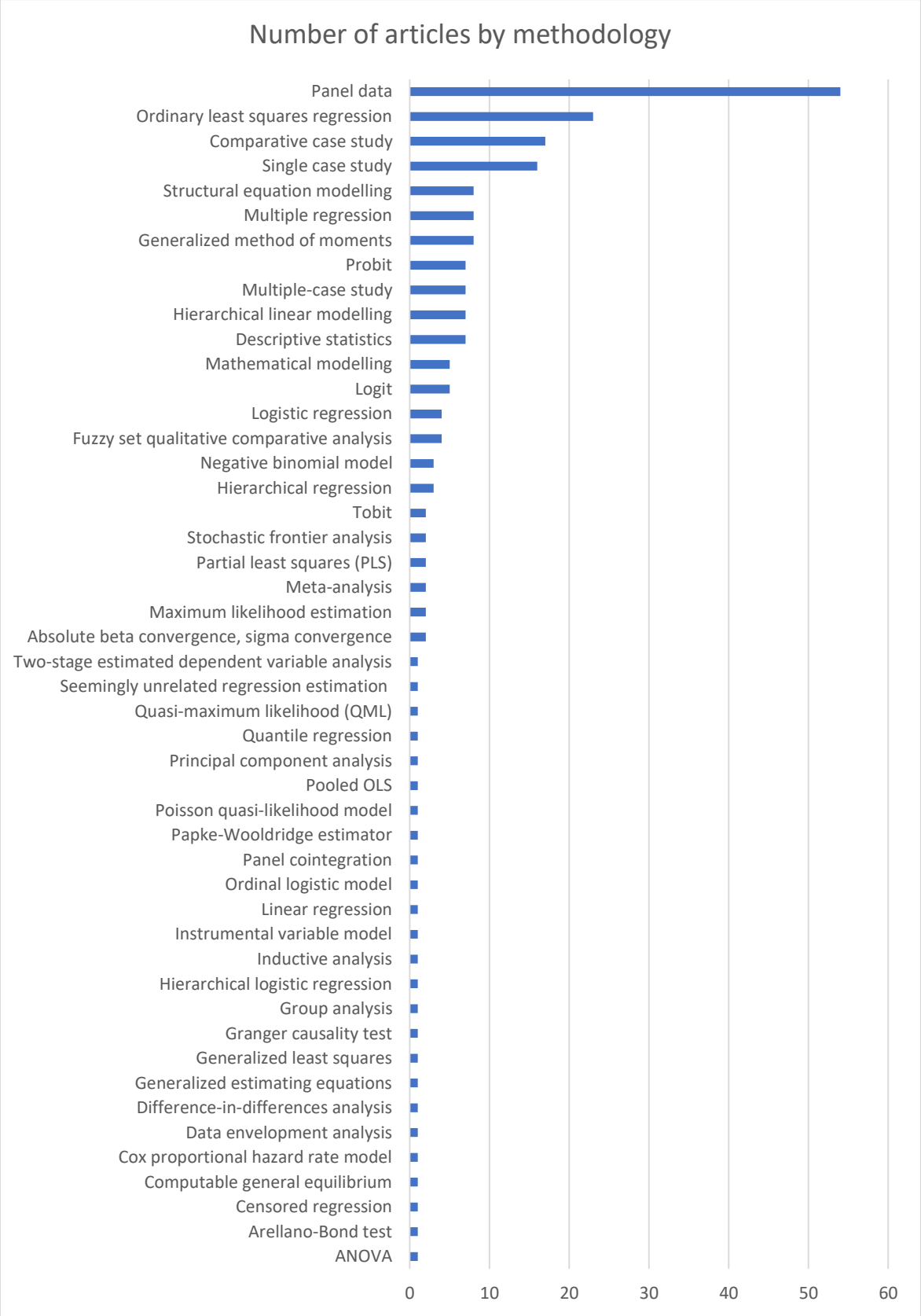


2.3.Methodological Approaches of the Articles

This section provides the findings about methodological approaches that the articles adopted. First of all, especially empirical articles were selected for the purpose of the thesis. But considering the whole literature on institutions and innovation, it is clear that empirical studies are predominant. There are only a few theoretical studies pertaining to the chosen time period, which shows that the research on institutions and innovations has reached maturity (Edmondson & McManus, 2007). This indicates that new methods of concept refinement and measurement are of primary importance for the future development of the area.

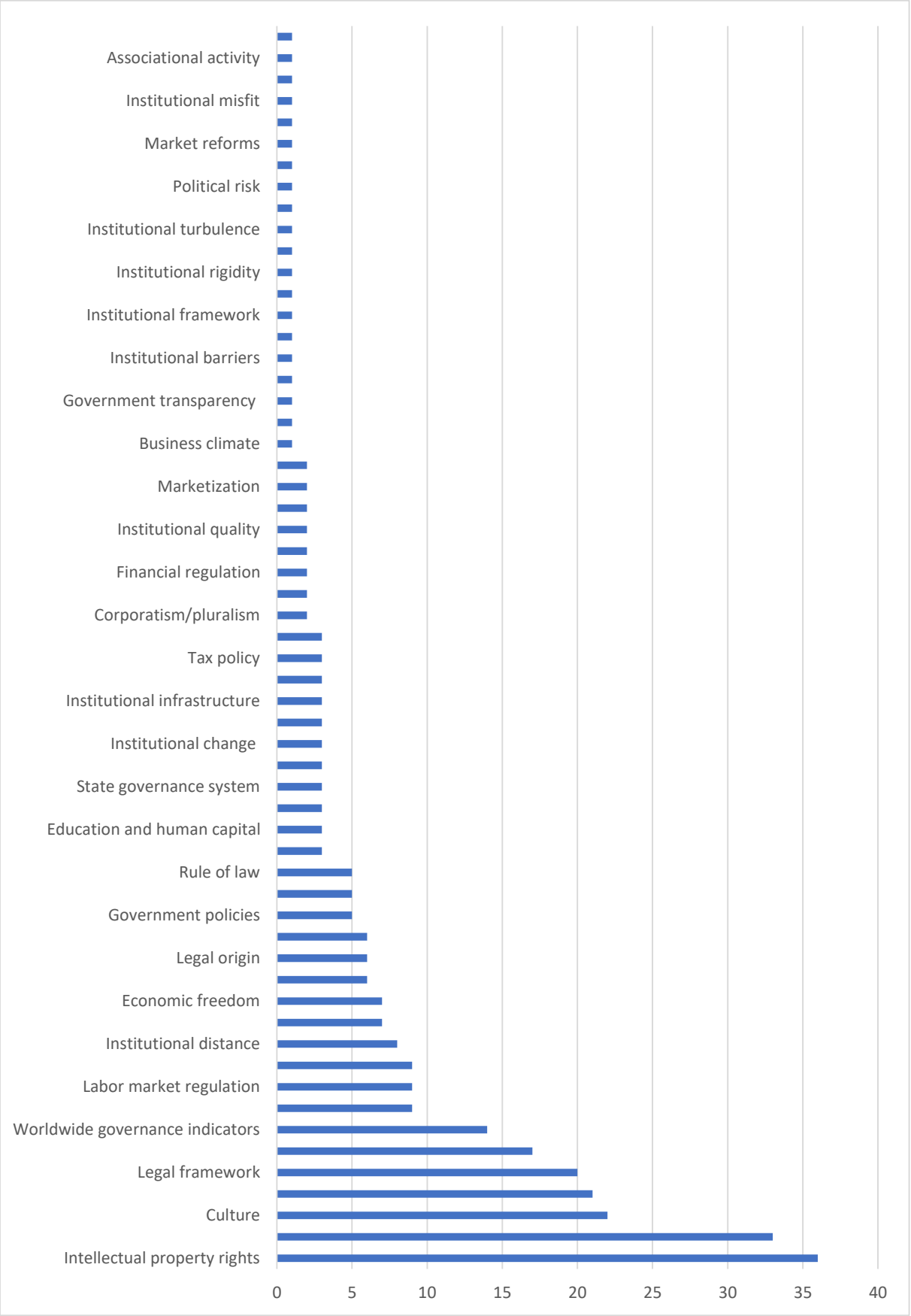
Second, the review shows that studies adopted several methodologies such as panel data models, fuzzy set qualitative comparative analysis or comparative case studies. As Figure 2 shows, panel data is by far the most commonly used methodology in the studies (n=54) and it is followed by ordinary least squares regression (n=23), comparative case study (n=17) and single case study (n=16). Since both institutions and innovation are dynamic concepts that are better examined by longitudinal studies (Tebaldi, 2013), panel data is expected to be the most suitable methodology for these studies. On the other hand, there is a considerable number of studies that employ case study methods. These studies generally compare two or more countries or provide extensive detail of a focused context in terms of the development process of national innovation systems (NIS). Historical accounts of how NISs develop in different country contexts offer useful insights for comparison. In addition, this type of studies may add theoretical contributions to the area by pointing out unique institutional combinations of different countries and how they affect innovation trajectories.

Figure 2: Number of Articles by Methodology



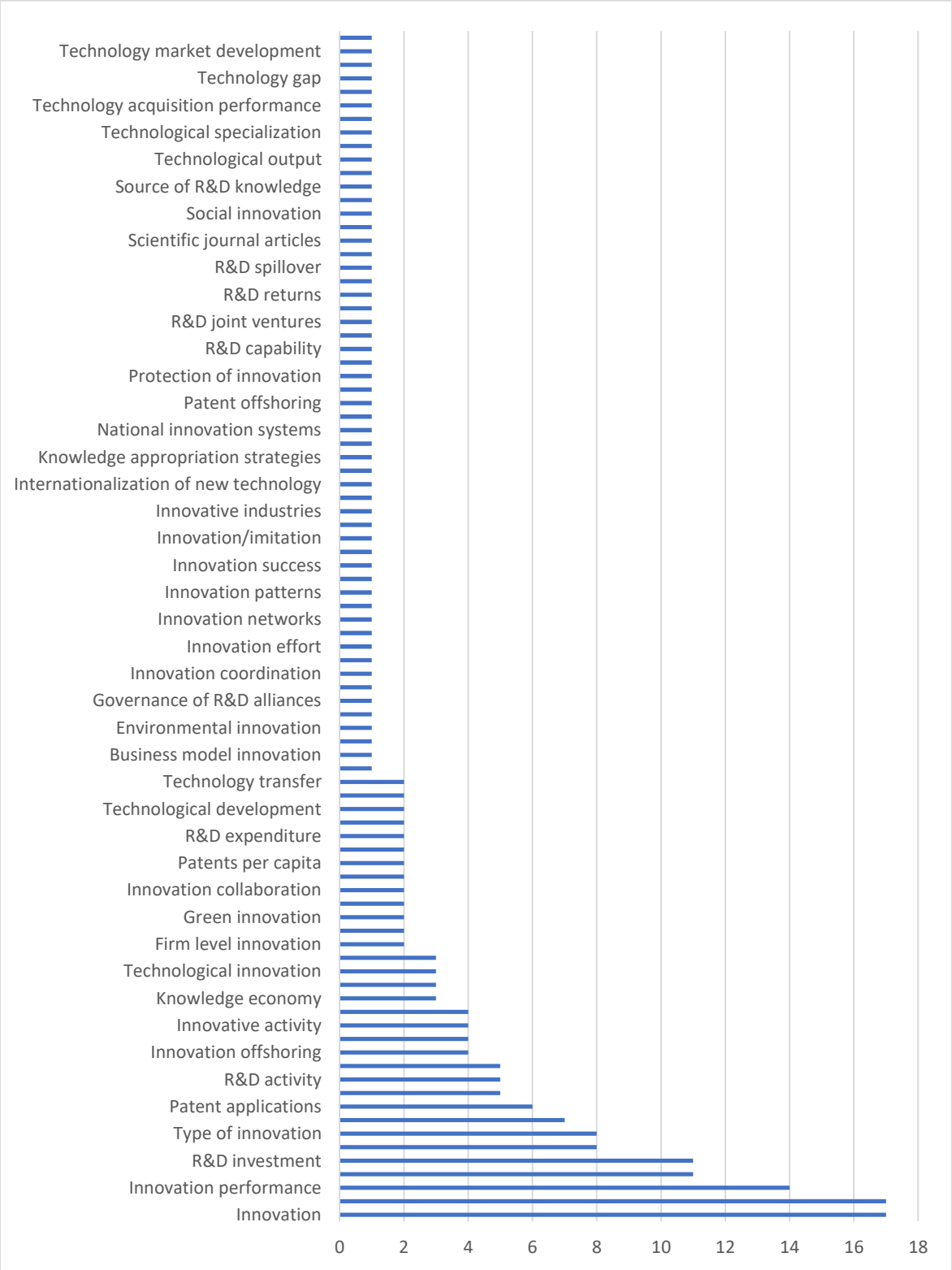
Thirdly, the articles were categorized according to their dependent and independent variables in order to show how studies utilized various measures for institutions and innovation. Among the independent variables, intellectual property rights were the most commonly used measure (n=36). Regulatory framework (n=33), culture (n=22), national innovation system (n=21), legal framework (n=20), corruption (n=17) and worldwide governance indicators (n=14) are the other important conduits through which institutions are operationalized. Most of the commonly used measures focus on the formal side of institutions while culture has a considerable weight in the sample as a measure of informal institutions. Another striking feature is the lack of comprehensive measures that encompass a large part of a country's institutional order. Two such measures, worldwide governance indicators of the World Bank and economic freedom index of the Heritage Foundation, have been used in less than 10% of the articles. Considering the multi-faceted nature of country level institutions, more studies that utilize comprehensive measures are needed in the literature. Figure 3 shows in detail how many times each measure was utilized in the selected articles.

Figure 3: Usage of independent variables



In terms of dependent variables, there is a plethora of measures related to the inputs and outputs of innovation as well as how the process of innovation is carried out. The highest usage frequency belongs to innovation (n=17) and number of patents (n=17). Innovation performance (n=14), R&D intensity (n=11) and R&D investment (n=11) follow. The most salient feature of the articles in terms of dependent variables is that most articles focus on either inputs or outputs of innovation when setting their measurement tools. However, the process definition of innovation includes both sides of the process as innovative activities. Whether they result in new products or not, innovation inputs should be included in measures together with outputs. Therefore, inclusive measures of innovative activity that cover the whole process should be given priority in new studies. Figure 4 depicts how many times innovation-related variables were used in the literature.

Figure 4: Usage of dependent variables



2.4. Content of the Articles

In recent years, research on institutions and innovation has investigated many different topics and problems in various contexts, so the issues covered by the articles are numerous and heterogeneous. The aim of this section is to identify the more debated issues in the latest institutions and innovation literature. Therefore, research topics of the articles were analyzed in order to find common features. Although the effects of institutions on innovative activity was selected as the main theme of the literature review, clustering articles enable to offer a more nuanced view of the area. As a result, the following matrix structure in Table 2 is identified. In this matrix, the literature is grouped based on the institutional and innovation related aspects they are examining. The horizontal axis of the matrix is composed of institutional features under examination. And the vertical axis represents innovation related variables that are affected from institutional context. At the intersection points of institutional and innovation related variables, number of articles are provided. This table summarizes what type of topics have attracted more scholarly interest.

Table 2: Content analysis of articles

	Innovation outputs (new products, patents etc.)	Innovation inputs (R&D activity etc.)	Governance of innovative collaboration	Innovation development process	A specific type of innovation (bricolage innovation, private innovation etc.)	Radical vs. incremental innovation	TOTAL
Corruption	10 (-)	3 (-)					13
Government support	4 (+)	5 (+)			2 (+)		11
Legal framework	22 (+)	14 (+)	5 (+)	2 (+)		1 (+)	44
Regulative framework	24 (+)	15 (+)	3 (+)	2 (+)	5 (+)	2 (+)	51
Political framework	**7** (+)	2 (+)	1 (+)			3 (+)	13
Overall institutional context	28 (+)	12 (+)	6 (+)	2 (+)	2 (+)	1 (+)	51
National innovation system	14 (+)	3 (+)	2 (+)	4 (+)		1 (+)	24
TOTAL	109	54	17	10	9	8	207

According to Table 2, the literature on institutions and innovation may be examined under seven categories: (1) corruption and innovation, (2) government support and innovation, (3) legal framework and innovation, (4) regulative framework and innovation, (5) political framework and innovation, (6) overall institutional context and innovation, (7) national innovation systems.

The first group includes articles on the impact of corruption on innovation (n=13). Studies about how corruption affects innovation related outcomes form the majority in this category. For example, Pirtea, Sipos & Ionescu (2019) found that corruption at governmental structures adversely affect innovation perspectives and lead to unfavorable innovation outcomes in developing countries. In another study, Spinesi (2009) argued that asymmetric information between political authorities and bureaucratic agencies diverts resources from innovative activities and feeds inequality. Anokhin & Schulze (2009) also states that control of corruption is positively related with entrepreneurship and innovation levels. On the other hand, Xie, Qi & Zhu (2019) claimed that corruption may have positive impact on firms' innovation results. They found that political instability and threats from the informal sector positively moderate the relationship between corruption and new product innovation in transition economies. Supporting this view, Krammer (2019) shows that bribery enables innovators in emerging markets to overcome bureaucratic obstacles, compensating for the lack of influential connections. He also finds that as the quality of formal institutions increase, the positive relationship corruption and innovation weakens. Other articles in this group present mixed results on the corruption-innovation relationship. While most of them exhibit positive relationships (e.g. Paunov, 2016; Athanasouli & Goujard, 2015; Barasa et al., 2017; DiRienzo & Das, 2015) others find conditional or no support (e.g. Rocha et al., 2019; Ervits & Zmuda, 2018).

The second group of articles examine the relationship between government support and innovation (n=11). While some of these studies relate active government support to higher level of innovation by private firms, others examine government's role as a provider of ground conditions for innovation. For instance, Kang & Park's (2012) research on Korean biotechnology firms shows that government support through project funding stimulates R&D efforts by private firms. Similarly, Chen & Yang (2019) found that government support in the form of R&D tax credits significantly increased firm level innovative inputs and outputs in Chinese companies. Alfranca & Huffman (2003) studied agricultural sector and found a strong association between government incentives and R&D investments. Zhu et al. (2019) point to

the strong effect of government support on bricolage innovation in emerging markets. Egan (2013) focused on location choices for multinationals' R&D activities and found that multinational firms are more likely to locate R&D activities in developing countries with a high level of government effectiveness. On the other hand, Carney & Zheng (2009) report that government incentives may generate conflicting demands on innovation and therefore stifle innovative activity. Szczygielski et al. (2017) draw attention to the type of activity that governments support and how it affects innovative outcomes. Their findings show that innovation performance increased in Poland when the government supported R&D activities and decreased when European Union grants attempted to upgrade human and physical capital. Overall, studies in this group demonstrate mixed results on the relationship between government support and innovation.

The articles in the third group focus on legal framework and its impacts on innovation (n=43). These studies are heavily invested in investigating how the strength of intellectual property rights regime (IPR) affect innovation in different countries. The effects of IPR on various innovation related variables have been studied, such as innovation performance, patent grants, technology diffusion or technology internationalization. For a majority of the studies on IPR, strong IPR regimes are a necessary condition facilitating innovation. For example, Sun et al. (2017) found that the performance of open innovation efforts is positively moderated by IPR enforcement. Furthermore, Bravo-Ortega (2012) showed that lack of intellectual-property protection channels the efforts of educated individuals into imitation rather than innovation. In addition, Ezzeddine & Hammami (2018) demonstrated the direct and indirect impact of IPR for human capital and economic development. In a study on innovation offshoring, Pisani & Ricart (2018) suggested that developed country multinationals are more likely to locate their innovation in emerging countries where IPR protection is stronger. IPR was also shown to influence firms' knowledge management strategies. Environments with less IPR uncertainty encourage firms to engage in knowledge appropriation through patenting whereas uncertain IPR conditions are more likely to support open science (Huang, 2017). On the other hand, contrasting views exist rarely on the relationship between IPR and innovation. While some scholars claim IPR is not the best way to protect innovation (Dosi, Marengo & Pasquali, 2006), others report it has no effect on innovation (Leger, 2005). Other studies on IPR are generally focused on contingencies that moderate the positive effect of IPR on innovation (e.g. Nagavi & Strozzi, 2015; Wu et al., 2019; Wang et al., 2020; Bukstein, Hernandez & Usher, 2019). The rest of the articles in this group examine the larger legal context which IPR is a part of. Legal

origin of countries and its impact on R&D alliances (Dickson, Weaver & Hoy, 2006), technology diffusion (Assiotis, Zachariades & Savvides, 2015) and knowledge economy (Asongu, 2017) is an important line of inquiry. Other notable research investigated the effects of current laws on patent applications (Blind, 2012), R&D intensity (Sun, Qu & Liao, 2018; Banerjee & Gupta, 2019; López-Iturriaga & López-Millán, 2017; Cai, Shen & Liu, 2016), innovation alliances (Malik & Yun, 2017) and technology adoption (Nguyen et al., 2017).

The fourth group is comprised of articles on various aspects of government regulation and their relationship with innovation (n=50). Studies on labor market regulation constitute a considerable body of research under this category. In this regard, negative views on employment protection, unionization and intensive regulation is shared by many scholars (Filippetti & Guy, 2020; Ferrett & Zikos, 2013; Barbosa & Faria, 2011). But some studies point to adverse effects of job precariousness and high unemployment on innovation levels (Kleinknecht, van Schaik & Zhou, 2014; Gatti, 2000). Other than labor markets, governments have a large repertoire of regulation methods which limit and enable innovation directly and indirectly. Regulatory pressures on environment (Marin & Zanfei, 2019; Yuan & Zhang, 2020; Wagner & Llerena, 2011), energy sector (Bradshaw, 2017; Garrone, Grilli & Mrkajic, 2018), automotive industry (Wang & Kimble, 2016; Helveston et al., 2019), telecommunications industry (Yoo, Lyytinen & Yang, 2005) and pharmaceuticals (Pyka, Buchmann & Vermeulen, 2017) significantly influence the type and quantity of innovations in these areas. Some studies that focus on overall regulatory quality show that governments can encourage innovative activity through tax policy (Jia & Ma, 2017; Gondim, Borini & Carneiro-Da-Cunha, 2017) and easing access to finance (Fombang & Adjasi, 2018, Cichy & Gradon, 2016; Abdallah, 2016; Bilal, Khan & Akoorie, 2016; Heredia-Perez et al., 2019). Regulations in corporate governance systems also play an important role in shaping firm-level innovation. Innovative activities such as R&D efforts suffer in countries with high levels of shareholder protection (Beloc, 2013; Malen & Vaaler, 2017; Rapp & Udoieva, 2017; Munari, Orieno & Sobrari, 2010). Articles on regulative framework constitute the largest group in the sample. There is an overall agreement on governments' important role in facilitating an innovation inducing environment through the use of various regulative methods.

The fifth group of articles are about the relationship between political framework and innovation (n=13). Political stability and level of democracy are the main variables under concern in this group. Their effects on innovation outputs, innovation activity and radical/incremental innovation constitute the main topics of these articles. For example, Ho et

al. (2018) report that political institutions indirectly affect innovation through stock market deepening. Kim (2011) considered different dimensions of democratic institutions such as parliamentary and presidential systems, electoral systems, federal and unitary systems and found that level of democracy matters in public R&D spending. Comin & Hobijn (2009) focused on the influence of lobbying in different countries and concluded that lobbying is an important barrier to technology diffusion. In a similar vein, studies on political stability exhibit mixed findings. In a comparative study on national technological performance, Coccia (2017) suggested that leadership-oriented governments are a contributing factor to technological innovation and socioeconomic growth. Nam et al. (2014) similarly reported significant positive effects of political stability on cross-national innovation. Kraft & Bausch (2018) pointed to the importance of managerial social networks in the absence of strong political institutions. To sum up, findings about the impact of political institutions show that political stability is a significant variable in predicting innovation. However, whether democracy or another political system is better for innovation is inconclusive.

The sixth group of articles encompasses overall institutional context as an antecedent to innovation (n=51). One important subgroup of articles focus on institutional distance between countries. Defined as the extent of similarity between the institutions of two countries (Xu & Shenkar, 2002), institutional distance have been argued to affect innovative collaboration (Ma, Kaldenbach & Katzy, 2014), offshoring of innovations (Lorenz, Clampit & Ramsey, 2018), R&D alliances (Choi & Yeniyurt, 2015), innovation transfer (Bezerra & Borini, 2015) and new product introduction (Wu, 2013). On the other hand, most of the studies in this group compare different institutional contexts in terms of their effects on innovation related aspects. Two measures are commonly used to assess institutional quality: Worldwide Governance Indicators (WGI) of the World Bank and the Economic Freedom Index (EFI) of the Heritage Foundation. These measures cover multiple dimensions of formal institutions including regulation, legal and political framework, corruption, government effectiveness, financial freedom etc. The underlying idea behind both measures is that some countries have more quality institutions that support innovation. Many articles that utilize WGI and EFI report positive relationships between institutional quality and innovation intensity (Silva & Plekhanov, 2018; Yi et al., 2020), knowledge creation (Boudreaux, 2017; Kwan & Chiu, 2015), number of patents (Phuc Canh, Schinckus & Thanh, 2019; Tebaldi & Elmslie, 2013), R&D intensity (Alam, Uddin & Yazdifar, 2019; Wang, 2013), R&D productivity (Nordin & Nordin, 2017), R&D capability (Chen, Li & Shapiro, 2015), technology licensing (Dohse, Goel & Nelson, 2019) and

innovativeness of nascent entrepreneurs (Fuentelsaz, Maicas & Montero, 2018). Among other studies that investigate overall institutional quality, institutional contexts have been linked with number of patents (Wu & Park, 2019; Yang, Liu & Cheng, 2016; Wu et al., 2016; Chang, Chung & Mahmood, 2006; Wu, Wu & Zhuo, 2015), innovation capabilities (Gölgeci et al., 2019), technology diffusion (Mignon & Bergek, 2016), technological development (Pattit, Raj & Wilemon, 2012; Pereira & Plonski, 2009), innovation orientation (Chittoor, Aulakh & Ray, 2015) and innovative collaboration (Love & Roper, 2004). Lastly, a few articles in this category investigated institutional change as the main catalyst of innovative processes. For instance, Delmas (2002) reported the negative effect of institutional rigidities on innovation outputs while Liu et al. (2019) concluded that R&D alliances are a useful method for attenuating this effect. Others examined economic transformation processes of different countries and tracked the co-evolution of institutions with innovation patterns (Choung, Hwang & Song, 2014), innovative behavior (Wu & Huang, 2008) and R&D investments (Choi et al., 2014). In conclusion, while most of the research on overall institutional context reported positive relationship between institutional quality and innovation, a few studies evaluated innovativeness and institutional profile as dynamic processes that evolve together.

The last group of articles include national innovation systems (NIS) related research (n=24). Rooted in the varieties of capitalism theory (Hall & Soskice, 2001), NIS approach posits that each country has an innovation system with different characteristics. National innovation systems include institutional aspects as well as industrial organization, government policies and political norms (Unger, 2000). NIS approach institutions as an integral part of innovation ecosystems. Expectedly, NIS related research generally includes case studies that compare and contrast countries in terms of innovation trajectories (Fuller, 2009; Xu & Chi, 2009; Gray, Malla & Phillips, 2006; Walsh & Le Roux, 2004), innovation performance (Rowe, 2018; Roper & Arvanitis, 2012; Malik & Huo, 2019; Malik, 2017; Guan & Chen, 2012; Gittelman, 2006), technological development (Ibata-Arens, 2008; Inzelt, 1996), technology adoption (Lloyd & Payne, 2019), technological specialization (Vertova, 2001) and radical innovation (Meelen, Herrmann & Faber, 2017). Historical processes in accumulating innovative capabilities, comparison of national innovation systems and catch-up potential of developing countries were the main themes under scrutiny in this group. In the extant literature, national innovation systems are generally evaluated in a framework provided by the variety of capitalism approach (Hall & Soskice, 2001). In this framework, liberal market economies are expected to produce radical innovations while coordinated market economies are limited to incremental innovations

(Hall & Soskice, 2001). But the heterogenous contributions from the literature show that context specific characteristics should be taken into account. For instance, findings from comparative studies show the advantages of coordinated or mixed market economies over liberal markets in published science (Malik & Huo, 2019) and transformation of science into export products (Malik, 2017). Meelen, Herrmann & Faber (2017) also add to this type of studies by demonstrating the weakness of varieties of capitalism in explaining economic specialization patterns. Therefore, country specific factors such as historical co-development of institutions with innovative capabilities attracted considerable interest in the literature. In a single case study on the Canadian canola industry, Gray, Malla & Phillips (2006) show that institutional deficiencies may be overcome by government support in the earlier phases of new product innovation but failures in property rights system require the development of new institutions in the long-run. In a comparative analysis that covers the last hundred years, Vertova (2001) argues mismatch between institutions and the prevailing technological paradigm lock countries into inferior technological paths. Walsh & Le Roux (2004) compared pharmaceutical innovations in USA and France and found important institutional differences that contributed to success. Xu & Chi (2009) show that differences between Taiwan and China in terms of institutional arrangements determine the effectiveness of R&D collaboration. Koh (2006) examined Singapore's efforts to become an innovation-based economy and identified key challenges such as policy coordination between government agencies. In sum, many studies from the literature render the assumptions of varieties of capitalism inconclusive. Therefore, the argument that liberal market economies have more developed institutions supporting innovative activity also merits questioning.

2.5. Gaps In the Literature

Considering the literature on institutions and innovation, some important gaps need to be addressed in future studies. The first gap pertains to the operationalization of the innovation concept. Most of the selected articles measure innovation by its inputs or outputs. Only a very few studies investigated innovation as a process. It is a clear result of this literature review that there is a lack of studies which utilize more comprehensive measures to operationalize innovation. The second gap is about sample selection. Most studies are limited in terms of the number of countries they examine. Including more countries will increase the representation of different contexts in sample, as well as the generalizability of future studies.

3. METHODOLOGY

3.1.Hypothesis Development

A comprehensive examination of the effects of institution on innovative capabilities requires a multi-faceted perspective on institutions. Innovative capabilities are related to various components of a country's institutional framework. As the rules of the game that direct economic activity (North, 1991), institutions impact innovative capabilities through different channels. Drawing on the recent literature, research hypotheses are developed in this section.

First of all, quality of public services, its independence from political pressures and credibility of the government's commitment to such policies are important institutional factors that affect innovation. An effective government is claimed to be a significant driver of national level innovative capabilities (Egan, 2013; Carney & Zheng, 2009). While government policies have been shown to impact innovation positively (Alfranca & Huffman, 2003), fine-tuning policy instruments is a critical ability of efficient governments that are successful in fostering innovation (Kang & Park, 2012; Molina, 2018; Zhu et al., 2019). As an overarching theme that affects other institutional pillars, government effectiveness also supports other institutional structures. Building on this:

H1: Government effectiveness is positively related to national innovative capabilities.

Another institutional factor in predicting innovative capabilities is the corruption levels of different countries. Corruption can be defined as the exercise of public power for private gain (Anokhin & Schulze, 2009). As explained above, there is contradictory evidence about corruption and innovation in the literature. While many scholars note corruption as an impediment to an innovation supporting environment (e.g. DiRienzo & Das, 2015; Pirtea, Sipos & Ionescu, 2019; Athanasouli & Goujard, 2015), contrary evidence also exists. Some studies claim corruption favors more efficient firms while negatively impacting worse performers (Rocha et al., 2019; Paunov, 2016). Corruption has even been shown to accelerate innovation processes in emerging markets (Xie, Qi & Zhu, 2019; Krammer, 2019) Others find no significant effect of corruption on innovation (Ervits & Zmunda, 2018). In line with the dominant view in the literature:

H2: Control of corruption is positively related to national innovative capabilities

When defining the rules of economic activity, governments rely heavily on regulation. Regulation entails the formulation and implementation of policies on various facets of national

economies, and the notion of institutional quality assumes that regulation affects innovation positively if it targets private sector development. Majority of studies support this view and report positive effects of regulation that decrease constraints on the private sector (Heredia-Perez et al., 2019; Bradshaw, 2017; Lachman & Lopez, 2019). The quality of government regulation is strongly linked to a series of innovative capabilities such as experimentation (Helveston et al., 2019), new product sales (Yi et al., 2017), R&D investment (Yoo & Rhee, 2013), green innovation (Zhang et al., 2020), business model innovations (Wang & Kimble, 2016) and development of innovative industries (Pyka, Buchmann & Vermeulen, 2017). Since economic regulation is significant in setting national innovation trajectories (Yoo, Lyytinen & Yang, 2005), there is a wide agreement on its positive effect in the literature. Therefore:

H3: Regulatory quality is positively related to national innovative capabilities

The fourth critical element in national institutional contexts is the rule of law. Rule of law is the extent to which people abide by official rules and regulations in a country. It encompasses contract enforcement, property rights, and the general confidence in the legal system. Since companies invest in innovation efforts in order to obtain profitable results, it is important to put mechanisms that protect intellectual property rights in place (Zhang et al., 2017; Bravo-Ortega, 2012). A sound legal system and strong property rights are attributed to better innovation performance by most scholars (Ezzeddine & Hammami, 2018; Ivus, 2015; Silva, 2015; Zhao, 2006). Furthermore, property rights also affect the location of innovation activities by multinational firms (Ivus, Park & Saggi, 2017; Martinez-Noya & Garcia-Canal, 2011; Athreye, Batsakis & Singh, 2016). Although rare studies present adverse effects of property rights (e.g. Huang, 2017), the agreement on their positive effects is dominant. In general, legislation that encourages competition and IPR protection are important contributors to innovation. Therefore:

H4: Rule of law is positively related to national innovative capabilities

The other important elements of institutional context are political stability and absence of violence/terrorism and voice and accountability. While political stability and absence of violence/terrorism signifies an adherence to coherence in ruling, voice and accountability is about the basic tenets of democratic regimes such as freedom in elections, association and media. Political stability is generally found to be a positive influence in innovation. Evidence shows politically stable types of government are better at supporting innovation even if they are low on democracy (Cocchia, 2017). Political stability is also shown to be important in the

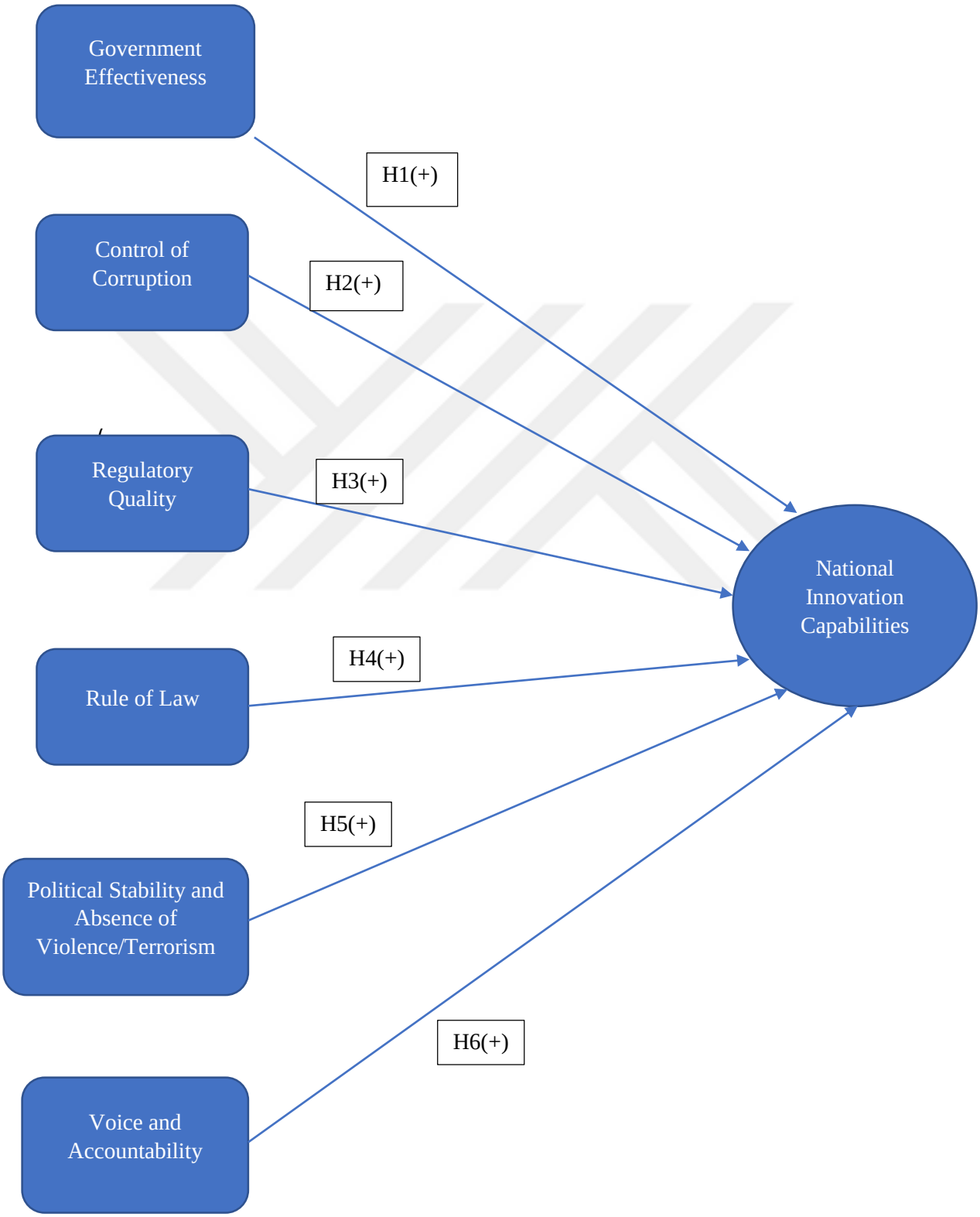
formation of innovation networks (Kaft & Bausch, 2018). With regard to voice and accountability, a few studies exist. Although the evidence is far from being conclusive, voice and accountability is found to be positively related to innovation (Ho et al., 2018; Kim, 2011). However, some democratic institutions like lobbying may set an impediment to innovation (Comin & Hobijn, 2009). Research on political institutions and innovation is still immature. Therefore, it is still early to reach broad generalizations. However, in line with the more supported view, it is suggested that:

H5: Political stability and absence of violence/terrorism is positively related to national innovative capabilities

H6: Voice and accountability is positively related to national innovative capabilities

A conceptual model that demonstrates the proposed relationships between variables is provided below:

Figure 5: Conceptual model



3.2.Sampling and Data Collection

The dataset used in this study covers an eleven -year period between 2007-2017 and contains information on 121 countries. 14641 observations take place in the model as total. To the best of the author's knowledge, this study includes the highest number of countries in the institutions-innovation literature. Data availability in terms of years and countries was the main driver of sample selection in this study. However, the sample is representative in the sense that it includes sufficient number of countries from different income groups. The selected countries are provided in Table 3.

Table 3: Countries in the sample

High Income	*Upper Middle Income*	*Lower Middle Income*	*Low Income*
Argentina	Albania	Bangladesh	Benin
Australia	Algeria	Bolivia	Burundi
Austria	Azerbaijan	Cambodia	Chad
Bahrain	Bosnia and Herzegovina	Cote dIvoire	Ethiopia
Belgium	Botswana	Egypt	Gambia
Canada	Brazil	El Salvador	Madagascar
Chile	Bulgaria	Ghana	Malawi
Croatia	China	Honduras	Mali
Cyprus	Colombia	India	Mozambique
Czech Republic	Costa Rica	Indonesia	Nepal
Denmark	Dominican Republic	Kenya	Senegal
Estonia	Ecuador	Kyrgyz Republic	Tajikistan
Finland	Georgia	Lesotho	Tanzania
France	Guatemala	Mauritania	Uganda
Germany	Jamaica	Mongolia	Zimbabwe
Greece	Jordan	Morocco	
Hungary	Kazakhstan	Nicaragua	
Iceland	Macedonia, FYR	Nigeria	
Ireland	Malaysia	Pakistan	
Israel	Mauritius	Philippines	
Italy	Mexico	Sri Lanka	

High Income	*Upper Middle Income*	*Lower Middle Income*	*Low Income*
Japan	Montenegro	Tunisia	
Kuwait	Namibia	Ukraine	
Latvia	Paraguay	Vietnam	
Lithuania	Peru	Zambia	
Luxembourg	Romania		
Malta	Russian Federation		
Netherlands	Serbia		
New Zealand	South Africa		
Norway	Thailand		
Oman	Turkey		
Panama	Venezuela		
Poland			
Portugal			
Qatar			
Saudi Arabia			
Singapore			
Slovak Republic			
Slovenia			
South Korea			
Spain			
Sweden			
Switzerland			
Trinidad and Tobago			
United Arab Emirates			
United Kingdom			
United States			
Uruguay			

Information about innovative capabilities was obtained from the Global Competitiveness Index (GCI) database of the World Economic Forum (WEF). WEF has been preparing the Global Competitiveness Reports which evaluate countries on various scales in terms of competitiveness since 2007. The GCI measures national competitiveness on twelve

pillars and innovation capability is one of these pillars. Innovation capability is a comprehensive measure that covers ten dimensions: diversity of workforce, state of cluster development, international co-inventions, multi-stakeholder cooperation, scientific publications, patent applications, R&D expenditures, research institutions prominence, buyer sophistication and trademark applications (World Economic Forum, 2019). As a result of the aggregation of these scores, innovative capability is obtained. These dimensions contain data from diverse sources that cover many critical aspects of the innovation including inputs, outputs and commercialization.

Data regarding institutional context is collected from the Worldwide Governance Indicators (WGI) database. As an ongoing project of the World Bank, WGI reports governance indicators for more than 200 countries over the time period 1996-2018 in six dimensions: voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, rule of law and control of corruption. These indicators combine the views of a large number of enterprises, citizens and experts in industrial and developing countries. They are based on over 30 individual data sources produced by a variety of survey institutes, think tanks, non-governmental organizations, international organizations, and private sector firms (World Bank, 2020). Each of six aggregate WGI measures are constructed by averaging together data from the underlying sources that correspond to the concept of governance being measured. This is done in three steps. In the first step, individual questions from the underlying data sources are assigned to each of the six aggregate indicators. For example, a firm survey question on the regulatory environment would be assigned to regulatory quality, or a measure of press freedom would be assigned to voice and accountability. Note that not all of the data sources cover all countries, and so the aggregate governance scores are based on different sets of underlying data for different countries. In the second step, the questions from the individual data sources are first rescaled to range from 0 to 1, with higher values corresponding to better outcomes. In the third step, a statistical tool known as an Unobserved Components Model (UCM) is used to make the 0-1 rescaled data comparable across sources, and then to construct a weighted average of the data from each source for each country. The UCM assigns greater weight to data sources that tend to be more strongly correlated with each other. While this weighting improves the statistical precision of the aggregate indicators, it typically does not affect very much the ranking of countries on the aggregate indicators. The composite measures of governance generated by the UCM are in units of a standard normal distribution, with mean zero, standard deviation of one, and running

from approximately -2.5 to 2.5, with higher values corresponding to better governance. Details about the data sources of institutional variables are provided in Appendix 2.

Lastly, data on the control variables are collected from the World Bank's World Development Indicators (WDI) database. World Bank provides data on many indicators that may have an effect on innovative capability. World Bank data are widely utilized in different research streams, and is therefore suitable for the purposes of this study.

3.3.Measurement

The dependent variable of the study is national innovation capability. It measures the ability to engage in and obtain favorable results from innovation efforts at the national level. It is operationalized by the innovation capability scores reported by WEF Global Competitiveness Index. Innovation capability measure from WEF covers all critical aspects of the innovation process, including inputs, outputs and commercialization. The concept has ten dimensions which are explained in Table 4. As observed in the table, innovation capability is measured with an aggregated score that is based on diverse scales. Besides object measures such as patent applications and scientific publications, WEF executive opinion survey constitutes an important part in the construction of the innovation capability score. Even though constructing country level indicators by the opinions of a limited number of business executives may seem questionable, meticulous procedures ensure the representativeness of the survey results. WEF selects its sample in line with national economic structures, ensuring the inclusion of diverse subjects in terms of industry, firm size and geographical coverage (WEF, 2019). The survey has also long been used by numerous research and practice-based organizations (WEF, 2019).

Table 4: Dimensions of national innovation capability

Dimension	*Measurement*	*Source*
Diversity of workforce	Response to the survey question "In your country, to what extent do companies have a diverse workforce (e.g. in terms of ethnicity, religion, sexual orientation, gender)?" [1 = not at all; 7 = to a great extent]	WEF Executive Opinion Survey
State of cluster development	Response to the survey question "In your country, how widespread are well-developed and deep	WEF Executive Opinion Survey

Dimension	*Measurement*	*Source*
	clusters (geographic concentrations of firms, suppliers, producers of related products and services, and specialized institutions in a particular field)?" [1 = non-existent; 7 = widespread in many fields]	
International co-inventions	Computed as the sum of the patent family applications with at least one co-inventor located abroad, filed in at least two of the major five (IP5) offices in the world	PATSTAT database
Multi-stakeholder collaboration	Average score of the following three Executive Opinion Survey questions: "In your country, to what extent do people collaborate and share ideas within a company?" [1 = not at all; 7 = to a great extent]; "In your country, to what extent do companies collaborate in sharing ideas and innovating?" [1 = not at all; 7 = to a great extent]; "In your country, to what extent do business and universities collaborate on research and development (R&D)?" [1 = do not collaborate at all; 7 =collaborate extensively]	WEF Executive Opinion Survey
Scientific publications	Number of publications and their citations, expressed at the country level	SCImago, Journal & Country Rank
Patent applications	Total number of patent family applications per million population	OECD, STI Micro-data Lab: Intellectual Property database
R&D expenditures	Expenditures on research and development (R&D), expressed as a percentage of GDP	World Bank, World Development Indicators database

Dimension	*Measurement*	*Source*
Research institutions prominence	Measures the prominence and standing of private and public research institutions	WEF calculations based on SCImago
Buyer sophistication	Response to the survey question "In your country, on what basis do buyers make purchasing decisions?" [1 = based solely on the lowest price; 7 = based on sophisticated performance attributes]	WEF Executive Opinion Survey
Trademark applications	Number of trademark applications per million population	World Intellectual Property Organization database

The independent variables represent institutional factors that affect national innovation capability and are measured by the six components of the Worldwide Governance Indicators. Each component covers an important facet of national institutional context and constructed with data collected from a large number of governmental, non-governmental and international organizations. Lastly, the study uses four control variables that reflect foreign direct investments, natural resource rents, urban population and human capital. All of the independent and control variables are explained in Table 5

Table 5: Independent and control variables

Name of the variable	*Description*	*Source (Measure)*
Control of corruption (st_cc)	The extent to which public power is exercised for private gain	WGI (Control of corruption component)
Regulatory quality (st_rq)	The ability of the government to formulate and implement policies and regulations that promote private sector development	WGI (Regulatory quality component)

Name of the variable	*Description*	*Source (Measure)*
Voice and accountability (st_va)	The extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media	WGI (Voice and accountability component)
Rule of law (st_rol)	The extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	WGI (Rule of law component)
Political stability and absence of violence/terrorism (st_ps)	The likelihood of the absence of political instability and/or politically motivated violence, including terrorism	WGI (Political stability and absence of violence/terrorism component)
Government effectiveness (st_ge)	The quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies	WGI (Government effectiveness component)
FDI inflow (st_fdiperc)	Foreign direct investment inflows as a percentage of GDP	WDI
Natural resources (st_natres)	Total natural resource rents as a percentage of GDP	WDI
Urban population (st_urbanpop)	Percentage of the population that live in cities	WDI
Human capital (st_hdi)	The collective skills, knowledge, or other intangible assets of a population	UNDP (Human Development Index)

3.4. Data Analysis

This section explains the methodological decisions in the treatment of the data and the empirical results of the model. The study utilizes a panel dataset that covers 121 countries over 11 years. Since the study uses data from different scales, all variables were standardized prior to analysis. The descriptive statistics are provided in Figure 5. Average values of independent and dependent variables through the years are provided in Figures 6 to Figure 16.

Figure 6: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
st_inno	1,331	-5.15e-15	1	-1.734044	2.740734
st_cc	1,331	-5.71e-17	1	-1.613672	2.299953
st_ge	1,331	-1.26e-16	1	-2.000437	2.380193
st_ps	1,331	3.06e-17	1	-3.120605	1.830558
st_rq	1,331	-3.39e-17	1	-2.745522	2.241176
st_rol	1,331	-8.41e-17	1	-2.459147	2.002182
st_va	1,331	-1.34e-16	1	-2.241667	1.77077
st_natres	1,331	-9.87e-16	1	-.6821276	5.572115
st_urbanpop	1,331	-2.45e-16	1	-2.360382	1.754526
st_hdi	1,331	1.05e-15	1	-2.552577	1.489043
st_fdiperc	1,331	-3.68e-16	1	-3.109233	21.38113

Figure 7: Average values of innovation capability

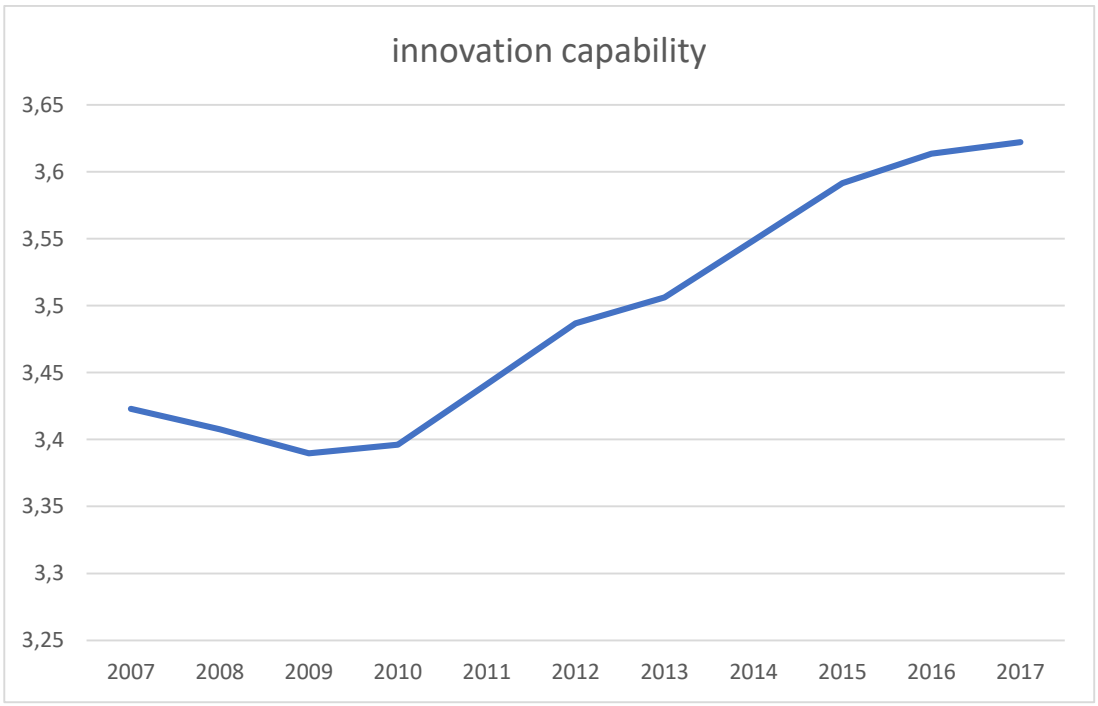


Figure 8: Average values of control of corruption

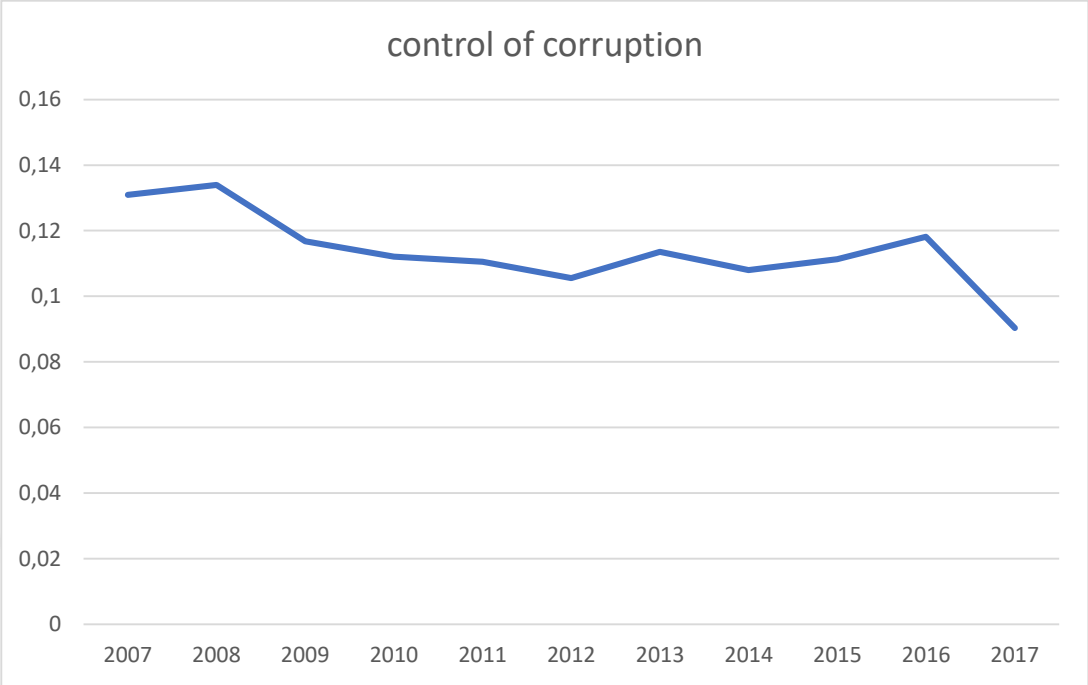


Figure 9: Average values of government effectiveness

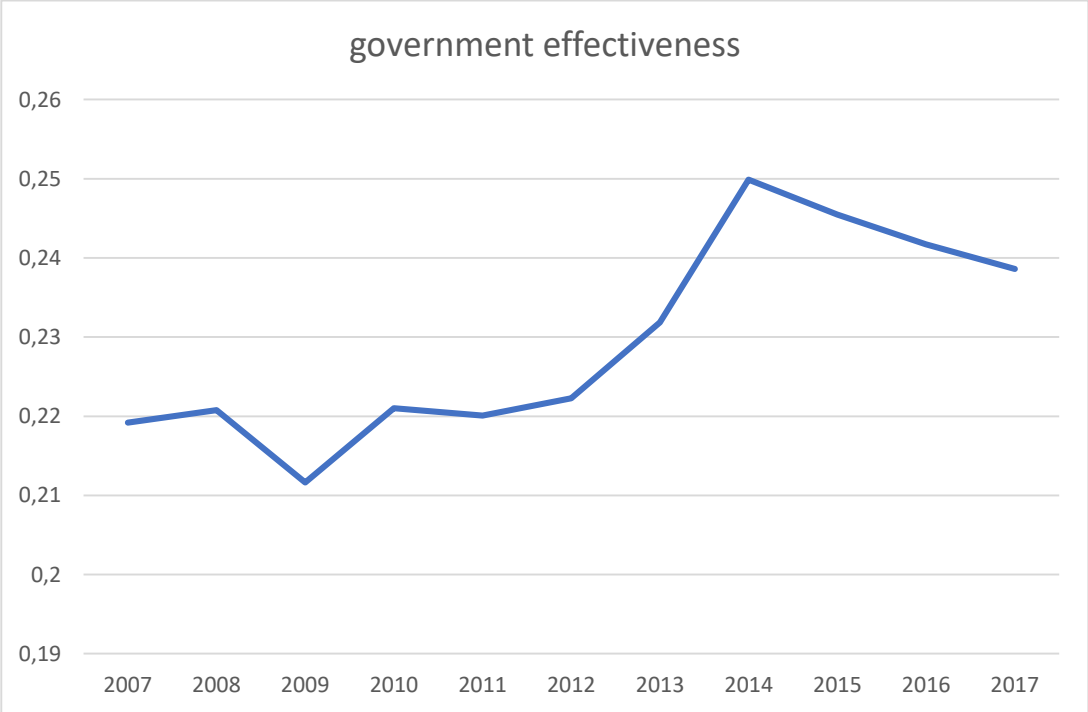


Figure 10: Average values of political stability and absence of violence/terrorism

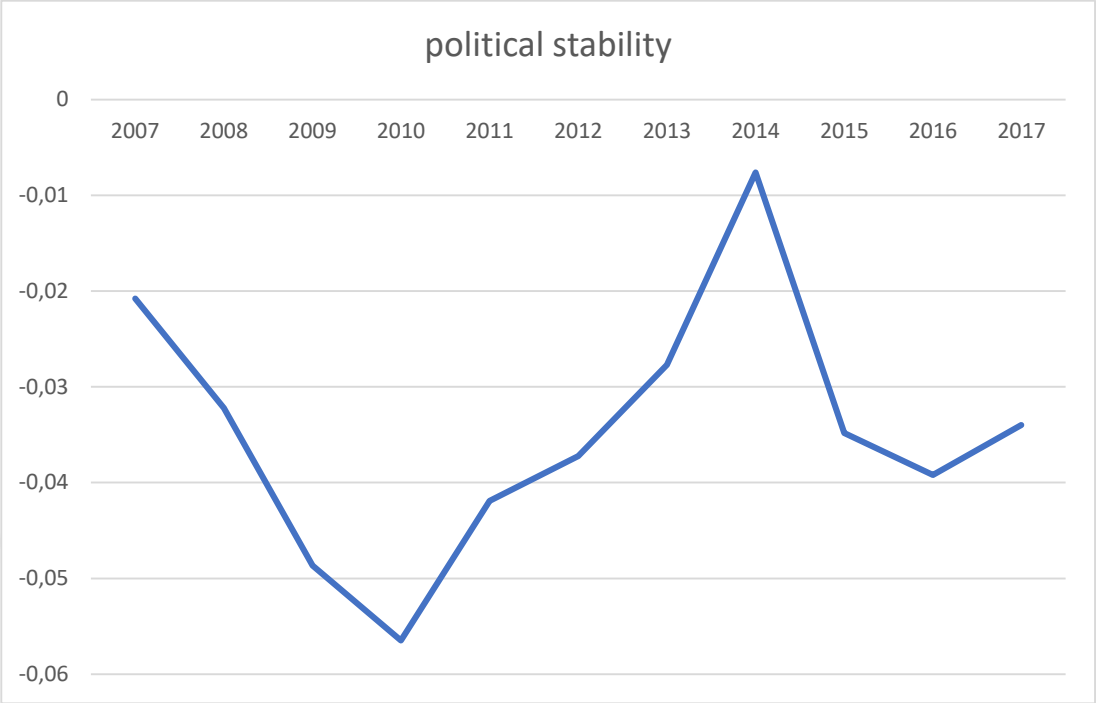


Figure 11: Average values of regulatory quality

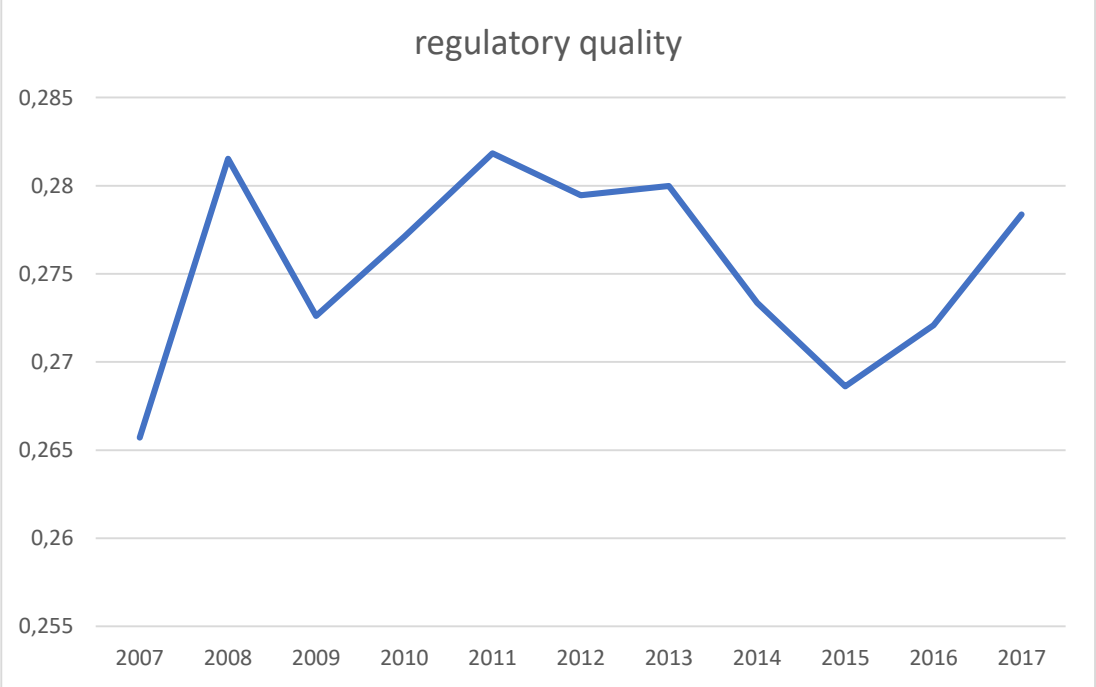


Figure 12: Average values of rule of law

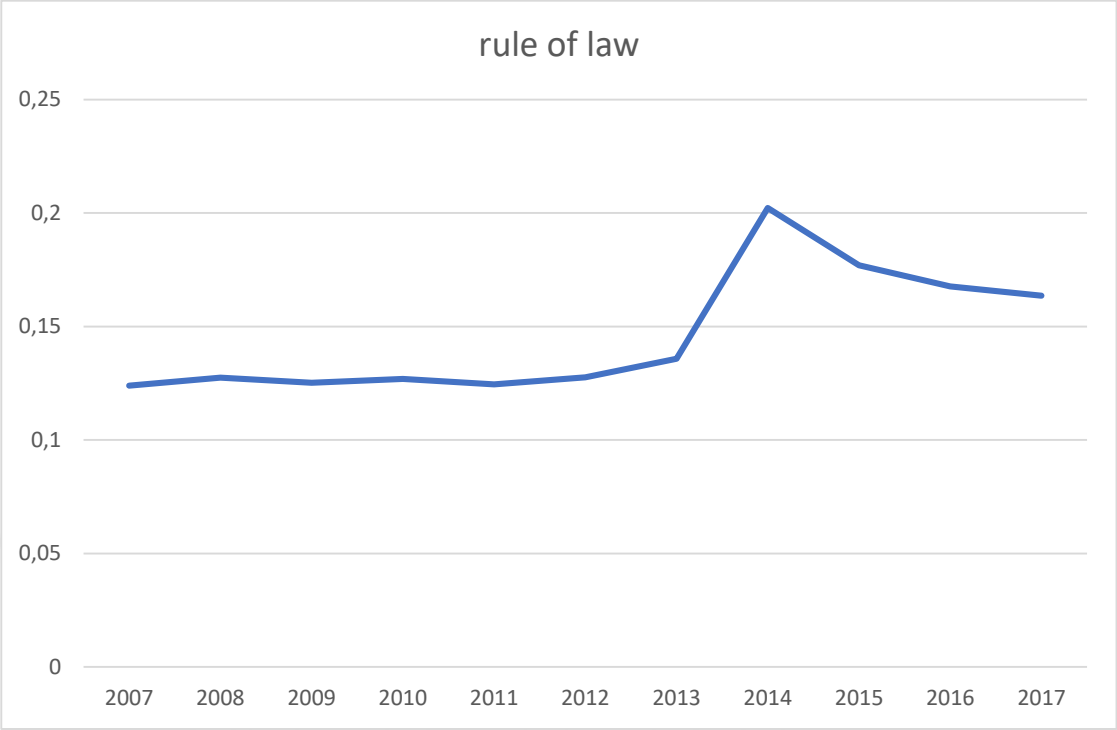


Figure 13: Average values of voice and accountability

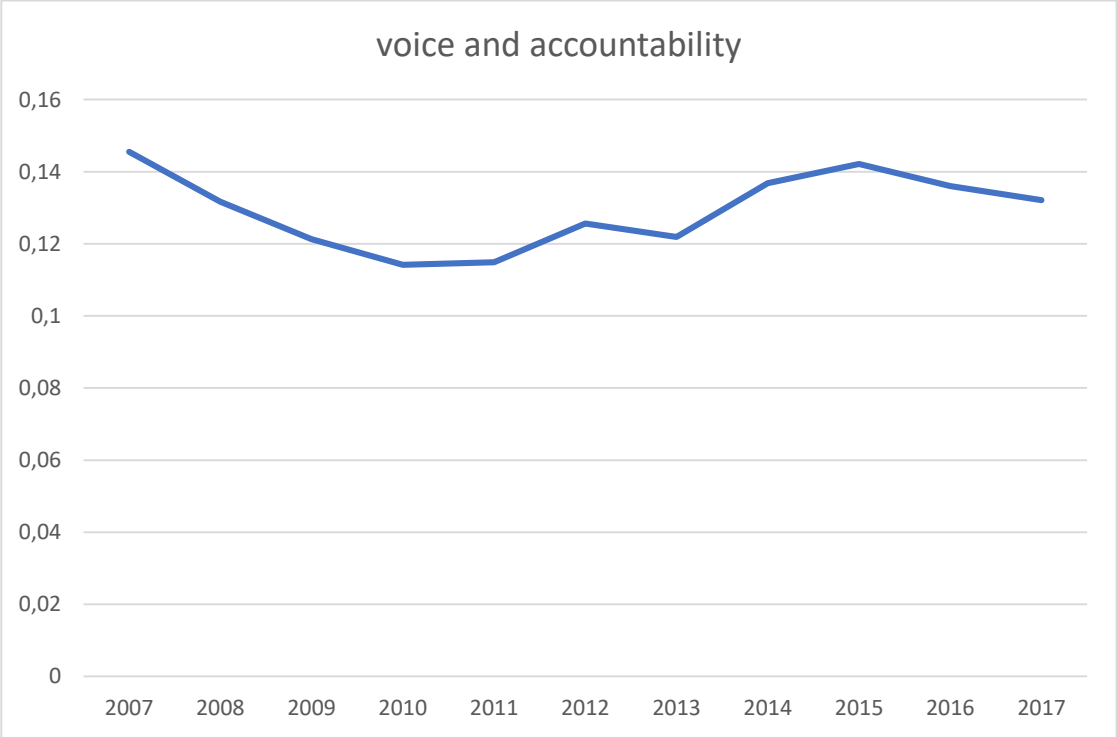


Figure 14: Average values of FDI inflows

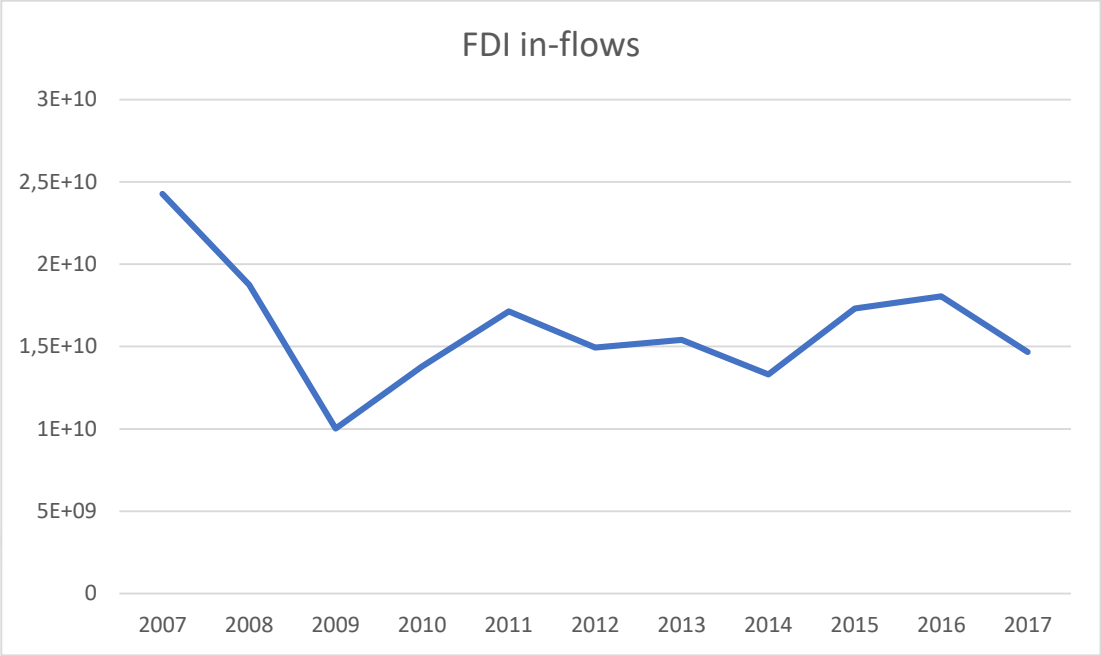


Figure 15: Average values of urban population rate

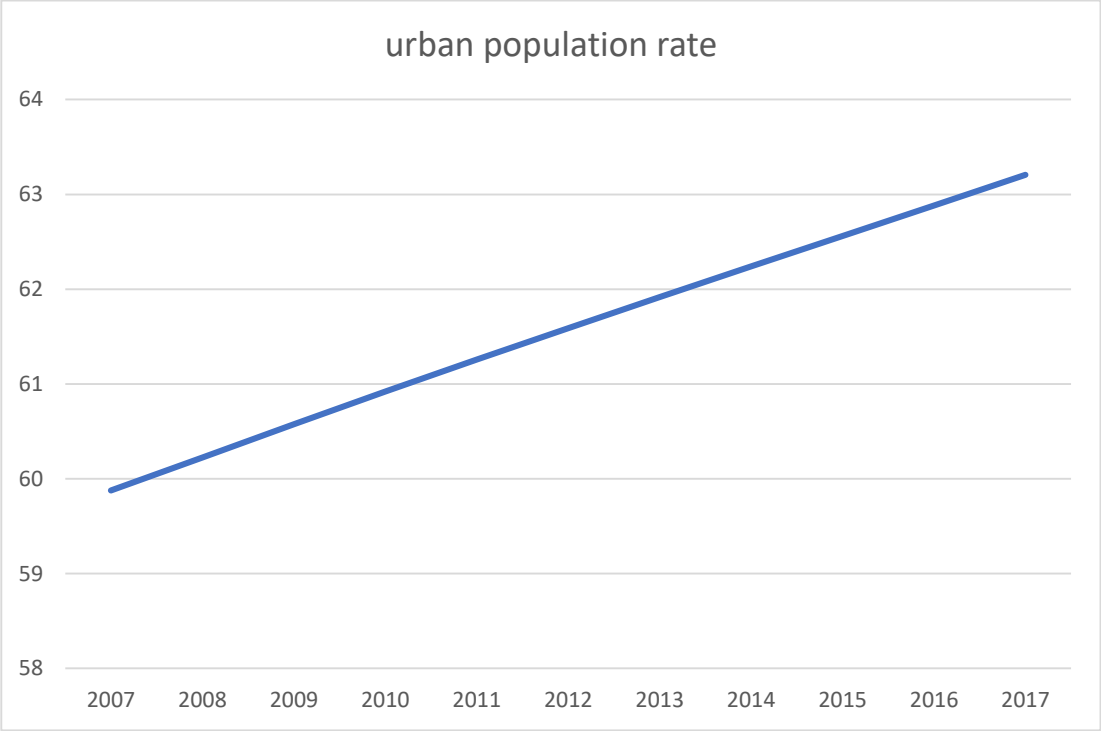


Figure 16: Average values of natural resource richness

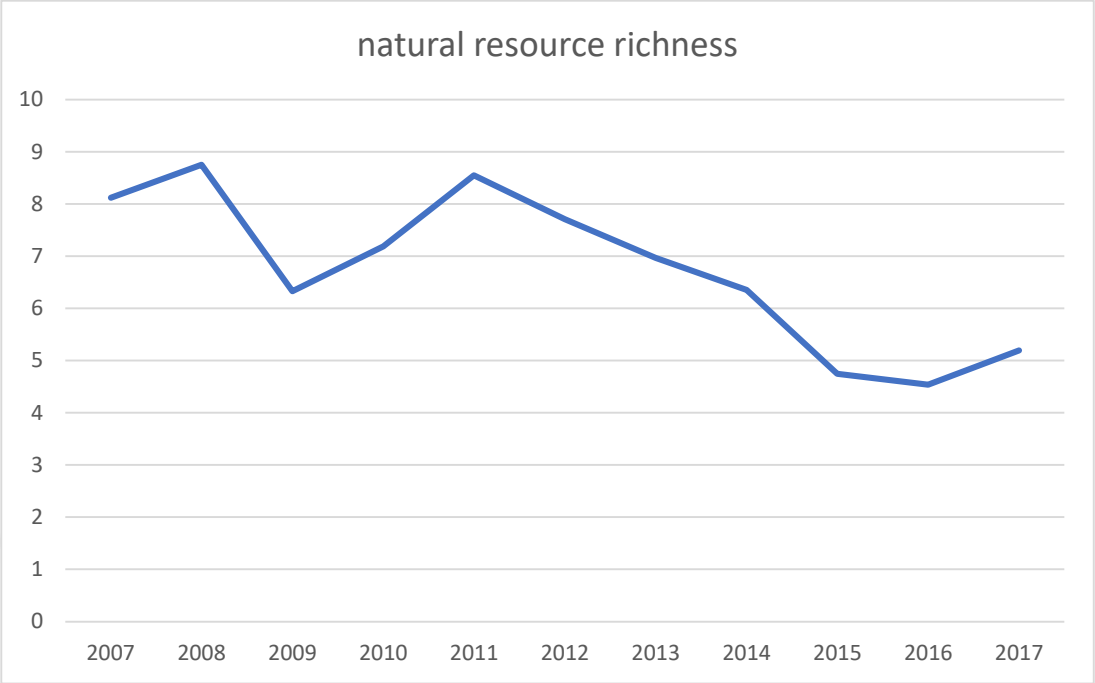
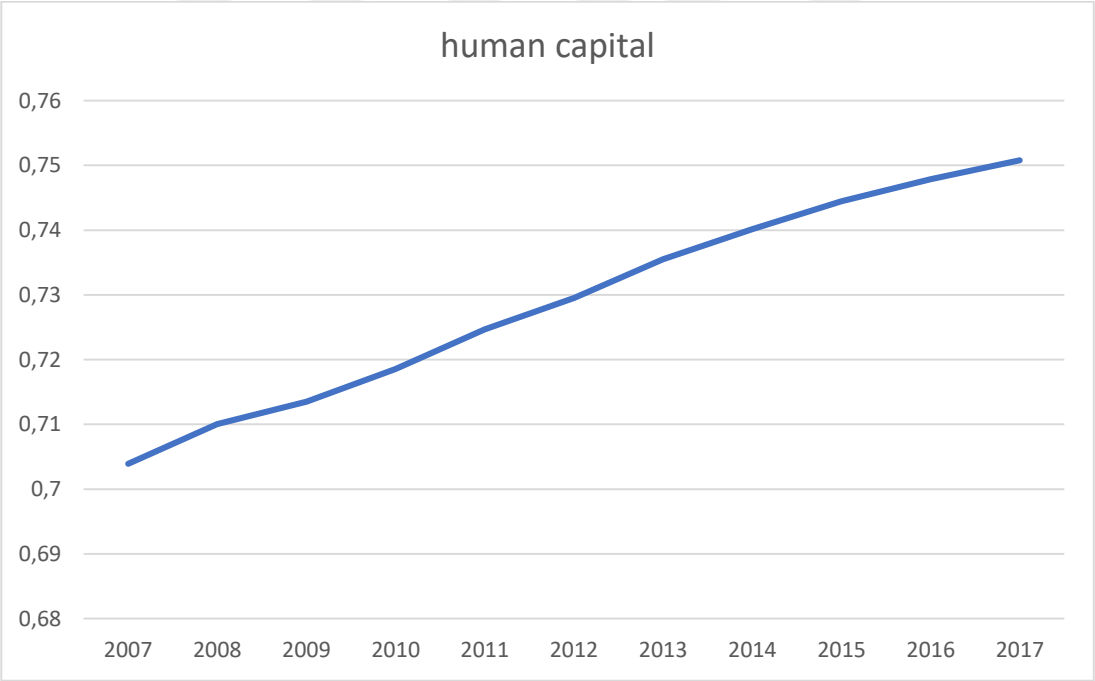


Figure 17: Average values of human capital



In order to ensure that proper estimation methods are used, the data was checked for endogeneity, heteroskedasticity, autocorrelation and cross-sectional dependence. Before checking the data for potential measurement problems, the first issue that was taken into account was endogeneity. Endogenous variables present an important obstacle to accurate measurement in panel data models, so endogeneity must be accounted for and dealt with if it

exists in the data (Baltagi, 2008). Endogeneity exists in an empirical model if an independent variable is correlated with the error term. This correlation generally stems from two issues: 1) important variables may be missing from the model (omitted variable bias), 2) the dependent variable may be a predictor of an independent variable and not simply a response to it (Baltagi, 2008). Comprehensiveness of the model in this study was attempted to be ensured by covering institutions as wide as possible. In addition, possibly related control variables were added into the model to control for omitted variable bias. The second source of endogeneity was also considered in this study. Although rare studies view institutions as endogenous to innovation (e.g. Wang, 2013), most of the literature is silent on the issue. Furthermore, institutional effects on a variety of outcomes have been shown as exogenous by different studies (e.g. Shvetsova, 2003; Lee, 2019; DellaPosta, Nee & Opper, 2016). Therefore, it is the author's judgment in this study that institutions can be evaluated as exogeneous to innovation. The control variables were also selected purposively in order to refrain from endogeneity problem. To sum up, the values of all the independent variables are highly unlikely to be significantly changed by the dependent variable in the defined time period.

After establishing the exogeneity of independent variables, the choice between random and fixed effects estimation was concluded by Breusch-Pagan and Hausman tests. The results are provided below:

Figure 18: Breusch-Pagan test results

```
Breusch and Pagan Lagrangian multiplier test for random effects

        st_inno[i1,t] = Xb + u[i1] + e[i1,t]

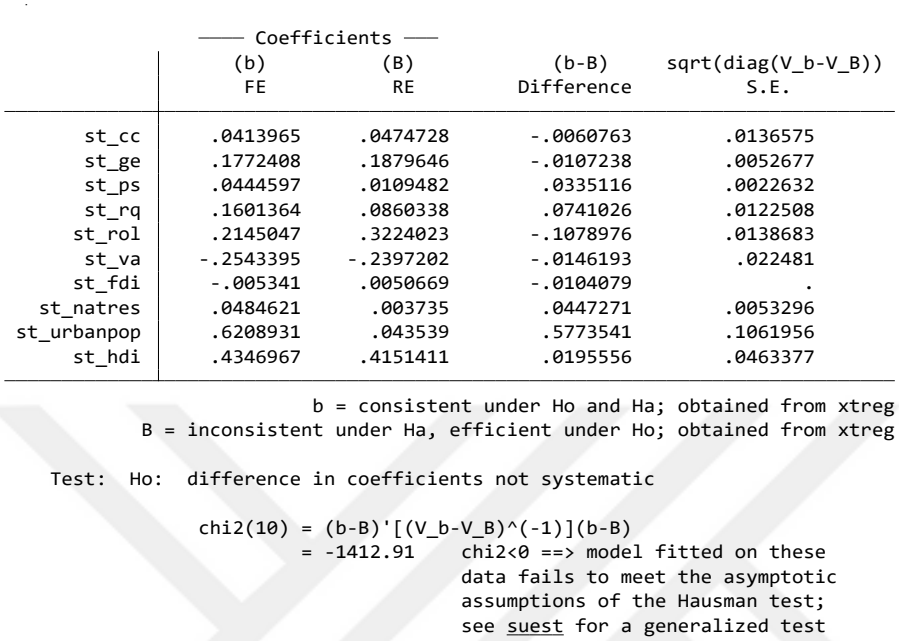
        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+------------------------------
                 st_inno |         1              1
                       e |  .0397771       .1994419
                       u |  .1977747       .4447187

        Test:   Var(u) = 0
                             chibar2(01) =  3756.99
                          Prob > chibar2 =   0.0000
```

The zero hypothesis of homoskedasticity is rejected as a result of the Breusch-Pagan test and it is apparent the model should not be estimated with pooled ordinary least squares

method. After, Hausman test was made in order to decide between fixed and random effects estimation:

Figure 19: Hausman test results



	Coefficients (b) FE	(B) RE	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
st_cc	.0413965	.0474728	-.0060763	.0136575
st_ge	.1772408	.1879646	-.0107238	.0052677
st_ps	.0444597	.0109482	.0335116	.0022632
st_rq	.1601364	.0860338	.0741026	.0122508
st_rol	.2145047	.3224023	-.1078976	.0138683
st_va	-.2543395	-.2397202	-.0146193	.022481
st_fdi	-.005341	.0050669	-.0104079	.
st_natres	.0484621	.003735	.0447271	.0053296
st_urbanpop	.6208931	.043539	.5773541	.1061956
st_hdi	.4346967	.4151411	.0195556	.0463377

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= -1412.91 chi2<0 ==> model fitted on these data fails to meet the asymptotic assumptions of the Hausman test; see suest for a generalized test

Schreiber (2008) notes that a negative chi-square score obtained from the Hausman test is interpreted as the rejection of the null hypothesis. In other words, fixed effects estimation should be used for this model instead of random effects estimation.

After testing for the suitability of pooled OLS and fixed/random effects decision, other assumptions of the panel data models were tested in order to determine the best estimation method. Testing for heteroskedasticity was the next step. The result of the modified Wald test confirms the existence of heteroskedasticity in the data (see Figure 8).

Figure 20: Modified Wald test results

```
Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (121)  =   4580.30
Prob>chi2 =      0.0000
```

After confirming heteroskedasticity, the data was tested for autocorrelation by using the Baltagi-Wu test (see Figure 9). Baltagi & Wu (1999) predicts there is no autocorrelation if the

Baltagi-Wu LBI value is close to two. In the current model, the test value is 0,857. Therefore, it can be interpreted that autocorrelation exists in the data.

Figure 21: Autocorrelation test results

```
FE (within) regression with AR(1) disturbances  Number of obs     =      1,210
Group variable: i1                              Number of groups  =        121

R-sq:                                           Obs per group:
     within  = 0.0787                                         min =         10
     between = 0.4782                                         avg =       10.0
     overall = 0.4637                                         max =         10

                                                F(10,1079)        =       9.21
corr(u_i, Xb)  = -0.8223                        Prob > F          =     0.0000
```

st_inno	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
st_cc	.0414484	.0552294	0.75	0.453	-.0669207	.1498176
st_ge	.0513191	.0499715	1.03	0.305	-.0467333	.1493714
st_ps	.0316496	.0246233	1.29	0.199	-.0166654	.0799647
st_rq	.0578972	.0513559	1.13	0.260	-.0428714	.1586659
st_rol	.1915547	.0611074	3.13	0.002	.0716518	.3114575
st_va	-.0326037	.0551199	-0.59	0.554	-.1407581	.0755507
st_fdi	.0063263	.0087028	0.73	0.467	-.0107501	.0234027
st_natres	.024757	.0169504	1.46	0.144	-.0085024	.0580163
st_urbanpop	1.074879	.2905568	3.70	0.000	.5047581	1.644999
st_hdi	.4465107	.1371455	3.26	0.001	.1774085	.7156128
_cons	-.0240685	.0054249	-4.44	0.000	-.034713	-.0134239
rho_ar	.7047849					
sigma_u	1.2477846					
sigma_e	.14270595					
rho_fov	.98708896	(fraction of variance because of u_i)				

```
F test that all u_i=0: F(120,1079) = 10.98                     Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = .61869026
Baltagi-Wu LBI = .85706371
```

Lastly, following De Hoyos & Sarafidis (2006), Pesaran CD test was applied in order to determine cross-sectional dependence (see Figure 10). As the test result shows, the null hypothesis is rejected, which means there is cross-sectional dependence in the data.

Figure 22: Cross sectional dependence test results

```
Average correlation coefficients & Pesaran (2004) CD test

Variables series tested: residf
                              Group variable: i1
                           Number of groups: 121
                  Average # of observations: 11.09
                                  Panel is: unbalanced
```

Variable	CD-test	p-value	corr	abs(corr)
residf	14.57	0.000	0.052	0.410

```
Notes: Under the null hypothesis of cross-section
       independence CD ~ N(0,1)
```

After completing the preliminary tests, the data is diagnosed with heteroskedasticity, autocorrelation and cross-sectional dependence. In addition, fixed effects estimation is shown to be more suitable for the model. Driscoll & Kraay (1998) developed an estimation method that obtains robust standard errors in the case of cross-sectional dependence. Hoechle (2007) confirmed the effectiveness of the estimator and later, Vogelsang (2012) reported that the method can also be applied when heteroskedasticity and autocorrelation exists. Taking all these factors into account, Driscoll-Kraay estimator was chosen as the most suitable method for estimation. In addition, the population of countries were divided into two as high-upper middle income group and low-lower middle income group in order to see which variables are significant for each income group. World Bank classification was applied for this segmentation. Then, the two groups countries were analyzed separately. Three models were estimated in total. Analysis results for the whole population and the two income groups are provided in Table 6.

Table 6: Analysis results

Dependent Variable: Innovation Capability				
	Model 1 (All countries)	*Model 2 (High income)*	*Model 3 (Upper middle income)*	*Model 4 (Lower middle and low income)*
Control of corruption	0,04 (0,052)	-0,034 (0,124)	0,004 (0,041)	0,24** (0,076)
Government effectiveness	0,177** (0,062)	-0,025 (0,435)	0,361*** (0,029)	-0,153 (0,138)
Political stability and absence of violence/terrorism	0,044* (0,02)	0,087 (0,061)	0,148*** (0,025)	0,041 (0,047)
Regulatory quality	0,157*** (0,04)	0,350** (0,118)	0,221*** (0,048)	0,203* (0,091)
Rule of law	0,219* (0,088)	0,087 (0,470)	-0,04 (0,142)	0,547*** (0,095)
Voice and accountability	-0,255*** (0,043)	-1,086 (0,766)	-0,152 (0,079)	-0,543*** (0,061)
FDI	-0,003 (0,003)	-0,005 (0,013)	-0,001 (0,036)	-0,092 (0,063)

Natural resources rents	0,048** (0,017)	-0,026 (0,128)	-0,034 (0,074)	0,271*** (0,054)
Urban population	0,622*** (0,091)	0,168 (0,501)	0,762*** (0,093)	1,455*** (0,294)
Human capital	0,431*** (0,104)	0,695 (0,597)	0,108* (0,46)	0,725** (0,218)
Number of observations	1331	528	352	451
Number of countries	121	48	32	41
F-value	10024,2	205,95	2582,21	22013,44
R-square	0,2501	0,0231	0,3359	0,3623
*p<0,05 **p<0,01 ***p<0,001				

Analysis results show that five of the six institutional variables are significant in predicting innovation capability in Model 1. Also the control variables except for foreign direct investment show significant effects on innovation capability. In Model 2, only regularity quality is significant. In Model 3, control of corruption, regulatory quality, rule of law and voice and accountability are significant. And for low income countries, control of corruption, regulatory quality, rule of law and voice and accountability is significant. An evaluation of the hypotheses in each model is provided below.

Table 7: Evaluation of the hypotheses

#	*Hypotheses*	*Model 1 (All countries)*	*Model 2 (High income group)*	*Model 3 (Upper-middle income group)*	*Model 3 (Lower-middle and low income group)*
1	Government effectiveness is positively related to	Supported	Not supported	Not supported	Not supported

#	*Hypotheses*	*Model 1 (All countries)*	*Model 2 (High income group)*	*Model 3 (Upper-middle income group)*	*Model 3 (Lower-middle and low income group)*
	national innovative capabilities				
2	Control of corruption is positively related to national innovative capabilities	Not supported	Not supported	Supported	Supported
3	Regulatory quality is positively related to national innovative capabilities	Supported	Supported	Supported	Supported
4	Rule of law is positively related to national innovative capabilities	Supported	Not supported	Supported	Supported
5	Political stability and absence of violence/terrorism is positively related to national innovative capabilities	Supported	Not supported	Not supported	Not supported
6	Voice and accountability is positively related to national innovative capabilities	Not supported	Not supported	Not supported	Not supported

The next chapter discusses and summarizes the research findings for all groups of countries, and provides theoretical and practical implications of the results.

4.DISCUSSION

This study investigated the relationships between formal institutions and innovative capabilities at the country level. This chapter includes a discussion of the major findings and how they relate to the larger literature. In addition, implications for policy makers are provided. The chapter concludes with a discussion of the limitations of the study, potential future research areas and a brief summary.

The study set out to pursue answers for two research questions:

1) What is the relationship between formal institutions and national innovation capabilities?
2) Do institutions have the same effect on innovation in countries from different income groups?

Regarding the first research question, this study supports the general findings in the literature. All institutional variables except voice and accountability were found to be positively related to innovation capability in one or more country groups. Therefore, the dominant view that better institutions bring better innovation performance is supported by the findings. On the other hand, the negative relationship between voice and accountability and innovation capability is an unorthodox result. Democracy have been argued to contribute to economic development by many studies (e.g. Lehkonen & Heimonen, 2015; Feng, 1997). But research on democracy and innovation is still immature as it was explained in the literature review and methodology sections. More empirical studies are needed on the topic in order to reach broad generalizations. The relationship between democracy and innovation may have different underlying dynamics. One explanatory argument about this result can be established through a political stability lense. This finding may be explained by two arguments. Some studies have shown that political stability fosters innovation even if the regime have authoritarian tendencies (Coccia, 2017). Therefore, political stability may have suppressed the disadvantages of lower levels of democracy in terms of innovation capability.

The second research question is addressed by the analysis results for different income groups. The findings show that institutions do not have the same effect on innovation capability for different country groups. First of all, only regulatory quality has a significant positive effect for all groups of countries in the chosen time period. Regularity quality represented the ability of governments to formulate and implement policies that supported private sector development. Its significance in all groups indicates that private sector is the primary engine of innovativeness

for the population of selected countries. Second, government effectiveness is significant only in the model with all countries. It is not significant for any of the subgroups, but when its effect is combined for all countries it becomes significant. This shows that government effectiveness is an important variable for the overall result but it is not a critical component in innovativeness for independent groups of countries. Thirdly, control of corruption is a significant contributor to innovation capability for upper-middle, lower-middle and low income countries even though it is not significant in models 1 and 2. This shows that corruption continues to be an important impediment to innovation for a high number of developing and least developed countries. Fourth, rule of law is significant in all groups except high-income countries. Consistent with the larger literature, appropriation of benefits seems to be a key concern for innovation efforts. Fifth, political stability and absence of violence/terrorism was significant only in the model with all countries. Similar to government effectiveness, its positive effect can not be observed in separate groups but when all countries are combined. And lastly, voice and accountability was significantly and negatively related to innovation capability in all groups. As explained above, more studies are needed to conclude whether seasonal factors affected the relationship between the variables.

In this study, I tested six hypotheses. The first hypothesis proposed a positive relationship between government effectiveness and national innovation capabilities. Government effectiveness "captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies" (World Bank, 2019). In summary, government effectiveness measures the extent of bureaucratic efficiency in a country. There are many studies that highlight the important role of of government efficiency in facilitating innovation. For instance, Kang & Park (2012) showed that governmental funding of R&D projects stimulated R&D efforts by private firms. Similarly, Chen & Yang (2019) found a positive relationship between tax credit supports and firm level innovative outputs. Alfranca & Huffman (2003) and Zhu et al. (2019) showed the favorable effect of government incentives on innovation inputs and outputs in emerging markets. Egan (2013) found that multinational firms are more likely to locate R&D activities in developing countries with a high level of government effectiveness. Overall, the literature generally reports positive relationships between government effectiveness and national innovation capabilities. The analysis results also suggest the same relationship. In other words, this study confirms the general point of view in the literature.

The second hypothesis proposed a positive relationship between control of corruption and national innovation capabilities. Control of corruption "captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as capture of the state by elites and private interests" (World Bank, 2019). Corruption has consistetly been reported as an adverse effect on innovation and entrepreneurship over a long time period. Adverse effects on innovation perspectives (Pirtea, Sipos & Ionescu, 2019), decreases in innovation and entrepreneurship levels (Anokhin & Schulze, 2009) and diversion of resources from innovative activities (Spinesi, 2009) are among the negative consequences of corruption. On the other hand, some studies claim corruption can help innovation by compensating for lack of proper institutional structures in emerging country contexts (Xie, Qi & Zhu, 2019; Krammer, 2019). The results of this study show that the second hypothesis is supported for upper-middle, lower-middle and low income countries. This indicates that control of corruption brings significant improvements to innovation capabilities of the developing and the less developed world.

The third hypothesis proposed a positive relationship between regulatory quality and national innovation capabilities. Regulatory quality captures "perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development" (World Bank, 2019). Governments have a variety of regulation tools that affect the quantity and direction of innovation efforts. In this regard, some scholars point to the negative effects of employment protection, unionization and intensive regulation (Filippetti & Guy, 2020; Ferrett & Zikos, 2013; Barbosa & Faria, 2011) while other studies demonstrate adverse effects of job precariousness and high unemployment on innovation levels (Kleinknecht, van Schaik & Zhou, 2014; Gatti, 2000). Regulatory pressures on different sectors are other important influences on the type and quantity of innovations (Marin & Zanfei, 2019; Bradshaw, 2017; Pyka, Buchmann & Vermeulen, 2017). Governments can also encourage innovative activity through tax policy (Jia & Ma, 2017) and easing access to finance (Fombang & Adjasi, 2018; Heredia-Perez et al., 2019). Regulations in corporate governance systems also play an important role in shaping firm-level innovation (Beloc, 2013; Malen & Vaaler, 2017). There is an overall agreement on governments' important role in facilitating an innovation inducing environment through the use of various regulative methods. The analysis results support the third hypothesis for all country groups. This indicates that governments have significant power over innovation processes even in more developed countries.

The fourth hypothesis proposed a positive relationship between rule of law and national innovation capabilities. Rule of law "captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence" (World Bank, 2019). Especially IPR regimes attracted a lot of attention in this vein. For a majority of the studies on IPR, strong IPR regimes are a necessary condition facilitating innovation (Sun et al., 2017; Bravo-Ortega, 2012; Pisani & Ricart, 2018). This study found support to the hypothesis for all country groups except high income countries. This finding may be explained by diminishing marginal returns to rule of law in high income countries.

The fifth hypothesis proposed a positive relationship between political stability and absence of violence/terrorism and national innovation capabilities. Political stability and absence of violence/terrorism "measures perceptions of the likelihood of political instability and/or politicallymotivated violence, including terrorism" (World Bank, 2019). Although there are not many studies on the issue, existing evidence generally suggests a positive influence of this variable (Ho et al., 2018; Kim, 2011). The study also supports the fifth hypothesis. Since political stability and absence of violence/terrorism are fundamental to a foreseeable future, they carry great importance for innovation efforts which are costly and risky. Therefore, the findings of this study about political stability and absence of violence/terrorism are congruent with the larger literature.

The sixth hypothesis proposed a positive relationship between voice and accountability and national innovation capabilities. Voice and accountability "captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media" (World Bank, 2019). This variable is a reliable measure for the level of democracy in a country. The effect of voice and accountability on innovation is a largely neglected area in the literature. Among the very few articles on the issue, Comin & Hobijn (2009) concluded that lobbying is an important barrier to technology diffusion. Kim (2011) shows that democratic institutions matter for innovation, but his dataset is limited to OECD countries. As a result, the research on voice and accountability is still immature and inconclusive. This study found no support for the sixth hypothesis in any country group. Actually, I found negative relationships. As explained above, political stability may be inversely related to voice and accountability. And it should be noted that the Worldwide Governance Indicators measure perceptions rather than objective

phenomena. Therefore, issues in sampling or other phases may have caused distortions in the data. In conclusion, more studies are needed on the issue to reach better conclusions

The findings of the study showed that different institutions were more important for different country groups. It indicates that governments should focus their efforts to develop these institutions. Especially developing and less developed countries have tighter budgetary constraints which force them to make prioritizations. So, each group should direct their limited resources to improve the most important areas. Regulatory quality is important for all groups and governments should increase their efforts to strengthen market institutions in order to pave the road to innovation for the private sector. Government effectiveness and political stability and absence of violence/terrorism were not found significant for any group even though they were significant for the overall population. Therefore, their prioritization would be a luxury cost for developing and less developed countries. On the other hand, rule of law and control of corruption are important for the developing world. So, countries that want to catch-up with the developed world should pay great attention to these institutional factors. Improvement on these dimensions will probably lead to a virtuous circle since they are critical in laying the foundation for an efficient economic system (Acemoglu & Robinson, 2012).

Regarding the control variables, natural resource rents, urban population and human capital are significant while FDI is insignificant. Natural resource rents, urban population rate and human capital have a significantly positive relationship with national innovation capabilities in all models except high income countries. Therefore, the natural resource curse hypothesis was falsified in this study. Natural resources are probably an important source of income which is necessary for innovation efforts. Urban population and human capital on the other hand returned expected results. Since innovation requires a collective effort of highly qualified individuals, it is more likely to happen in urban areas rather than rural ones. And human capital is fundamental to a country's innovation capability since it represents the quality of its workforce.

Besides its interesting theoretical and practical implications, the study has several limitations. First of all, the data covers an eleven-year time period between 2007-2017. Institutions are relatively stable structures that resist change (North, 1991). So, this time period may not be long enough to observe institutional change. Nevertheless, the findings show that there is a meaningful relationship between institutions and innovation in the short term. Nevertheless, their inclusion in the empirical models would yield more comprehensive results. Second, institutions could be covered by more dimensions. Especially informal institutions such

as national culture were omitted purposively since they are out of the scope of this study. Thirdly, the data used in this study were obtained from secondary sources. Therefore, they are measuring concepts according to the assumptions of data collecting organizations. For example, World Bank data is generally depending on surveys which measure perceptions rather than objective phenomena. But they are widely used in the literature since data availability is an important constraint in this type of research. In addition, collecting country level data is a large scale endeavor that can be done only by international organizations. So, using the readily available secondary data was the only choice in this research. Fourth, the number of countries could be higher but data availability constrained sample section as well.

Other than its practical implications, the study also aimed to guide future research by spotting gaps in the literature. Firstly, innovation is mostly measured by its outputs or inputs in most studies. Since it is a more comprehensive process, innovation should be measured by more exhaustive tools. This study included a rarely used measure of innovation that covers the whole process. Future studies may develop new initiatives to address this issue. Second, as demonstrated in the literature review part, the research interest has been focused on innovation inputs and outputs. This results in a lack of studies on different innovation types, governance of innovation and the development process of innovations. These topics present a fruitful research avenue for interested scholars. Thirdly, the institution-innovation relationship has been handled as a static one in most studies. More emphasis on co-evolution of institutions and innovations may open new paths in front of aspiring researchers. And lastly, there is a lack of studies that compare countries in terms of their national innovation systems. Comparative case studies constituted a small percentage of overall articles. It needs to be given more attention in order to obtain insights about how institutions and innovation efforts interact in unique country contexts.

5. CONCLUSION

To sum up, this study is motivated by theoretical arguments that institutional quality positively affects national innovation capability. It aims to provide empirical analyses on the relationship between these two concepts. By estimating panel data models on different group of countries, the study found evidence supporting a series of arguments.

First, institutions have a direct effect on innovation capability. This relationship is robust after controlling for cross-sectional dependence, autocorrelation and heteroscedasticity. All independent variables except voice and accountability positively affect innovation capability in

one or more country groups. By finding this relationship, the study provided support to the widely held belief that institutional quality and innovation capability are positively related at the country level. Second, voice and accountability was found to be negatively related to innovation capability in all groups. This result contradicts with the conventional assumptions about democracy and innovation. This kind of relationship may be due to a seasonal effect during the selected time period or due to the suppression of the positive effect of voice and accountability by political stability and absence of violence/terrorism. More empirical studies are needed to reach exhaustive conclusions.

Second, institutions have different effects on innovation capability for different country groups. Regulatory quality is the only variable that is significant for all groups. Government effectiveness and political stability and absence of violence/terrorism were not found significant for any independent group even though they were significant in the model included all the sample. Lastly, rule of law and control of corruption were significant for upper-middle, lower-middle and low income groups.

Third, findings have implications for policy makers. Governments from all income groups should increase their efforts to strengthen market institutions that aim to develop the private sector. Developing and less developed countries should focus on improving their legal systems and controlling corruption in order to catch-up with the developed in terms of innovation capabilities.

Lastly, the study opens future research paths. Governance of innovation, different innovation types and innovation development process are potential research areas that calls for an institutional perspective. In addition, new tools for measuring innovation will enable future studies to make original contributions.

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
Abdallah A.-H. (2016)	Does credit market inefficiency affect technology adoption? Evidence from Sub-Saharan Africa	Two stage least squares (2SLS)	The study finds that the relationship between credit and technology adoption is one-way causal relation (i.e. credit access leads to technology adoption) as opposed to a two-way relation (i.e. mutual dependent relation). Further, the results indicate that credit market inefficiency can be a major barrier to the adoption of yield enhancing technologies in Sub-Saharan Africa	Technology adoption	Access to finance	Formal
Afonso O. (2016)	Effects of labour-market institutions on employment, wages, R&D intensity and growth in 27 OECD countries: From theory to practice	Mathematical modelling	On average, the obtained results also reveal that: Continental-European countries present the highest skilled-labour share in production; Eastern-European countries record the highest size of R&D spill-overs; Nordic countries have the highest share of skilled labour in the total population, R&D intensity, and proportionality factor related to the generosity of the (unemployment)benefits; and Eastern-Asian countries have the highest unskilled-labour share in production	R&D intensity	Labor market regulation	Formal
Aguilar-Barceló J.G., Higuera-Cota F. (2016)	Challenges in innovation management for Latin America and the Caribbean: An efficiency analysis	Data envelopment analysis	Where the region performs best is on infrastructure and adaptation of information and communication technologies (ICTs), but there are problems with human capital formation, the conduct and impact of research, and institutional aspects. The output of countries such as Chile and Colombia proved lower than expected given	Innovation index	Infrastructure, institutional dimensions	Formal

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			their factors, meaning that their strong innovation results are not matched by their efficiency management. Enhancing market functioning (competition, credit and investment) and knowledge absorption capacities is among the main challenges for the region			
Akkermans D., Castaldi C., Los B. (2009)	Do 'liberal market economies' really innovate more radically than 'coordinated market economies'?. Hall and Soskice reconsidered	Quantile regression	Our results indicate that Hall and Soskice's conjecture cannot be upheld as a general rule, but that it survives closer scrutiny for a substantial number of industries and an important dimension of radicality.	Liberal/coordinated market	Radical/incremental innovation	Formal
Alam A., Uddin M., Yazdifar H. (2019)	Institutional determinants of R&D investment: Evidence from emerging markets	Generalized method of moments	The results show that among the institutional determinants, corruption of a particular emerging country is found to be most important in influencing R&D investment followed by regularity quality, government effectiveness, rule of law, and political instability.	WGI	R&D investment	Formal

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Alcorta L., Peres W. (1998)	Innovation systems and technological specialization in Latin America and the Caribbean	Descriptive statistics	The innovative performance of LAC's innovation systems, with the only exception perhaps of Mexico, as measured by the ITS, is low in absolute terms and has lost relatively to many countries that started at similar levels twenty years ago. Furthermore, LAC exports are relatively less geared today to the most technologically advanced products than what they were in the mid-1970s	National innovation systems	Number of patents, technological specialization	Formal
Alfranca O., Huffman W.E. (2003)	Aggregate private R&D investments in agriculture: The role of incentives, public policies, and institutions	Panel data	We find strong impacts of incentives, public policies, and institutions on private aggregate agricultural R&D investment; we find interactions between public policies and institutions. Furthermore, for the EU countries in this study, the evidence is that public agricultural R&D crowds-out private agricultural R&D investments at low levels of private R&D, but at high levels of private R&D, they are complementary	Government incentives, public policy	R&D investment	Formal
Andersen M.S. (1999)	Governance by green taxes: implementing clean water policies in Europe 1970–1990	Comparative case study	It is argued that institutionalized practices of public policy making influenced the specific design of the four water pollution control programs, including the design and role of economic instruments, and that the regulatory design in turn affected the degree to which	Government incentives, public policy, regulatory environment	Technological innovation	Formal

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			the incentives provided by the economic instruments were able to influence the behavior of the polluters.			
Anokhin S., Schulze W.S. (2009)	Entrepreneurship, innovation, and corruption	Panel data	We posit that better control of corruption will also be associated with rising levels of innovation and entrepreneurship. Absent such trust, however, monitoring and other transactions cost should restrict the scale and scope of trade and thus, hamper productivity and investment in innovation and entrepreneurship. Longitudinal data from 64 nations lends support to our propositions, thus helping unpack the puzzling relationship between entrepreneurship, innovation, and corruption	Corruption, rule of law	Rate of realized innovation	Formal
Aram J.D., Lynn L.H., Reddy N.M. (1992)	Institutional relationships and technology commercialization: Limitations of market based policy	Comparative case study	A comparison of U.S. and Japanese institutional responses to the commercial potential of high definition television suggests that (1) the market approach to this technology has led to conflicting policy prescriptions in the U.S., and (2) Japanese policymakers have been more effective than their American counterparts in facilitating non-market relationships.	Government policy, social norms	Technology commercialization	Formal and informal

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Arora S., Romijn H.A., Caniëls M.C.J.	Governed by history: Institutional analysis of a contested biofuel innovation system in Tanzania	Single case study	The concept of "institutional arrangements" refers to the ensemble of formal and informal institutions assembled during Tanzania's colonial and postcolonial eras, which directly govern innovative activities in specific organizational models. Based on a location-specific and historically grounded institutional analysis within the innovation system framework, implications are drawn for the future development of Tanzania's Jatropha sector including its links with European markets and for the regulation of "next-generation" biofuels	Historical development of institutions	Governance of innovation	Formal and informal
Asongu S.A. (2017a)	Knowledge Economy Gaps, Policy Syndromes, and Catch-Up Strategies: Fresh South Korean Lessons to Africa	Absolute beta convergence, sigma convergence	With the exception of ICT for which catch-up is not very apparent, in increasing order, it is visible in innovation, economic incentives, education, and institutional regime. The speed of catch-up varies between 8.66 and 30.00 % per annum with respective time to full or 100 % catch-up of 34.64 and 10 years.	Legal origin, political stability	Knowledge economy index	Formal
Asongu S.A. (2017b)	The Comparative Economics of Knowledge Economy in Africa: Policy Benchmarks,	Absolute beta convergence, sigma convergence	Based on the determined fundamental characteristics, computed dynamic benchmarks, policy syndromes, and syndrome-free scenarios, we establish that landlocked, low-income, conflict-affected, Sub-Saharan African, nonoil-exporting, and French civil law countries are generally more predisposed to lower levels of KE,	Legal origin, political stability	Knowledge economy index	Formal

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	Syndromes, and Implications		whereas English common law, openness to sea, absence of conflicts, North African, and middle-income countries are characteristics that predispose certain nations to higher KE.			
Assiotis A., Zachariades M., Savvides A. (2015)	What determines technology diffusion across frontiers? R&D content, human capital and institutions	Panel data	We find that economic institutions and political institutions have a large and significant effect on computer imports (that embody a higher R&D content) but not for less technologically-intensive types of capital goods such as metalworking machinery. The role of institutions is mirrored by that of human capital.	Legal origin, political institutions	Technology diffusion	Formal
Athanasouli D., Goujard A. (2015)	Corruption and management practices: Firm level evidence	OLS	We find that firms in more contract dependent industries, located in more corrupt regions, tend to have lower management quality, a more centralized decision-making process, and a lower level of education among administrative staff. In more corrupt regions, contract dependent firms are also characterized by lower investment in R&D, and smaller product markets	Corruption, rule of law	R&D investment	Formal

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Athreye S., Batsakis G., Singh S. (2016)	Local, global, and internal knowledge sourcing: The trilemma of foreign-based R&D subsidiaries	Seemingly unrelated regression estimation	The results indicate that R&D subsidiaries with support lab mandates are less likely to use host and internal (intra-MNE) sources of knowledge and more likely to use the home location's sources of knowledge. Internationally independent labs are less likely to source knowledge from internal networks. The findings show also that the scientific capability and availability of a technically skilled workforce in the host location is associated with the R&D subsidiary's use of local, rather than internal knowledge sources. Finally, weak IPR spurs the use of local knowledge sources, suggesting a role for technological spillovers.	Intellectual property rights (IPR)	Source of R&D knowledge	Formal
Back Y., Praveen Parboteeah K., Nam D.-I. (2014)	Innovation in Emerging Markets: The Role of Management Consulting Firms	OLS	We explore the critical aspects of the firms' internal and external environments and posit that well-functioning national institutions and a high level of firm competency attenuate the positive roles of management consulting firms because there are few voids that management consultancy can effectively address under such conditions. To test our hypotheses, we examine the effects of management consultancy on both the input and output aspects of innovation. We use a sample of 1330 establishments operating in nine emerging markets. Our findings support all main and moderating	Property rights	R&D spending (firm)	Formal

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			effects on innovation inputs but not on innovation outputs.			
Banerjee R., Gupta K. (2019)	The effect of environmentally sustainable practices on firm R&D: International evidence	Panel data	Our main finding is that an increase in environmentally sustainable practices (ESP) increase R&D intensity. Therefore, ESP encourages a higher number of innovations and there is a negligible trade-off between these two factors of firm performance. Further, the positive effect of ESP is stronger in countries where institutional quality and R&D infrastructure supports are superior	Legal framework, government support	R&D intensity (firm)	Formal
Barasa L., Knoben J., Vermeulen P., Kimuyu P., Kinyanjui B. (2017)	Institutions, resources and innovation in East Africa: A firm level approach	Logistic regression	We examine the moderating role ofinstitutions with regards to the transformation of firm-level resources including internal research anddevelopment, human capital and managerial experience into innovative output using firm-level data. We find that the effects of firm-level resources vary depending on the institutional environment and that regional institutional quality positively moderates the effects of the firm-level resources	Corruption, rule of law, regulatory quality	Innovation output	Formal

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Barbosa N., Faria A.P. (2011)	Innovation across Europe: How important are institutional differences?	Papke-Wooldridge estimator	Our results are broadly consistent with previous empirical literature. They show that stringent product and labor market regulation affects innovation intensity negatively, and that more developed credit markets foster innovation. However, the empirical findings also raise doubts with respect to the strengthening of intellectual property rights as a means to stimulate innovation, a result that is in accordance with recent propositions in the literature.	Labor market regulation, property rights, access to finance	Innovation intensity	Formal
Belloc F. (2013)	Law, finance and innovation: The dark side of shareholder protection	Panel data (3SLS)	We perform three-stage least squares estimation on a sample of 48 countries during 1993-2006 and find that countries with stronger shareholder protection tend to have larger market capitalisation but also lower innovative activity.	Shareholder protection	Innovative activity	Formal
Bezerra M.A., Borini F.M. (2015)	The impact of social and relational contexts on innovation transfer in foreign subsidiaries	OLS	Through an ordinary least squares (OLS) regression analysis we found that the relational context affects the conventional and reverse innovation transfer in subsidiaries hosted in emerging markets. We however did not find support for the social context effect.	Institutional distance (formal)	Conventional /reverse innovation transfer	Formal

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Bilal A.R., Khan A.A., Akoorie M.E.M. (2016)	Constraints to growth: a cross country analysis of Chinese, Indian and Pakistani SMEs	OLS	The results show the differential effects of the proposed CDSG model in China, India and Pakistan. Access to external finance is found to be irrelevant to the growth of SMEs in China, while it has a positive influence in India and Pakistan. Furthermore, in terms of the innovation process, partial mediation is traced.	Access to finance, infrastructure, corruption	Innovation	Formal
Blind K. (2012)	The influence of regulations on innovation: A quantitative assessment for OECD countries	Panel data (weighted least squares regression)	In general, the modifications in selected regulatory and legal framework conditions have a significant influence on the dynamics of the innovative performance of OECD countries measured by the intensity of world patent applications. On the one hand, we observe contradictions between the positive influence of general legal and regulatory framework conditions encouraging competitiveness, an efficient regime enforcing IPR and unrestricted price setting. On the other hand, we see a positive impact of product and service legislation deterring business activities in general, and environmental laws and compliance hindering competitiveness in particular	Legal and regulatory framework	Patent applications	Formal and informal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
Boschma R., Capone G. (2015)	Institutions and diversification: Related versus unrelated diversification in a varieties of capitalism framework	OLS	Our results show that relatedness is a stronger driver of diversification into new products in coordinated market economies, while liberal market economies show a higher probability to move in more unrelated industries: their overarching institutional framework gives countries more freedom to make a jump in their industrial evolution. In particular, we found that the role of relatedness as driver of diversification into new sectors is stronger in the presence of institutions that focus more on 'non-market' coordination in the domains of labor relations, corporate governance relations, product market relations, and inter-firm relations.	Liberal/coordinated market	New product diversification	Formal
Boudreaux C.J. (2017)	Institutional quality and innovation: Some cross-country evidence	OLS	The findings reveal that the effect of market institutions on innovation is promoted by both knowledge and creativity. When innovation is broken down into its component measures, the results suggest that a high-quality legal system is associated with more creativity and free trade is associated with greater knowledge	Market institutions (economic freedom)	Global innovation index	Formal

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Bradshaw A. (2017)	Regulatory change and innovation in Latin America: The case of renewable energy in Brazil	Single case study	The pre-existing hydropower infrastructure, both physical and institutional, is demonstrated to have created important constraints on the adoption of alternative forms of energy. Against this backdrop, it examines the factors that have enabled the share of wind and solar in the Brazilian energy supply. A central focus lies with the role of regulations and regulatory agencies that were created to govern the electricity sector. In particular, it is argued that regulators have undertaken innovative changes to encourage the use of renewable energy within the scope of their mandate.	Regulative environment	Technology adoption	Formal
Bravo-Ortega C. (2012)	Exploring the interaction between intellectual property rights, human capital and R & D expenditures: Are there implications for developing countries?	Panel data	The model predicts that without minimum intellectual-property protection, additional education may result in more imitation rather than innovation. Additionally, the model implies that human capital and intellectual property rights are substitutable incentives for skilled labour to participate in R & D. The preponderance of the evidence suggests that interactions between human capital and IPRs determine global patterns of R & D, and intellectual property rights tend to raise the effect of educational attainment on the incidence of R & D.	Intellectual property rights	Innovation/imitation	Formal

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Breetz H., Mildenberger M., Stokes L. (2018)	The political logics of clean energy transitions	Comparative case study	The political institutions and conditions that nurture new technologies into economic winners are not always the same conditions that let incumbent technologies become economic losers. Thus, as the scale of technology adoption moves from niches towards systems, new political coalitions are necessary to push complementary system-wide technology	Political institutions, government policy	Technology adoption	Formal
Broberg J.C., McKelvie A., Short J.C., Ketchen D.J., Wan W.P. (2013)	Political institutional structure influences on innovative activity	Hierarchical linear modelling	Findings suggest that countries with political institutional structures characterized by weak state authority and corporatist societies generate greater levels of basic innovative activity. Further, national political institutions typified by strong state authority and corporatist societies were found to create higher levels of applied innovative activity.	State authority, corporatism	Basic/applied innovation	Formal
Brown J.R., Martinsson G., Petersen B.C. (2017)	What promotes R&D? Comparative evidence from around the world	Difference-in-differences analysis	Using data from a broad sample of OECD economies, we find that financial market rules that improve accounting standards and strengthen contract enforcement share a significant positive relation with R&D in more innovative industries, as do stronger legal protections for intellectual property. In contrast, stronger creditor rights and more generous R&D tax	Financial regulation, contract enforcement, IPR, tax policy	Innovative R&D	Formal

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			credits have a negative differential relation with R&D in more innovative industries.			
Bukstein D., Hernández E., Usher X. (2019)	Assessing the impacts of market failures on innovation investment in Uruguay	Panel data	Our results show that market, financial, knowledge, and context obstacles are the most important factors reducing innovation propensity and the amount invested in innovation activities. The effects are similar for firms in the industry and services sectors. Investment in equipment and investment in R&D and other intangible activities are affected differently by obstacles. On the other hand, innovation outcomes are affected mainly by financial and market-related barriers	IPR, infrastructure, economic stability	Innovation intensity	Formal
Cai D., Shen H., Liu B. (2016)	Identifying the influence of institutional factors on the R&D activities of Chinese SMEs	Multiple regression	The empirical results show that government intervention has a negative effect and that financial market development and legal system quality have positive effects on SMEs' R&D activities.	Legal framework, financial regulation	R&D activity	Formal

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Cano-Kollmann M., Hamilton R.D., Mudambi R. (2017)	Public support for innovation and the openness of firms' innovation activities	Multiple regression	We find that support policies for innovation, both monetary and nonmonetary, are related to an increase in the degree of openness of individual firms, both in terms of the number of external partners with whom they collaborate and the number of open innovation activities they perform. However, the relationship between support and openness seems to be negatively moderated by the existence of previous innovative activity within the firm. Public support has more impact on less innovative firms and less influence when the firm is already innovative, which could potentially indicate the existence of crowding-out effects. Additionally, our results suggest that nonfinancial support is more strongly linked to openness than financial support.	Monetary/non-monetary government support	Open innovation activity	Formal
Carney R.W., Zheng L.Y. (2009)	Institutional (Dis)incentives to innovate: An explanation for Singapore's innovation gap	Single case study	This article argues that the citystate's institutional arrangements generate conflicting innovation incentives and ultimately undermine innovative activity. Statistical tests across twenty-three countries offer evidence that is consistent with this argument.	Government policies	Innovative activity	Formal

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Casper S. (2000)	Institutional adaptiveness, technology policy, and the diffusion of new business models: The case of German biotechnology	Single case study	Analysis of the new firms demonstrates that Germany's new technology policies have facilitated important extensions within the business system that have, for the first time, allowed the systematic promotion of entrepreneurial technology companies. However, the dominant strategies of market specialization and company organizational patterns found within these companies have been strongly influenced by incentives and constraints created by long-established national institutional structures. Technology policy has, however, promoted institutional adaptiveness by providing opportunities for firms to experiment with or reconfigure elements of relatively stable national institutional frameworks to create new business practices.	Legal framework, financial regulation	Technology development	Formal
Castellacci F. (2015)	Institutional Voids or Organizational Resilience? Business Groups, Innovation, and Market Development in Latin America	Maximum likelihood estimation	The empirical analysis focuses on a large sample of firmsin Latin America. In line with the organizational resilience thesis, the results point out that the superior innovation performance of group affiliated firms is stronger for national economies with more efficient financial, legal, and labor market institutions	Financial system, legal system, labor market regulation	Innovation performance	Formal

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Cespedes Quiroga M., Martin D.P. (2017)	Technology foresight in traditional Bolivian sectors: Innovation traps and temporal unfit between ecosystems and institutions	Single case study	Findings highlights the difficulty to implement a virtuous circle of innovation because of innovation traps (1) that can be seen as a consequence of the socio-technical regime, and because of some misfit between formal institutions (2) and what is required by the value chain.	Misfit between institutions	Innovation	Formal and informal
Chadee D., Roxas B. (2013)	Institutional environment, innovation capacity and firm performance in Russia	Structural equation modelling (SEM)	The results show that regulatory quality, rule of law and corruption have strong direct and negative impacts on both the innovation capacity and performance of firms, and that innovation capacity strongly mediates the effects of institutions on firm performance. The results suggest that the current state of the regulatory quality, rule of law and corruption in Russia inhibit firm innovation and their resulting performance.	Regulatory quality, rule of law, corruption	Innovation performance	Formal
Chang S.-J., Chung C.-N., Mahmood I.P. (2006)	When and how does business group affiliation promote firm innovation? A tale of two emerging economies	Panel data	On average, business group affiliates outperform independent firms in South Korea, but not in Taiwan, and in the early 1990s, but not in the late 1990s. The existence of alternative institutional infrastructures for innovation might explain these differences.	Institutional infrastructure	Number of successful patent applications	Formal

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Chen L., Yang W. (2019)	R&D tax credits and firm innovation: Evidence from China	Panel data	Using a panel data set of listed companies in China from 2010 to 2012, we show that the local institutional contexts, such as government transparency, market development, and industrial policies, promote the allocation of R&D tax credit. The fiscal capacity of local governments constrains the implementation of tax credit policy. Furthermore, this article estimates the causal effect of R&D tax credit on firm innovation. We find that R&D tax credit significantly increases firms' innovative input and output.	Government transparency, market development	Innovation output	Formal
Chen V.Z., Li J., Shapiro D.M. (2015)	Subnational institutions and outward FDI by Chinese firms: The mediating role of firm-specific advantages	Maximum likelihood estimation	Using a unique data set on overseas investment by Chinese firms and causal mediation analysis, the authors find strong evidence in support of the view that strong sub-national institutions help emerging market firms develop the capabilities to enter developed country markets.	Economic liberalization, property rights protection, legal system	R&D capability	Formal
Chittoor R., Aulakh P.S., Ray S. (2015)	Accumulative and Assimilative Learning, Institutional Infrastructure, and Innovation Orientation	Panel data	The macro- and micro-institutional context in which firms are embedded condition the effect of global resource and product market participation on indigenous innovation efforts. In particular, technology imports (accumulative learning) have a stronger effect on inducing investments in innovation when the macro-	Institutional infrastructure	Innovation orientation	Formal

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	of Developing Economy Firms		institutional development is weak and for firms that are affiliated to business groups. However, product market internationalization (assimilative learning) plays a more important role in facilitating innovation efforts as the institutional environment becomes stronger and for independent firms that do not possess the network advantages inherent in business groups			
Choi J., Yeniyurt S. (2015)	Contingency distance factors and international research and development (R&D), marketing, and manufacturing alliance formations	Probit	The results support the view that R&D alliances tend to have a smaller national, industry, and firm-specific distance than marketing and manufacturing alliances. In addition, the pattern of R&D alliance formation confirms the argument that firms take advantage of both exogenous and endogenous location economies by forming international R&D alliances with infrastructural, institutional, and technological proximity between countries of partnering firms.	Institutional distance (formal and culture)	R&D alliance	Formal and informal
Choi Y.R., Yoshikawa T., Zahra S.A., Han B.H. (2014)	Market-oriented institutional change and R&D investments: Do business groups enhance advantage?	Generalized estimating equations	Institutional change reduced the financing constraints on independent firms more than for business group affiliates in R&D investment. Independent firms, however, appeared less capable than group affiliates of translating the benefits of improved institutional environments into efficient R&D investment.	Institutional change	R&D investment	Formal

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Choung J.-Y., Hwang H.-R., Song W. (2014)	Transitions of Innovation Activities in Latecomer Countries: An Exploratory Case Study of South Korea	Multiple-case study	The study distinguishes three archetypes of innovation activities: deepening of the process, architectural, and radical innovations. Study also argues that each route of innovation activities in the transition period of the emerging economies requires corresponding institutional frameworks, different base of capabilities, and different relationships among innovation actors to facilitate the transition from imitator to innovator	Institutional change	Innovation patterns	Formal
Cichy J., Gradoń W. (2016)	Innovative economy, and the activity of financial market institutions. Case of Poland	Single case study	Innovativeness of the economy is the result of interrelatedness between companies, science and government, but the factor determining innovativeness is capital availability. Although the offer of funding sources of innovation is wide, it can be argued that its use is unsatisfactory. Mainly banks are responsible for such a situation, which are characterized by, in addition to certain regulatory restrictions, risk aversion.	Access to finance	Innovativeness	Formal
Coccia M. (2017)	Varieties of capitalism's theory of innovation and a conceptual integration with leadership-oriented executives:	ANOVA	Results of the study here show that high levels of technological performance of nations seem to be associated to executive with parliamentary monarchy and monarchy (leadership-oriented governments), whereas nations with mixed executive tend to have lower technological performances. A possible reason of	Political stability	Technological performance	Formal

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	The relation between typologies of executive, technological and socioeconomic performances		these results is that, in general, some typologies of executive leadership-oriented (e.g., monarchy) support the political stability of countries with subsequent socioeconomic developmental paths over the long run.			
Coe D.T., Helpman E., Hoffmaister A.W. (2009	International R&D spillovers and institutions	Panel data	Our results suggest that institutional differences are important determinants of TFP and that they impact the degree of R&D spillovers. Countries where the ease of doing business and the quality of tertiary education systems are relatively high tend to benefit more from their own R&D efforts, from international R&D spillovers, and from human capital formation. Strong patent protection is associated with higher levels of total factor productivity, higher returns to domestic R&D, and larger international R&D spillovers. Finally, countries whose legal systems are based on French and, to a lesser extent, Scandinavian law benefit less from their own and foreign R&D capital than countries whose legal origins are based on English or German law.	Ease of doing business, education, legal origin	R&D spillover	Formal

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Coeurderoy R., Murray G. (2008)	Regulatory environments and the location decision: Evidence from the early foreign market entries of new-technology-based firms	Multiple regression	We provide evidence that entrepreneurial young firms choose to enter country markets offering better regulatory protection for their intellectual property. This decision is moderated by a home regulatory regime bias. In contrast, we observe that the speed of internationalisation is influenced less by the foreign regulatory regime and more by industry and firm characteristics	Legal system, political risk, IPR	Internationalization of new technology	Formal
Comin D., Hobijn B. (2009)	Lobbies and technology diffusion	Multiple regression	We find that each of the relevant institutional variables that affect the costs of erecting barriers has a significantly larger effect on the diffusion of technologies with a competing predecessor technology than when no such technology exists. These effects are quantitatively important. Thus, we conclude that lobbies are an important barrier to technology adoption and to development.	Level of democracy, judicial effectiveness, legal flexibility	Technology diffusion	Formal
Corsi C., Prencipe A. (2019)	High-tech entrepreneurial firms' innovation in different institutional settings. Do venture capital and private equity have	Poisson quasi-likelihood model	The empirical results show that the VC/PE effect on high-tech entrepreneurial firms' innovation is stronger in countries with a less-developed capital market. This suggests that VC/PE investments play a substitute role. A partial substitute role of VC/PE is also detected in firms located in countries with a low entrepreneurial	Capital market development, IPR	Number of patents	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
	complementary or substitute effects?		culture. However, no significant evidence emerged regarding the level of protection of intellectual property rights			
Dar A.A., AmirKhalkhali S. (2002)	Government size, factor accumulation, and economic growth: Evidence from OECD countries	Generalized least squares	Our results indicate that, on average, total factor productivity growth, as well as the productivity of capital, are weaker in countries where government size is larger. The advantage of a small government sector, in general, likely reflects the greater efficiencies resulting from fewer policy-induced distortions (such as the burden of taxation), the greater discipline of market forces which fosters efficiency of resource use, and the absence of crowding-out effects that weaken the incentives to create new capital which embodies new technologies.	Government size	Total factor productivity (TFP) growth	Formal
Das G.G. (2015)	Why some countries are slow in acquiring new technologies? A model of trade-led diffusion and absorption	Computable general equilibrium	By constructing different technology appropriation parameters based on embodied and disembodied R&D, absorption and learning effects, it shows: (i) North-South R&D flows have a positive impact on TFP; (ii) human capital-induced skill facilitates North-South R&D flows; (iii) socio-institutional and technology	Socio-institutional parameter	TFP	Formal and informal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
			adoption parameters do play roles for knowledge flows, its capture, and transmission			
Das G.G., Drine I. (2020)	Distance from the technology frontier: How could Africa catch-up via socio-institutional factors and human capital?	Generalized method of moments	We show that knowledge capabilities backed by human development, access to new technology, capacity to absorb new technologies are essential for development success. On the other hand, Africa's poor infrastructure, relatively poor business environment, and lack of human development are the most significant barriers to technology catch-up.	Socio-institutional factors	Technology gap	Formal and informal
Delmas M.A. (2002)	Innovating against European rigidities institutional environment and dynamic capabilities	Logistic regression	this paper shows that the risk-averse attitude of European firms and their difficulty to develop dynamic capabilities may explain the weakness of European innovation. Institutional factors such as pervasive rigidities and distortions that hamper the functioning of markets, may also prevent innovative responses	Institutional rigidity	Innovation output	Formal

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Dickson P.H., Weaver K.M., Hoy F. (2006)	Opportunism in the R&D alliances of SMES: The roles of the institutional environment and SME size	Hierarchical linear modelling	The results suggest that firm size moderates the relationship between the technological munificence and the predominant culture of the domestic market of the SME and concerns about the opportunistic behavior of an SME alliance partner.	Legal origin, culture	Governance of R&D alliances	Formal
DiRienzo C., Das J. (2015)	Innovation and role of corruption and diversity: A cross-country study	Multiple regression	The results of this analysis suggest that corruption significantly harms innovation activities across countries, but the effect is mitigated in wealthier countries. As expected, ethnic diversity weakens innovation activities; however, religious diversity, which can be a proxy for tolerance, is found to positively contribute to innovation.	Corruption, religious diversity	Innovative activity	Formal and informal
Doblinger C., Dowling M., Helm R. (2016)	An institutional perspective of public policy and network effects in the renewable energy industry: enablers or disablers of entrepreneurial	SEM	Our results show that public policies can constrain firm innovativeness and risk-taking behaviour because they steer firms towards a more conservative attitude and discourage the pursuit of high-risk innovation projects. However, firms can counteract these influences and enhance their innovativeness by maintaining close network ties with research associations as we find that innovativeness and a highly innovative product portfolio are key success factors.	Regulatory uncertainty	Innovativeness	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
	behaviour and innovation?					
Dohse D., Goel R.K., Nelson M.A. (2019)	What induces firms to license foreign technologies? International survey evidence	Logit	Results show that firms with own R&D are more likely to license foreign technologies, as are larger firms and firms in the nations' main business cities. However, the macroeconomic and institutional environment matters as well: domestic interest rates, informal sector competition, and the literacy of a country's labor force all impact foreign technology licensing.	Economic freedom, IPR	Technology licensing	Formal
Dosi G., Marengo L., Pasquali C. (2006)	How much should society fuel the greed of innovators?. On the relations between appropriability, opportunities and rates of innovation	Descriptive statistics	The evidence broadly suggests that, first, IPRs are not the most important device apt to "profit from innovation"; and second, they have at best no impact, or possibly even a negative impact on the underlying rates of innovation.	IPR	Innovation	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
Egan P.J.W. (2013)	R&D in the periphery? Foreign direct investment, innovation, and institutional quality in developing countries	Logit	The multilevel empirical analysis suggests that multinational firms are likely to both locate R&D activities and pursue them intensively in developing countries with well-regarded institutions, and that the impact of institutional variables is more significant than other likely predictors, such as education levels in host countries.	Government effectiveness (WGI)	R&D intensity	Formal
Ervits I., Zmuda M. (2016)	Comparative Study of the Role of Institutions in Shaping Inventive Activity in Mid-Range Emerging Economies	Descriptive statistics	The paper contributes to the body of evidence that confirms that a combination of fundamental institutions like the rule of law or freedom of expression, which are not necessarily aimed at boosting innovation, create an overall environment conducive to patenting. We demonstrate that "mid-range emerging economies",2 including those in Central and Eastern Europe3 (CEE), where the quality of institutions is lagging behind more developed counterparts and/or their influence is weak or sporadic, have not yet reached the threshold of inventive activity yet.	Rule of law, freedom of expression	Inventive activity	Formal

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Ervits I., Zmuda M. (2018)	A cross-country comparison of the effects of institutions on internationally oriented innovation	Linear regression	It is ascertained herein that the inventive activity of global innovators has a linear relationship with institutional factors, while there is no observed relationship between the quality of the institutional environment and PCT patenting by multinational enterprises (MNEs).	Corruption, business climate	PCT applications	Formal
Ezzeddine S., Hammami M.S. (2018)	Nonlinear effects of intellectual property rights on technological innovation	Panel threshold regression	The results revealed a significant influence of the threshold of the intellectual property rights on innovation. In other words, the impact of protection by the Institute of Pacific Relations on innovation is significant, which implies a nonlinear relationship. It was also shown to play an indirect role by increasing the impact of human capital and economic development on innovation.	IPR	Number of patents	Formal
Fan D., Li Y., Chen L. (2017)	Configuring innovative societies: The crossvergent role of cultural and institutional varieties	Fuzzy-set qualitative comparative analysis	We confirm the equal importance of both cultural and institutional mechanisms as contributors to national innovativeness, and identify equifinal configurations of cultural and institutional varieties as leading to a high-tech society.	Culture, market capitalization, union density	Patent applications	Formal and informal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
Ferrett B., Zikos V. (2013)	Wage-setting institutions and R&D collaboration networks	Mathematical modelling	Within the context of a three-firm industry, a central union that sets a uniform wage is shown to induce a partial R&D network that includes two firms but excludes the third. In contrast, we find that, under less centralised union structures, firms have incentives to form R&D networks with a larger number of alliances.	Labor market regulation	R&D alliances	Formal
Filippetti A., Guy F. (2020)	Labor market regulation, the diversity of knowledge and skill, and national innovation performance	Pooled OLS	Estimating the effects of unemployment production (UP) and employment production (EP) on patenting for 25 OECD countries over 24 years, we find a positive effect from UP, a negative effect from EP, and evidence that the UP effect is mediated by diversity of skill	Labor market regulation	PCT applications	Formal
Finegold D., Wagner K. (1997)	When lean production meets the "German model": Innovation responses in the German and US pump industries	Comparative case study	The study compares 18 German pump manufacturers with a closely matched set of US firms, focusing on product and process innovations. Variations in the rate and success of innovations are traced to differences in two key factors: national institutions and product markets	National institutions	Innovation responses	Formal

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Fombang M.S., Adjasi C.K. (2018)	Access to finance and firm innovation	Instrumental variable model	The research finds that finance in the form of overdraft overwhelmingly drives innovation in all selected countries – Cameroon, Kenya, Morocco, Nigeria and South Africa. Trade credit enhances innovation among firms in Nigeria, South Africa and Cameroon, while asset finance drives innovation amongst firms in Cameroon, Nigeria and South Africa.	Access to finance	Firm level innovation	Formal
Franco C., Pieri F., Venturini F. (2016)	Product market regulation and innovation efficiency	Stochastic frontier analysis	By estimating a knowledge production function on OECD industries through a stochastic frontier analysis, we find that service regulation reduces R&D efficiency in the manufacturing sector. The marginal impact of PMR is higher in less regulated economies indicating that large improvements in R&D efficiency cannot be obtained at the earlier stages of deregulation	Product market regulation	Number of patents	Formal
Fu X., Yang Q.G. (2009)	Exploring the cross-country gap in patenting: A Stochastic Frontier Approach	Stochastic frontier analysis	The gap in patenting performance between the UK and the world frontier is due to relative underperformance in both patenting capacity and efficiency in patent production. Institutional factors are found to be significantly associated with the patenting efficiency of an economy	IPR, access to capital	Number of patents	Formal

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Fuentelsaz L., Maicas J.P., Montero J. (2018)	Entrepreneurs and innovation: The contingent role of institutional factors	Hierarchical logistic regression	Our results show that individual characteristics of the entrepreneur, such as risk tolerance, entrepreneurial alertness, education and previous entrepreneurial experience, influence innovation in new ventures but that their effect is reinforced by an institutional context with high economic freedom	Economic freedom	Innovation	Formal
Fuller D.B. (2009)	China's national system of innovation and uneven technological trajectory: The case of China's integrated circuit design industry	Single case study	This paper argues that developing countries have institutions beyond the national system that can affect science and technology activities. Owing to co-ethnic transnational technology networks and the politics of finance, China's firms experience distinct patterns of performance not explained by the NSI framework. A particular type of foreign firm, the hybrid foreign-invested enterprise, combines foreign finance with commitment to China to drive China's technological development. Other firms, particularly those closely tied to the Chinese state, contribute less or even negatively to China's development. Strong ties to the state in the context of China actually undermine the incentive for innovation	NIS	Technological trajectory	Formal and informal

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Fuller D.B., Akinwande A.I., Sodini C.G. (2003)	Leading, following or cooked goose? Innovation successes and failures in Taiwan's electronics industry	Single case study	Four success factors are identified to characterize products where the Taiwanese pursue innovation: granularity of production; absence of need for large amounts of patient capital; volume production; and manufacturing-based production. In turn, this paper argues that products exhibiting these characteristics succeed because such characteristics draw upon the institutional and historical strengths of the Taiwanese economy.	Historical development of institutions	Innovation success	Formal and informal
Gang K.W., Choi B. (2019)	Impact of Korean pro-market reforms on firm innovation strategies	Panel data	Our findings suggest that market reforms positively influence both innovation input and output, but these associations are contingent on firm-specific factors.	Market reforms	R&D investment	Formal
Gans J.S., Hsu D.H., Stern S. (2008)	The impact of uncertain intellectual property rights on the market for ideas: Evidence from patent grant delays	Cox proportional hazard rate model	If the market for technology licenses is efficient, the timing of licensing is independent of whether IP has already been granted. In contrast, the need to disclose complementary (yet unprotected) knowledge, asymmetric information or search costs may retard efficient technology transfer. In these cases, reductions in uncertainty surrounding the scope and extent of IP rights may facilitate trade in the market for ideas	IPR system	Patent grant timing	Formal

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Gao Y., Gao S., Zhou Y., Huang K.-F. (2015)	Picturing firms' institutional capital-based radical innovation under China's institutional voids	SEM	Using a survey data from 280 Chinese high-technology firms, we find that firms' informal institutional capital has a higher positive effect on firms' radical innovation than the formal institutional capital does. The effects of firms' formal institutional capital on radical innovation would be higher in the complex market, and for the state owned enterprises, whereas the effect of firms' informal institutional capital on radical innovation would be higher in the developed provinces but lower in the complex market	Institutional capital	Radical innovation	Formal and informal
Garrone P., Grilli L., Mrkajic B. (2018)	The role of institutional pressures in the introduction of energy-efficiency innovations	Probit	Analysis of a cross-sectional sample of 22,936 firms from nine European countries, drawn from the 2006–8 Community Innovation Survey, confirms the hypothesis that formal and informal institutions influence the propensity of firms to introduce EEIs in general. Furthermore, formal institutions that generate regulatory pressures are found to spur both product and process EEI activities, while informal institutions exerting social pressures are able to significantly drive only product EEI activities.	Regulatory framework, government effectiveness, public attentiveness	Energy efficiency innovation	Formal and informal

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Gatti D. (2000)	Unemployment and innovation patterns: The critical role of coordination	Mathematical modelling	The mode of coordination is shown to affect firms' choices of either radical or incremental innovations and their responses to competitive pressure. Higher unemployment may result as a consequence of specialization along innovation trajectories that increase job precariousness.	Labor market regulation	Radical/incremental innovation	Formal
Ghazal R., Zulkhibri M. (2015)	Determinants of innovation outputs in developing countries: Evidence from panel data negative binomial approach	Panel data	The results implicitly suggest that providing a fertile ground to attract more foreign direct investment (FDI) can lead to much better innovation outputs. The study also strongly supports the role of institutions and governance for increasing innovation activities in developing economies as indicated by positive impacts of governance factors in the model. However, the impact of economic freedom indicators on improving innovation outputs is mixed.	Economic freedom, WGI	Innovation output	Formal
Giménez G., Sanaú J. (2007)	Interrelationship among institutional infrastructure, technological innovation and growth. An empirical evidence	Generalized method of moments	Technological innovation is positively conditioned by human capital developed during the period and the institutional infrastructure. Human capital sets the level of knowledge required to ensure that research and development processes lead to relevant and positive results. The construction of an appropriate institutional infrastructure through legislation to protect intellectual	WGI, human capital	Technological innovation	Formal

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			and industrial property and enforcement of the law determines the possible appropriation of the outcome of the innovation process and hence the incentives involved.			
Gittelman M. (2006)	National institutions, public-private knowledge flows, and innovation performance: A comparative study of the biotechnology industry in the US and France	Comparative case study	The models show that entrepreneurial firms are associated with high-performing innovations in this sector whereas large established firms perform poorly in both countries, and highlight the importance of institutions in creating country-specific combinations of human capital with organizational capabilities.	NIS	Innovation performance	Formal
Gondim I.J.C., Borini F.M., Carneiro-Da-Cunha J.A. (2017)	Tax burden on open innovation: The case of the automotive industry in Brazil	Ordinal logistic model	Our findings suggest that a high distance of taxes increases the likelihood of the adoption of open innovation, and, surprisingly, the presence of tax incentives in Brazil does not increase the likelihood of adoption.	Tax rates	Open innovation	Formal

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Gölgeci I., Assadinia S., Kuivalainen O., Larimo J. (2019)	Emerging-market firms' dynamic capabilities and international performance: The moderating role of institutional development and distance	SEM	The study finds that the linkages between three innovation-related dynamic capabilities (innovativeness, supply-chain agility, and adaptability) and international performance are positively and negatively moderated by institutional development and institutional distance, but that their influences are opposite.	Institutional development, institutional distance	Innovation capabilities	Formal
Granville B., Leonard C.S. (2010)	Do Informal Institutions Matter for Technological Change in Russia? The Impact of Communist Norms and Conventions, 1998-2004	Panel data	Property rights reform ranged from full enforcement in the Northwest to blocking in Communist regions in the Southeast. We find an unambiguous relationship between early strong reform and technological change. In our model, the quality of informal institutions is proxied by investment risk	IPR, corporate transparency	Technological change	Formal
Gray R., Malla S., Phillips P.W.B. (2006)	Product innovation in the Canadian canola sector	Single case study	In the pre-biotechnology period, missing links in the supply chain and the absence of private property rights contributed to public good market failures; the resulting market failures and inadequate investment incentives were overcome by development of public research programs and new participatory institutions that	NIS, IPR	Innovation trajectory	Formal

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			managed research coordination, extension and market development. In the biotechnology-phase, private property rights, vertical integration and contracting resolved many of the earlier market failures but failures in research coordination, enforcement of property rights and marketing have required new institutions.			
Guan J., Chen K. (2012)	Modeling the relative efficiency of national innovation systems	Partial least squares (PLS)	The results obtained using PLSR show that the various factors chosen to represent the embedded policy-based institutional environment have a significant influence on the efficiency performance of the two individual component processes, confirming the impact of public policy interventions undertaken by the government on the innovation performance of NISs.	NIS	Innovation performance	Formal and informal
Ha Y.J., Wei Y. (2019)	Dual isomorphic mechanisms and the role of a transnational agent: How foreign MNEs affect environmental innovation in domestic firms	Logistic regression	This study reports the following results: the direct effects of domestic institutions on CEI adoption in domestic firms vary according to institution type; foreign MNEs have a positive effect, whether using global or local CEI strategies; and the positive effect of foreign MNEs strengthens when the stringency of domestic environmental regulation increases	Regulative environment, government support	Environmental innovation	Formal

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Haley G.T., Haley U.C.V. (2012)	The effects of patent-law changes on innovation: The case of India's pharmaceutical industry	Single case study	Indian pharmaceutical companies have changed their decision-makingin response to changed patent laws by moving from process to product research. However, the preliminary results indicate that these changes may have hurt domestic innovation.	IPR, regulatory framework	Innovation	Formal
Helveston J.P., Wang Y., Karplus V.J., Fuchs E.R.H. (2019)	Institutional complementarities: The origins of experimentation in China's plug-in electric vehicle industry	Multiple-case study	We find that in contrast to the innovation trajectories of multinational and Chinese arms of joint venture (JV) firms, independent domestic Chinese firms (those with no history of international JV partnerships) are undertaking significant experimentation across multiple levels—infrastructure, core system, subsystem, and component—of the emerging PEV technology platform. We propose the concept of "institutional complementarities" to describe how interactions among institutions—here the national JV regulation and local market support and subsidies—may have turned regional markets into protected laboratories, extending the incubation periods for independent domestic firm experimentation	Regulatory environment, government support	Experimentation	Formal

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Hemmert M. (2004)	The influence of institutional factors on the technology acquisition performance of high-tech firms: Survey results from Germany and Japan	OLS	A detailed analysis of the influence of these factors on the technology acquisition performance of German and Japanese pharmaceutical and semiconductor business units reveals that it (1) generally varies to a large extent between different factors and (2) also differs between countries and industries to a considerable degree	Political and legal framework	Technology acquisition performance	Formal
Heredia J., Flores A., Geldes C., Heredia W. (2017)	Effects of informal competition on innovation performance: The case of Pacific Alliance	SEM	The results state that informal competition has a negative effect on the innovation performance of formal companies	Quality of governance, labor market rigidity	Innovation performance	Formal
Heredia Pérez J.A., Geldes C., Kunc M.H., Flores A. (2019)	New approach to the innovation process in emerging economies: The manufacturing sector case in Chile and Peru	Group analysis	Companies with high perceptions of financial constraints exhibit a preference for the development of marketing innovations to substantially improve production performance; if a company perceives few financial barriers, it increases innovation resources and process innovation to significantly improve market performance	Regulative environment	Type of innovation	Formal

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Ho C.-Y., Huang S., Shi H., Wu J.	Financial deepening and innovation: The role of political institutions	Panel data	Our results show that banking market deepening is associated with increased innovation only when political institutions are sufficiently democratic. In contrast, the enhancing effect of stock market deepening on innovation requires a lower level of political democracy. Further, we find that increasing the state's openness and competitiveness in the executive recruitment of leaders is the main channel through which political democratization promotes the role of banking and stock markets for financing innovation.	Level of democracy	Innovation	Formal
Huang K.G.-L. (2017)	Uncertain intellectual property conditions and knowledge appropriation strategies: Evidence from the genomics industry	Panel data	We find that under uncertain IPR conditions, firms reveal and accumulate more knowledge through open science (follow-on publishing) but shift to knowledge appropriation through commercial science (follow-on patenting) when IPR uncertainty is narrowed. This effect is most salient when firms develop their knowledge assets or operate under strong IPR institutional regime	IPR	Knowledge appropriation strategies	Formal

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Ibata-Arens K. (2008)	Comparing national innovation systems in Japan and the United States: Push, pull, drag and jump factors in the development of new technology	Comparative case study	Through an analysis of best practices in national and regional innovation systems one can get a sense of important push (for example, policy stimuli), pull (market demand), drag (capital and institutional weaknesses) and jump (targeted community-level strategies) factors underlying the ability of certain locales and countries to create competitive advantages in new technology industries.	NIS	Technology development	Formal and informal
Inzelt A. (1996)	Institutional support for technological improvement - The case of Hungary	Single case study	The main lesson of the study is that industry during its redeployment can create few demands for technology development institutes. Because of inherited structure, the accumulated knowledge of existing institutes and the supply and scattered demand of industry for technological support do not regularly coincide.	NIS	Technological improvement	Formal
Ivus O. (2015)	Does stronger patent protection increase export variety? Evidence from US product-level data	Panel data (2SLS)	The results show that the strengthening of IPRs increased exports of new products in patent-sensitive industries. The expansion in product variety accounted for the entire increase in US exports. The findings substantiate claims that ratification of TRIPS by developing countries promotes access to new foreign products and technologies. Additionally, the results demonstrate that patent protection is a significant	IPR	New product exports	Formal

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			institutional factor in US firms' business decisions over the introduction of new products and processes into a developing country marketplace			
Ivus O., Park W.G., Saggi K. (2017)	Patent protection and the composition of multinational activity: Evidence from US multinational firms	Panel data	We find that a strengthening of patent protection in the host country increases the incentive to license innovations to unaffiliated parties. While unaffiliated licensing rises among all firms, the volume of affiliated licensing falls among complex-technology firms but rises among simple-technology firms. The positive appropriability effect on affiliated licensing is strong enough among simple-technology firms that the entire composition of their licensing further shifts towards affiliated parties	IPR	Technology transfer	Formal
James B.E., McGuire J.B. (2016)	Transactional-institutional fit: Corporate governance of R&D investment in different institutional contexts	OLS	Analyses of 7943 firms across 12 countries from 1997-2010 support the key proposition: in bank-based (market-based) countries, higher levels of bank loan debt coupled with higher levels of R&D investment increase (decrease) firm performance	Financial system	R&D governance	Formal

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Jia J., Ma G. (2017)	Do R&D tax incentives work? Firm-level evidence from China	Panel data	Our results show that tax incentives motivate R&D expenditures for our sample firms. A 10% reduction in R&D user costs leads firms to increase R&D expenditures by 3.97% in the short run. We also find considerable effect heterogeneity: Tax incentives significantly stimulate R&D in private firms but have little influence on state-owned enterprises' R&D expenditures. Moreover, the effects of tax incentives are more pronounced for private firms without political connections	Tax policy	R&D investment	Formal
Jin X., Lei G., Yu J. (2016)	Government governance, executive networks and enterprise R&D Expenditure	Panel data	The empirical results reveal that the governance efficiency of the government where the enterprise is located determines the efficiency of resource allocation firms are faced with, which provides institutional constraints on corporate R&D intensity, and that the establishment and scale of executive networks do contribute to R&D decisions. Further testing shows that compared with non-state-owned enterprises, state-owned enterprises are faced with relatively weaker restraints and pressures in terms of policy, finance, technology and competition. Thus, they show no	Governance	R&D intensity	Formal

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			obvious reliance on government governance quality and the information diffusion of executive networks.			
Kafouros M., Wang C., Piperopoulos P., Zhang M. (2015)	Academic collaborations and firm innovation performance in China: The role of region-specific institutions	Tobit	Our analysis challenges the assumption of institutional homogeneity within a given country, showing that institutions evolve in different ways across sub-national Chinese regions. This uneven institutional evolution affects the enforcement of intellectual property rights (IPRs), the level of international openness, the quality of universities and research institutes across regions and thus the degree to which Chinese EMEs benefit from academic collaborations. Our findings reveal that sub-national institutional variations have a profound impact on the relationship between academic collaborations and firms' innovation performance	IPR	Innovation performance	Formal
Kang K.-N., Park H. (2012)	Influence of government R&D support and inter-firm collaborations on	SEM	Findings show that upstream partnerships were significantly associated with the innovation output of biotechnology SMEs, and international linkages were much stronger than domestic connections. The government support through project funding directly	Government support	Patent applications	Formal

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	innovation in Korean biotechnology SMEs		and indirectly affects firms innovation by stimulating internal R&D and domestic upstream and downstream collaborations.			
Khedhaouria A., Thurik R. (2017)	Configurational conditions of national innovation capability: A fuzzy set analysis approach	Fuzzy-set qualitative comparative analysis	The results show no singular path leading to high levels of innovation capability but there are three configurations of conditions. Two configurations highlight that the combination of three distinct conditions is sufficient for a country to reach a high innovation capability (one in which market conditions 'are not necessary' and one in which institutions 'are not necessary' conditions). The third configuration highlights that the combination of all five conditions is necessary for a country to reach a very high innovation capability.	NIS	National innovation capability	Formal
Kim J. (2011)	Political Institutions and Public R & D Expenditures in Democratic Countries	Panel data	This article reports that democratic institutions do matter in the levels of public R&D spending. However, the effect is more complicated across the different types and performers of research than expected. Additionally, the effect of one institutional dimension is found to be moderated by the existence of the other dimensions,	Political framework	Public R&D expenditure	Formal

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			which makes it clearly more challenging to sort out different degrees and directions of the relationships between R&D expenditures and political institutions.			
Kleinknecht A., van Schaik F.N., Zhou H. (2014)	Is flexible labour good for innovation? Evidence from firm-level data	Logit	In sectors with a 'routinised' innovation regime, high shares of low-paid temporary workers have a negative impact on the probability that firms invest in R&D. In sectors that tend towards a 'garage business' regime, however, flexibility has no impact.	Labor market regulation	R&D investment	Formal
Koh W.T.H. (2006)	Singapore's transition to innovation-based economic growth: Infrastructure, institutions and government's role	Single case study	Coordinated policy changes to the national innovation system remain a key challenge. The public sector bureaucracy has been streamlined, and there are nascent efforts to develop stronger global network links with key high-tech regions to expose research institutions to the global collaboration opportunities.	NIS	Innovation capabilities	Formal
Koléda G. (2008)	Promoting innovation and competition with patent policy	Mathematical modelling	When the level of the patent novelty requirement is initially high, a patent policy that weakens the patent height can reinforce competition and promote innovation	IPR	Innovation	Formal

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Kraft P.S., Bausch A. (2018)	Managerial Social Networks and Innovation: A Meta-Analysis of Bonding and Bridging Effects across Institutional Environments	Meta-analysis	Using several meta-analytic techniques to integrate findings from 88 studies, thereby spanning 26 different countries and 20 years of research, the results of this study reveal that institutional environments significantly moderate the impact bonding and bridging networks have on innovation. In particular, the findings indicate that cohesive networks are more effective to stimulate innovation in weak political, regulatory, and financial institutions as well as in collectivistic cultures, whereas diverse networks are more beneficial for innovation in strong political and regulatory institutions as well as in individualistic cultures	Political and regulatory framework	Innovation networks	Formal
Krammer S.M.S. (2015)	Do good institutions enhance the effect of technological spillovers on productivity? Comparative evidence from developed and transition economies	Panel data	The results confirm that good institutions have positive and comparable direct effects on productivity across the board. However, they moderate differently the relationship between foreign technological spillovers and productivity. Thus, governance, IPR and economic freedom exhibit negative moderation in the case of transition economies, while easiness of doing business moderates positively this relationship for both groups of countries. Further, the moderation effects are larger for transition economies and for trade-related spillovers. Overall, these results suggest a trade-off for transition	WGI, economic freedom	TFP	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
			countries between pursuing institutional upgrades and enjoying greater gains from technological spillovers			
Krammer S.M.S. (2019)	Greasing the Wheels of Change: Bribery, Institutions, and New Product Introductions in Emerging Markets	Probit	I argue that bribery may help innovators in these markets to introduce new products by overcoming bureaucratic obstacles, compensating for the lack of kinship or political affiliations, and hedging against political risk. I also propose that the relationship between firm bribery and new product introduction will be negatively moderated (i.e., weakened) by the quality of the formal and informal institutions in place. Employing data from over 6,000 firms in 30 emerging markets and a wide range of empirical tests, my results support these hypotheses.	Corruption	New product introductions	Formal
Krkoska L., Robeck K. (2008)	Business environment and enterprise behaviour in East Germany compared to West Germany and Central Europe	Probit, OLS	We show that institutional performance in East Germany is significantly different from West Germany. In addition, Central European transition countries are shown to have a similar institutional quality as East Germany in many areas. We also show that enterprises in the Central European transition countries have	IPR, regulatory framework, corruption, access to finance	Innovation performance	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
			strongly focused on company level innovation and investment in human capital. Meanwhile, East German enterprises report investments in new products and processes as well as in skills well below the level of not only West Germany but also the Central European transition countries			
Kwan L.Y.-Y., Chiu C.-Y. (2015)	Country variations in different innovation outputs: The interactive effect of institutional support and human capital	Panel data	Results showed that innovation output is a multi-faceted construct, consisting of at least three aspects: knowledge creation, knowledge impact, and knowledge diffusion. Quality of human capital predicts knowledge creation; institutional support and human capital have additive effects on knowledge impact; and the presence of both human capital and institutional support is required for knowledge diffusion.	WGI, ease of doing business	Innovation outputs	Formal
Lachman J., López A. (2019)	Innovation obstacles in an emerging high tech sector: The case of precision agriculture in Argentina	OLS	In this study, it was determined that market and cost factors negatively affect firms' growth, while institutional obstacles reduce the amount of innovation efforts. In turn, knowledge barriers positively impact on the relevance firms assigned to R&D activities.	Regulative framework, IPR	Innovation	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
Le T. (2012)	R&D spillovers through student flows, institutions, and economic growth: What can we Learn from African countries?	Panel cointegration	In addition, this paper extends the analysis to include institutional variables such as the ease of doing business, legal origins, and religious majority to see if institutional characteristics have any impact on the way knowledge diffusion affecting total factor productivity (TFP). However, it is not clear that institutional differences are important factors that influence the degree of R&D spillovers and, hence, the TFP of African countries	EODB, legal origin	TFP	Formal
Lee W.C., Law S.H. (2017)	Roles of Formal Institutions and Social Capital in Innovation Activities: A Cross-Country Analysis	OLS, instrumental variables, quantile regression	The empirical results indicate that formal institutions and social capital complement one another in influencing countries' innovations level. In terms of the relative importance of both in promoting innovation activities, the social capital has greater role compared to formal institutions. Furthermore, the empirical result suggests that innovation level tends to be higher in countries with higher social capital.	Political and legal framework, government effectiveness, corruption	Patent applications	Formal
Léger A. (2005)	Intellectual property rights in Mexico: Do they play a role?	Descriptive statistics	Complete enumeration of the Mexican maize breeding industry showed that, contrary to the hypothesis that IPR would support innovation, IPR play no role in the industry.	IPR	Innovation	Formal

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Lewellyn K.B., Bao S.R. (2015)	R&D investment in the global paper products industry: A behavioral theory of the firm and national culture perspective	HLM	Our multilevel analysis demonstrates outperforming industry peers and national culture are both important for explaining variance in firm-level R&D investment in the global paper industry	Culture	R&D investment	Informal
Leyva-de la Hiz D.I. (2019)	Environmental innovations and policy network styles: The influence of pluralism and corporativism	Arellano-Bond test	Our analysis, based on a longitudinal analysis of 84,274 environmental patents from the United States, Japan, Germany, and the UK during the period 1976–2003, indicates support for our prediction that neo-corporatist countries tend to generate more important environmental innovations than pluralistic countries. Yet, our findings do not support our hypothesis suggesting that pluralistic countries are more likely to generate a higher number of environmental innovations	Corporatism/pluralism	Number of patents	Informal
Leyva-de la Hiz D.I., Hurtado-Torres N., Bermúdez-Edo M. (2019)	The Heterogeneity of Levels of Green Innovation by Firms in International Contexts: A Study Based on the Home-Country Institutional Profile	Panel data	The results show that firms from countries with environmental institutional weakness reinforce their utilization of technological capabilities to generate environmental innovations in international contexts	Environmental regulation	Green innovation	Formal

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Liu B., Tang N., Zhu X. (2008)	Transferring technology across borders: Institutional effects in Chinese context	SEM	The results of structural equation modeling, the subject of this paper, were based on an empirical study of 167 foreign ventures sampled in China, but they did not fully confirm what the institutional theory emphasized about the effectiveness of technology transfer. The normative dimension of the country institutional profile was shown to have a significantly positive effect on the effectiveness of technology transferring across borders, but contrary to expectations, the regulatory dimension of the country institutional profile was shown to have a significantly negative effect on the effectiveness of technology transfer, while the cognitive dimension has no significant effect on it	Social norms, regulatory framework	Technology transfer	Formal and informal
Liu Y., Deng P., Wei J., Ying Y., Tian M. (2019)	International R&D alliances and innovation for emerging market multinationals: Roles of environmental turbulence and knowledge transfer	OLS	Innovation performance of EMNEs is positively influenced by knowledge transfer activities (knowledge replication and knowledge adaption), technological and market turbulence, while negatively influenced by institutional turbulence. In addition, different aspects of environmental turbulence moderate the relationship between knowledge transfer practices and innovation performance of EMNEs differently	Institutional turbulence	Innovation performance	Formal

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Lloyd C., Payne J. (2019)	Rethinking country effects: robotics, AI and work futures in Norway and the UK	Comparative case study	Drawing upon interviews with technology experts, employer associations and trade unions, it examines their perspectives on public policy support for the development and diffusion of robotics and AI, along with potential consequences for employment, work and skills. The research indicates significant country differences and the continued relevance of institutions, interests and power in analysing country effects	NIS	Technology adoption	Formal and informal
López Iturriaga F.J. (2011)	Capital markets, financial intermediaries and financing of new technologies: International evidence from industry data	OLS, GMM	Using OLS, GMM, and VAR methods, my results show a positive relation between capital market development and the importance of the most R&D-intensive sectors. Nevertheless, there are some exceptions to this pattern, which may be related to the legal and institutional framework of each country.	Financial system orientation	R&D intensity	Formal
López Iturriaga F.J., López-Millán E.J. (2017)	Institutional framework, corporate ownership structure, and R&D investment: an international analysis	OLS	Our results show that better protection of investors' rights by the institutional environment has a positive influence on corporate R&D. We also find that corporate ownership concentration works as a substitute for legal protection. This finding means that R&D investment of the firms in the countries with poor legal	Legal framework, investor protection	R&D intensity	Formal

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			protection increases as ownership becomes more concentrated.			
Lorenz M.P., Clampit J., Ramsey J.R. (2018)	Distance is a Janus: an exploratory study of offshored innovation	Hierarchical regression	The authors have developed a model of distance and innovation which goes beyond the traditional assumption of distance as overwhelmingly negative. Whereas in some cases, the positive effect of formal and informal distances outweigh the negative effects stimulating innovation; in other cases, the negative effects of distance hamper innovation. Finally, some elements of distance may not have an impact on innovation outcomes at all	Institutional distance	Innovation offshoring	Formal and informal
Love J.H., Roper S. (2004)	The organisation of innovation: Collaboration, cooperation and multifunctional groups in UK and German manufacturing	Comparative case study	In Germany, institutional and social norms are found to encourage collaborative inter-plant innovation, but aspects of the German skills training and industrial relations systems make the adoption of more flexible internal systems more difficult. In the UK, by contrast, the more adversarial nature of inter-firm relations makes it more difficult to establish external collaborations based on mutual trust, but less restrictive labour market	Institutional norms, social norms	Innovation collaboration	Formal and informal

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			structures make it easier for UK plants to adopt multifunctional working			
Ma X.-F., Kaldenbach M., Katzy B. (2014)	Cross-border innovation intermediaries - matchmaking across institutional contexts	Multiple-case study	This paper draws attention to the specific aspect of institutional environments in international matchmaking for innovation. While technology is largely global this exploratory study of 18 cross-border cases between Europe and China points to the impact of distant institutional environments on the success and structure of cross-border collaborative innovation.	Institutional distance	Innovation collaboration	Formal and informal
Malen J., Vaaler P.M. (2017)	Organizational slack, national institutions and innovation effort around the world	Two-stage estimated dependent variable analysis	Stronger shareholder protections diminish while stronger employee protections magnify slack effects on innovation effort.	Shareholder protection, employee protection	Innovation effort	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
Malik T.H. (2017)	Varieties of capitalism, innovation performance and the transformation of science into exported products: A panel analysis	Panel data	This study shows that MMEs are at a disadvantage regarding publications, patents and exports. However, MMEs perform better than LMEs and CMEs in the transformation of national science into exported products from high R&D intensity sectors. At the dyadic level of analysis, individual MMEs are compared with a typical LME (USA) and a typical CME (Germany). This comparison shows that some MMEs perform better than the USA and Germany	NIS	Innovation outcomes	Formal
Malik T.H., Huo C. (2019)	Entrepreneurial state vs liberal market: Chinese comparative advantage in the transformation of national science to technology artefacts	Panel data	The results show that Chinese state entrepreneurship has a comparative advantage over liberal economies in published science. However, Chinese state entrepreneurship has a comparative disadvantage compared to liberal entrepreneurship in patent science. Regarding the dyadic level of comparability between the national economies, there are mixed results in the transformation of national science.	NIS	Innovation outcomes	Formal
Malik T.H., Yun J. (2017)	Operational complexity of foreign innovation projects and the inter-organisational alliance in the	Panel data	The evidence from the clinical trials innovation projects in the biopharmaceutical sector supports the operational complexity-alliance (OCA) proposition in China at three levels: institutional (legal and cultural), technological (purpose and methodology) and dispositional	Legal framework, culture	Innovation alliance	Formal and informal

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	biopharmaceutical industry in China		(organisation type and its experience). Institutional complexity shows that the legal difference between the home and host country positively predicts the inter-organisational alliance. Similarly, in national cultural differences, power distance, uncertainty and long-term orientation support the OCA proposition.			
Marin G., Zanfei A. (2019)	Does host market regulation induce cross-border environmental innovation?	Probit	This paper evaluates the effect of host-country environmental policy stringency on the offshoring of green patents for 2000 top world R&D performers. It is shown that a more stringent environmental regulation triggers patent offshoring in the field of green technologies.	Regulation stringency	Patent offshoring	Formal
Martínez-Noya Andrea A., García-Canal Esteban E. (2011)	Technological capabilities and the decision to outsource/outsource offshore R&D services	Probit	We argue that: (1) firms with more technological capabilities will tend to both outsource and outsource offshore R&D services, (2) the positive effect of technological capabilities would be leveraged when the institutional context of the firms' country of origin has allowed them to transform their technological expertise into governance capabilities, and (3) that those firms with a higher local responsiveness attitude will be more likely to outsource offshore R&D services. We have found support for our hypotheses using survey data	IPR	R&D outsourcing	Formal

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			from a sample of 182 technology intensive firms from the European Union and the US			
Meelen T., Herrmann A.M., Faber J. (2017)	Disentangling patterns of economic, technological and innovative specialization of Western economies: An assessment of the Varieties-of-Capitalism theory on comparative institutional advantages	Panel data	Our analyses of panel data on exports and patents show that the VoC theory is rather weak in explaining patterns of economic specialization but can account for technological specialization	NIS	Radical/incremental innovation	Formal
Mignon I., Bergek A. (2016)	System- and actor-level challenges for diffusion of renewable electricity technologies: an	Multiple-case study	Results based on a qualitative multiple case study of 28 adopters in France and in Sweden show that adopters were faced with system-level challenges, such as market-structure obstacles and lack of institutional routines, as well as actor-level challenges, such as lack of resources or behavioral characteristics.	Institutional barriers	Technology diffusion	Formal

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	international comparison					
Miravitlles P., Achcaoucaou F., Núñez-Carballosa A., Guitart-Tarrés L., Cruz-Cazares C. (2017)	Are the BRIC countries overtaking intermediate countries in the race for international R&D? The case of Spain	Multiple-case study	Based on eight case studies of subsidiaries with R&D centres in Spain, we conclude that the policies adopted by certain emerging economies to develop their national innovation systems are proving effective and that these countries now pose a threat to intermediate economies. However, the BRICs still lag behind in terms of the security of their institutional framework; this situation leaves intermediate countries in an advantageous position	Economic and political stability, culture	R&D activity	Formal and informal
Molina O. (2018)	Innovation in an unfavorable context: Local mining suppliers in Peru	Multiple-case study	All the suppliers in the sample are very new in technologically complex activities, and their innovations remain limited from a global perspective. Our findings suggest that this is partly due to a weak institutional setting, scarce support from external organizations, and limited coordination channels in the sector	Government support, education	R&D activity	Formal

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Monroe-White T., Zook S. (2018)	Social Enterprise Innovation: A Quantitative Analysis of Global Patterns	HLM	Results indicate that similar to social enterprise, macro-institutional factors predict social enterprise innovation. More specifically, macro-institutional factors influence the various types of innovations (product, process and marketing) differently	WGI, culture	Social innovation	Formal and informal
Munari F., Oriani R., Sobrero M.	The effects of owner identity and external governance systems on R&D investments: A study of western European firms	Censored regression	our findings show that higher shareholding by families is negatively associated with R&D investment. Moreover, widely-held firms invest less in R&D in the United Kingdom than in Continental European countries, thus suggesting the existence of a greater pressure towards the reduction of R&D in market-based governance systems.	Corporate governance system	R&D intensity	Formal
Murphy G., Siedschlag I., McQuinn J. (2017)	Employment protection and industry innovation	Panel data	Our estimates indicate that stricter EPL led to significantly lower innovation intensity in industries with higher job layoff propensity.	Labor market regulation	Innovation intensity	Formal

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Naghavi A., Strozzi C. (2015)	Intellectual property rights, diasporas, and domestic innovation	Panel data	Using a panel dataset of emerging and developing countries, we show that emigration has a favorable effect on strengthening the link between IPR protection and innovation by making a new source of knowledge available to domestic innovators	IPR, culture	Innovation performance	Formal and informal
Nam D.-I., Parboteeah K.P., Cullen J.B., Johnson J.L. (2014)	Cross-national differences in firms undertaking innovation initiatives: An application of institutional anomie theory	HLM	Through the use of Hierarchical Linear Modeling techniques, we reveal significant interaction effects of in-group collectivism and education, uncertainty avoidance and political stability, and in group-collectivism and political stability on cross-national levels of innovation.	Political stability, culture	Innovation activity	Formal and informal
Nguyen H.-T., Skitmore M., Gray M., Zhang X., Olanipekun A.O. (2017)	Will green building development take off? An exploratory study of barriers to green building in Vietnam	Principak component analysis	While legislative and institutional barriers are widely perceived as the most challenging obstacles, social and cognitive barriers as a whole represent the main hindrances involved.	Legal framework, social norms	Technology adoption	Formal and informal

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Nooteboom B. (2000)	Institutions and forms of co-ordination in innovation systems	Comparative case study	This article shows how institutions enable and constrain forms of co-ordination for inter-organizational relations, and how these affect innovative performance.	Culture, governance system	Innovation coordination	Formal and informal
Nordin N.N., Nordin N.H. (2017)	The role of economic freedom in research and development-productivity growth nexus: Study based on different income level on developing countries	Panel Dynamic Ordinary Least Square	The findings indicate that there are mixed results that show positive and negative relationship of the role economic freedom as mediating factor on domestic and international R&D on productivity growth	Economic freedom	R&D productivity	Formal
Oluwatobi S., Efobi U., Olurinola I., Alege P. (2015)	Innovation in Africa: Why institutions matter	Generalized method of moments	The empirical result reveals that government effectiveness and regulatory quality are two institutional measures that have the most equivalent impact on innovation.	WGI	Scientific journal articles	Formal

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Omidi V., Shahabadi A., Mehregan N. (2019)	The impact of natural resources on innovation	Generalized method of moments	The results show that while the effect of natural resources on innovation is negative in those countries, which confirms the resource curse hypothesis, but the impact of natural resources interaction with institutional quality is positive.	WGI	Innovation outputs	Formal
Parker R. (2004)	Explaining variations in the knowledge economy in three small wealthy countries	Comparative case study	Australia has been regarded as a variant of the competitive business system and has generally been described as an entrepreneurial economy with a large small firm population. In contrast Sweden has a coordinated business system that has favoured large industrial firms. The Danish variant of the coordinated model, with its well-developed vocational training system, is distinguishable by its large population of networked small and medium size enterprises.	NIS	Knowledge economy	Formal and informal
Pattit J.M., Raj S.P., Wilemon D. (2012)	An institutional theory investigation of U.S. technology development trends since the mid-19th century	Inductive analysis	Based on an inductive analysis of the history of technology development and corporate R&D, we show that both formal and informal institutional rules and constraints played a role in the initial rise of markets for technology, their decline during the early-20th century, and their eventual return at the end of the 20th century. We also find that formal and informal institutions	Institutional framework	Technology market development	Formal and informal

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			influenced the widespread adoption of in-house R&D labs during the mid-20th century.			
Paunov C. (2016)	Corruption's asymmetric impacts on firm innovation	Panel data	My results show that corruption reduces the likelihood that firms in these industries obtain quality certificates. Corruption affects particularly smaller firms but has no impacts on exporters or foreign- and publicly-owned firms. While corruption does not reduce patenting, it lowers machinery investments for innovation. By contrast, more reliable business environments foster firms' adoption of quality certificates	Corruption	Patents, quality certificates	Formal
Pereira L., Plonski G.A. (2009)	Shedding light on technological development in Brazil	Descriptive statistics	In overall, we concluded that weakness of the institutions and inadequacy of social and organizational demography play a key role in explaining to a large extent why countries differ in technological development and diffusion	Institutional infrastructure	Technological development	Formal

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Pezeshkan A., Smith A., Fainshmidt S., Amini Sedeh A. (2016)	National business systems and firm innovation: A study of developing economies	Fuzzy-set qualitative comparative analysis	This study addresses this issue by introducing an institutional framework of national business systems shaping firm innovation within a country, and conducts a configurational analysis of 47 developing and emerging economies to uncover how state, human capital, financial, and informal institutions combine to influence firm innovation. The analysis identifies three distinct institutional configurations associated with high firm innovation. This study highlights the usefulness of a configurational approach to better understand how complementary and substitutable institutions may facilitate firm innovation within a country.	WGI, culture	Innovation	Formal and informal
Phuc Canh N., Schinckus C., Thanh S.D. (2019)	Do economic openness and institutional quality influence patents? Evidence from GMM systems estimates	Generalized method of moments	Our results show that, although institutional quality appears as a vital driver for patent applications, FDI flows and trade openness have different influences. Precisely, higher inward FDI flows have a positive effect on the number of patents whereas trade openness might have a negative one	WGI	Number of patents	Formal

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Pirtea M.G., Sipos G.L., Ionescu A. (2019)	Does corruption affects business innovation? Insights from emerging countries	Panel data (GLM)	This research study is emphasizing that corruption at governmental structures and institutional level has a significant negative impact on business innovation, adversely affecting innovation perspectives	Corruption	Innovation	Formal
Pisani N., Ricart J.E. (2018)	Offshoring Innovation to Emerging Countries: The Effects of IP Protection and Cultural Differences on Firms' Decision to Augment Versus Exploit Home-Base-Knowledge	Logit	Concerning formal institutions, we argue that the stronger the emerging host country's IP protection, the higher the likelihood that a DMNE offshores innovation activities aimed at augmenting home-base-knowledge. Regarding informal institutions, we argue that the greater the cultural differences between the developed home country and the emerging host country, the higher the likelihood that a DMNE offshores innovation activities aimed at augmenting home-base-knowledge. Additionally, we propose a key contingency that attenuates the relationship involving IP protection while strengthening the one involving cultural differences: the DMNE's experience with offshoring innovation. Analysis of 128 offshoring innovation implementations by 78 DMNEs in ten emerging countries provides support for all our hypotheses except for the one	IPR, culture	Innovation offshoring	Formal and informal

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			focused on the moderation effect of experience on the relationship involving cultural differences			
Pyka A., Buchmann T., Vermeulen B. (2017)	Biosimilars in Germany: the emergence of a new industry in the light of the varieties of capitalism approach	Single case study	With the recent differentiation in biopharmaceuticals, again, the differences in the institutional environment on both sides of the Atlantic are responsible for different dynamics. However, this time German companies are in the better position: the industry refers to a tradition of engineering capabilities in chemicals and pharmaceuticals. Additionally, European regulation introduced the world's first regulatory framework, which moreover is designed in a progressive way concerning market admission	Regulatory framework	Innovative industries	Formal
Rapp M.S., Udoieva I.A. (2017)	Corporate Governance and Its Impact on R&D Investment in Emerging Markets	OLS	We find that R&D intensity is lower in firms with (strategic) block ownership, and this effect is more pronounced in countries with stronger shareholder rights protection. This suggests that, similar to the situation in developed economies, dispersed ownership, which allows shareholders to diversify their investment risks,	Corporate governance system	R&D intensity	Formal

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			is beneficial for corporate R&D and that this effect is intensified by more developed institutions			
Riaz M.F., Cherkas N.I., Leitão J. (2018)	Corruption and innovation: Mixed evidences on bidirectional causality	Granger causality test	we find that in whole sample, corruption causes in a Grangerian sense the innovation, while innovation does not cause a la Granger corruption. In the case of Continental and V-4 countries no evidence of causality in both directions is found. In Nordic countries corruption does not cause a la Granger the innovation, albeit innovation causes corruption in a Grangerian sense. In the case of PIIGS countries, empirical evidence reveals bidirectional causality.	Corruption	Innovation	Formal
Rocha L.A., Dal Poz M.E.S., Lima P.V.P.S., Khan A.S., Silva N.G.A. (2019)	Corruption, bureaucracy and other institutional failures: The "cancer" of innovation and development	Generalized method of moments	Interacting efficiency scores with the corruption index, the less-efficient firms are disadvantaged with corruption in relation to the frontier firms. This pattern is observed in the coefficient of elasticity of R & D investments indicating that corruption leads to different costs, 'favoring' the most efficient firms in relation to the most backward firms	Corruption	R&D investment	Formal

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Roper S., Arvanitis S. (2012)	From knowledge to added value: A comparative, panel-data analysis of the innovation value chain in Irish and Swiss manufacturing firms	Panel data	Innovation drives productivity growth in different ways in the two countries, however, through product change in Switzerland and through process change in Ireland. Other differences in the determinants of innovation performance linked to ownership and firms' institutional context emphasise the systemic nature of innovation and the legacy of past patterns of industrial development.	NIS	Innovation growth	Formal and informal
Rosenbusch N., Gusenbauer M., Hatak I., Fink M., Meyer K.E. (2019)	Innovation Offshoring, Institutional Context and Innovation Performance: A Meta-Analysis	Meta-analysis	The results of our meta-analysis that synthesizes evidence from 48 samples show that IO is related positively to innovation performance. As predicted, this relationship is moderated by differences in the institutional environments across countries. Specifically, when national innovation systems are weak at home, IO appears to enable institutional arbitrage strategy whereas Confucian cultures enable more effective reverse knowledge transfer.	NIS, culture	Innovation offshoring	Formal and informal
Rowe A.M. (2018)	Gender and innovation policy in Canada and Sweden	Comparative case study	This study finds that Sweden is a global policy leader in the development of gender-conscious innovation policy, while Canada has yet to consider a gender-conscious approach to innovation policy. Gender-conscious innovation policy norms have not traveled across the	NIS	Innovation	Formal and informal

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			OECD because of administrative solos and political opportunity structures.			
Sabry M.I. (2019)	Fostering innovation under institutional deficiencies: formal state–business consultation or cronyism?	Panel data	Evidence is found that the presence of business associations that are widely participated help in promoting innovation. They do this also in countries suffering from low institutional settings, and correct for the shortcomings caused by low regulatory quality.	Regulatory framework	Innovation	Formal
Santangelo G.D., Meyer K.E., Jindra B. (2016)	MNE Subsidiaries' Outsourcing and InSourcing of R&D: The Role of Local Institutions	OLS	Drawing on institutional and transaction cost economics, we argue that the degree of local R&D outsourcing is greater in high quality subnational institutional contexts. However, the quality of local institutions has less impact on the degree of R&D outsourcing by subsidiaries that are more open to external knowledge.	IPR, corruption	R&D outsorcing	Formal

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Shinkle G.A., McCann B.T. (2014)	New product deployment: The moderating influence of economic institutional context	Logistic regression	Overall, our analysis indicates that two critical aspects of economic institutions should be incorporated into our understanding and our models—the current level of institutional development and the institutional context. Thus, it has implications for both practicing managers and scholars	Institutional quality	New product deployment	Formal
Silva G.G., Jr. (2015)	Innovation and apropriability in the Brazilian manufacturing firms	Probit	Our probit panel regressions reveals that patents improve all R&D activity and product innovation but not internal or external R&D, trade mark as well	IPR	R&D activity	Formal
Silve F., Plekhanov A. (2018)	Institutions, innovation and growth: Evidence from industry data	OLS	We construct a measure of the innovation content of individual manufacturing industries and show that countries with stronger economic institutions specialize in more innovation-intensive industries. Our results also provide evidence that industries involving higher levels of innovation grow relatively faster in countries with better economic institutions.	WGI	Innovation intensity	Formal

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Spinesi L. (2009)	Rent-seeking bureaucracies, inequality, and growth	Mathematical modelling	Asymmetric information between political authorities and rent-seeking bureaucratic agencies diverts resources from innovative activities - crucial for development to take off in middle and low income countries - and unnecessarily exacerbates income inequality. The theoretical predictions not only match empirical facts on inequality, institutional quality and growth well documented in the literature, but are easily assessed in two groups of Latin American and African countries	Corruption	Innovation	Formal
Sun F., Hong J., Ma X., Wang C. (2017)	Subnational institutions and open innovation: evidence from China	OLS	The findings point to the context-dependent nature of OI strategy and the complementary effect of institutional parameters in emerging markets and help to reconcile the contrasting findings regarding the effect of OI in the prior literature.	IPR	Innovation performance	Formal
Sun P., Qu Z., Liao Z. (2018)	How and when do subnational institutions matter for R&D investment? Evidence from the Chinese pharmaceutical sector	Multiple regression	We find that the quality of subnational institutions, such as the degree of government deregulation and the effectiveness of local contracting institutions, has a significantly positive impact on corporate R&D intensity. Moreover, this institutional effect is more salient in indigenous firms and international joint ventures than in wholly owned foreign subsidiaries.	Legal and regulatory framework	R&D intensity	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
Szczygielski K., Grabowski W., Pamukcu M.T., Tandogan V.S. (2017)	Does government support for private innovation matter? Firm-level evidence from two catching-up countries	Panel data	We find that government aid for R&D activities contributed to better innovation performance by firms in both countries. By contrast, EU-funded grants for physical and human capital upgrading in Poland were inefficient in fostering innovation; in fact they may have actually impeded it	Government support	Private innovation	Formal
Tebaldi E., Elmslie B. (2013)	Does institutional quality impact innovation? Evidence from cross-country patent grant data	OLS	This study finds that institutional arrangements explain much of the cross country variations in patent production. Our results also imply that controlling for institutional quality, geographic related variables are not significant in explaining patent production.	WGI	Number of patents	Formal
Unger B. (2000)	Innovation systems and innovative performance: Voice systems	Descriptive statistics	The first tentative empirical results show that the regime effect dominates over the sector exposure effect.	NIS	Innovation	Formal and informal
Varsakelis N.C. (2006)	Education, political institutions and innovative activity: A cross-country empirical investigation	Panel data	The findings support the hypothesis that the higher the investment of a society in the quality of education, the higher the output of innovation activity. Furthermore, the development level of the governmental institutions is positively correlated with innovation activity.	Education, political framework	Patents per capita	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
Vecchi A., Della Piana B., Vivacqua E. (2015)	An Institutional-Based View of Innovation - An Explorative Comparison of Business Groups in China and India	Comparative case study	From the findings, it emerges that not only that China overperforms India in relation to all the Innovation Indexes but that their distinctive institutional environments tend to favour very different dynamics of innovation. More precisely, while China's regulatory environment tends to support a more conservative approach of business groups towards investments in traditional sectors, India's lack of infrastructures coupled by a more efficient regulatory environment tend to support more resourceful and creative approach	Regulatory framework, infrastructure	Innovation performance	Formal
Veliyath R., Sambharya R. (2011)	R and D Investments of Multinational Corporations	Panel data	Differences in a country's national technological innovation capability, that comprised the country's capacity for the creation of technology, technology infrastructure and the development of human skills, were the most important factors in attracting R&D investments	IPR, political stability	R&D investment	Formal
Vertova G. (2001)	National technological specialisation and the highest technological opportunities historically	Descriptive statistics, OLS	Only the country with a proper national system of innovation is likely to specialise in the highest technological opportunities. By contrast, countries with a miss-match between the institutional set-up of the economy and the prevailing technological paradigm are	NIS	Technological specialization	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
			more likely to remain locked into inferior technological paths.			
Wagner M., Llerena P. (2011)	Eco-Innovation Through Integration, Regulation and Cooperation: Comparative Insights from Case Studies in Three Manufacturing Sectors	Comparative case study	The paper derives results from analysing nine case studies and finds that the realization of eco-innovation is often an activity originating at the micro-level that however requires simultaneous integration of environmental aspects with the overall corporate strategy. Furthermore, market demand is identified as a crucial driver of eco-innovation and regulation as a complementary institutional factor especially for the diffusion of eco-innovation.	Regulatory framework	Innovation diffusion	Formal
Walsh V., Le Roux M. (2004)	Contingency in innovation and the role of national systems: Taxol and taxotère in the USA and France	Comparative case study	The empirical work was able to bring out the nuances and subtleties of each environment, the way in which innovation took place in practice, and some striking differences from what stereotypical accounts of innovation in each country would have suggested.	NIS	Innovation trajectory	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
Wang C. (2013)	Can institutions explain cross country differences in innovative activity?	Panel data	Countries with better institutions qualities as captured by the World Banks' Worldwide Governance Indicators (WGI) tend to attract more scientists and engineers into the research field and to spend more on R&D as well. This paper has also found evidence that the effect of institutions varies in different economies characterized by different levels of financial development and human capital accumulation, but stays relatively unchanged across countries with different levels of trade openness	WGI	R&D expenditure	Formal
Wang C., Kafouros M., Yi J., Hong J., Ganotakis P. (2020)	The role of government affiliation in explaining firm innovativeness and profitability in emerging countries: Evidence from China	Tobit	Affiliation with higher-level governments enhances firms' innovativeness, whereas affiliation with lower-level governments is effective for enhancing profitability. Our framework also clarifies how location-specific institutional substitution occurs, indicating that the usefulness of government affiliation for innovativeness depends on how effectively legal institutions protect intellectual property in each region	IPR, informal ties	Innovation performance	Formal and informal
Wang H., Kimble C. (2016)	How External Factors Influence Business Model Innovation: A Study of the Bosch Group and the Chinese	Single case study	The Bosch Group's investment in the Chinese automobile aftermarket highlights the impact of four principal external factors—industry, technology, institutions, and market—on business model innovation	Regulatory framework	Business model innovation	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
	Automotive Aftermarket					
Wang H., Zhao Y., Dang B., Han P., Shi X. (2019)	Network centrality and innovation performance: the role of formal and informal institutions in emerging economies	Panel data	Results suggest that formal institutions (marketization) positively moderate the relationship between network centrality and innovation performance, whereas informal institutions (social cohesion) negatively moderate this relationship. Moreover, formal and informal institutions have a strong joint impact on such relationship, that is, the effect of network centrality on innovation performance is most positive when marketization is high and social cohesion is low	Marketization, social cohesion	Innovation performance	Formal and informal
Wang J., Mao N. (2019)	Mercantile culture and corporate innovation: evidence from China	OLS	Using a sample of listed firms located in areas with cultural origin in China, we show that mercantile culture has a significantly positive effect on firm innovation. Higher level of marketization with better legal environment and less market distortion strengthen the association of culture and corporate innovation.	Culture, legal framework	R&D intensity	Formal and informal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
Witt M.A., Jackson G. (2016)	Varieties of Capitalism and institutional comparative advantage: A test and reinterpretation	Fuzzy-set qualitative comparative analysis	Applying fuzzy-set qualitative comparative analysis to data from 14 industries in 22 countries across 9 years, we find that comparative advantages in industries with radical innovation emerge in specific configurations mixing coordinated and liberal institutional features.	Coordinated/liberal markets	Radical/incremental innovation	Formal
Wu J. (2013)	Diverse Institutional Environments and Product Innovation of Emerging Market Firms	Panel data	The results show a positive relationship between institutional distance and product innovation success. An inverted U-shaped relationship was found between the institutional diversity of a firm's foreign markets and its product innovation success	Institutional distance (formal)	New product introduction	Formal
Wu J., Huang S. (2008)	Innovation or rent-seeking: The entrepreneurial behavior during China's economic transformation	Single case study	In this paper, we argue that before 1994, the coexistence was induced by a series of expediential institutional arrangements to stimulate entrepreneurial activities and after 1994, it was entrenched because of the slow progress in the overall reform toward becoming a market economy and because of inappropriate government actions and the lack of government action in institutional building	Institutional change	Innovative behavior	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
Wu J., Ma Z., Liu Z., Lei C.K. (2019)	A contingent view of institutional environment, firm capability, and innovation performance of emerging multinational enterprises	Panel data	Specifically, we examine three key aspects of host market's institutional environment: market maturity, intellectual property right protection, and cultural distance, to investigate their distinct impact on innovation performance. We further explore how the effects of institutional environment is contingent upon firm-specific absorptive capability. The analyses of a panel data of 735 Chinese EMNEs provide support for this contingent view	IPR, culture	Number of patents	Formal and informal
Wu J., Park S.H. (2019)	The role of international institutional complexity on emerging market multinational companies' innovation	Panel data	We propose that international institutional complexity provides learning opportunities for EMMCs' innovation performance but also incurs higher management costs to handle information overload from overextended internationalization. We further propose that the host exposure and the heterogeneity of an EMMC's top management team (TMT) moderate the main effect of international institutional complexity on EMMC innovation. The empirical testing utilizes a longitudinal panel dataset of 7,072 foreign expansion steps by 767 Chinese firms from 2001 and 2010 and offers strong support for the proposed hypotheses	Institutional complexity	Number of patents	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
Wu J., Steven S., Wu X. (2016)	Entrepreneurial Finance and Innovation: Informal Debt as an Empirical Case	OLS	We suspect that informal debt has an important effect on innovation, and this effect is contingent on the accessibility of formal debt and institutional development. The hypotheses are tested using survey data from 3,235 entrepreneurs in an emerging economy, China	Financial development	Number of patents	Formal
Wu J., Wang C., Hong J., Piperopoulos P., Zhuo S. (2016)	Internationalization and innovation performance of emerging market enterprises: The role of host-country institutional development	Panel data	Our panel-data analysis of Chinese EMEs shows that although host-country institutional development on average enhances innovation performance of the parent, such effects are more pronounced for EMEs with strong absorptive capacity and for those diversifying into a larger number of countries. Interestingly, EMEs with a higher level of state ownership gain more when entering countries with a lower level of institutional development.	Institutional development	Number of patents	Formal
Wu J., Wu Z., Zhuo S. (2015)	The effects of institutional quality and diversity of foreign markets on exporting firms' innovation	Negative binomial model	this study proposes that expanding into a foreign market with well-developed institutions helps exporting firms improve innovation performance and that a high degree of institutional diversity of multiple foreign markets positively influences firm innovation. The study also suggests that institutional diversity weakens the positive relationship between institutions and firm innovation.	Institutional quality and diversity	Number of patents	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
			The findings provide support for the proposed hypotheses			
Xie X., Qi G., Zhu K.X. (2019)	Corruption and New Product Innovation: Examining Firms' Ethical Dilemmas in Transition Economies	Panel data	Our empirical results show that corruption has a positive effect on firms' new product innovation. Moreover, we find that policy instability and competitive threats from the informal sector positively moderate the relationship between corruption and new product innovation. Using post hoc analysis, we find that the potentially positive effect of corruption on new product innovation is the consequence of inherent institutional weaknesses in transition economies; as the level of institutional development increases, the effect of corruption on firms' new product innovation will gradually decrease	Corruption	New product innovation	Formal
Xu Q., Chi R. (2009)	Comparing R&D consortia in Taiwan and the Chinese mainland	Comparative case study	R&D consortia in Taiwan and PTPs in the Chinese mainland have unique structural characteristics with their common catch-up goals and have been developing in different ways reflecting the relationships and interaction between academia, industry, and government. The effectiveness of R&D consortia is	NIS	Innovation trajectory	Formal

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			largely determined by the institutional arrangements including goal setting, organizational arrangements, and government involvement			
Yi C., Xu X., Chen C., Wu Y.J. (2020)	Institutional Distance, Organizational Learning, and Innovation Performance: Outward Foreign Direct Investment by Chinese Multinational Enterprises	Panel data	The results suggested that a formal institutional distance (FID) paradox existed between the FID and OFDI firms' innovation performance; the informal institutional distance inhibited the technology transfer from foreign subsidiaries to their parent companies and the growth of the parent companies' innovation performance; exploratory learning can effectively attenuate the negative influence of IID on OFDI firms' innovation performance.	WGI, culture	Innovation intensity	Formal and informal
Yi J., Hong J., Hsu W.C., Wang C. (2017)	The role of state ownership and institutions in the innovation performance of emerging market enterprises: Evidence from China	Panel data	Evidence derived from a large sample of Chinese manufacturing firms demonstrates that state ownership positively moderates the effect of R&D intensity on innovation performance. However, state ownership is not equally beneficial for all firms. Our analysis shows that region-specific marketization and industry-specific institutional policy enhance the innovation-enhancing effect of state ownership.	Regulatory framework	New product sales	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
Ying Y., Liu Y., Cheng C. (2016)	R&D activities dispersion and innovation: implications for firms in China	Negative binomial model	The results show that a firm in an emerging market with a decentralized R&D organizational structure with geographically centralized R&D activities has better innovation outputs. Moreover, institutional development positively moderates the relationship between the dispersion of R&D activities and innovation performance.	Institutional development	Number of patents	Formal
Yoo T., Rhee M. (2013)	Agency theory and the context for R&D investment: Evidence from Korea	Panel data	Using panel data on 100 large listed Korean firms, the study provides evidence that market-based governance mechanisms facilitate R&D investment	Regulatory framework	R&D investment	Formal
Yoo Y., Lyytinen K., Yang H. (2005)	The role of standards in innovation and diffusion of broadband mobile services: The case of South Korea	Single case study	Our study shows how CDMA standards shaped specific configurations of actor networks that enabled the fast and aggressive development and deployment of 2G mobile infrastructures and a rapid transition to 3G services. These actor networks span three separate and critical realms of activities: the regulatory regime, the innovation system, and the market place	Regulatory framework	Innovation trajectory	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
Yuan B., Zhang Y. (2020)	Flexible environmental policy, technological innovation and sustainable development of China's industry: The moderating effect of environment regulatory enforcement	Generalized method of moments	Environment regulatory enforcement positively moderates the relationship between flexible environmental policy and technological innovation. However, it has a potentially positive but not significant moderating impact on the relationship between technological innovation and industrial sustainable development, indicating that there is still an "implementation gap"	Regulatory enforcement	Technological innovation	Formal
Zhang J., Liang G., Feng T., Yuan C., Jiang W. (2020)	Green innovation to respond to environmental regulation: How external knowledge adoption and green absorptive capacity matter?	Hierarchical regression	Our results indicate that both command and control regulation and market-based regulation have positive influences on external knowledge adoption. External knowledge adoption fully mediates these positive relationships. In addition, green absorptive capacity only strengthens the positive impact of market-based regulation on external knowledge adoption	Regulatory framework	Green innovation	Formal
Zhang W., Zhao Y., Tian L., Liu D. (2017)	Boundary-spanning demand-side search and radical technological innovations in China:	Hierarchical regression	Results show that BSDSS has a positive effect on radical technological innovations. Further, the authors find that dysfunctional competition and political ties negatively moderate the main effect, whereas firms'	IPR	Radical innovation	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
	The moderation of innovation appropriability		legal and IPRs protection capabilities positively moderate the main effect			
Zhao M. (2006)	Conducting R&D in countries with weak intellectual property rights protection	Negative binomial model	The empirical analysis on a sample of 1,567 U.S.-headquartered innovating firms finds results consistent with the hypotheses that (i) technologies developed in countries with weak IPR protection are used more internally, and (ii) technologies developed by firms with R&D in weak IPR countries show stronger internal linkages	IPR	Protection of innovation	Formal
Zhao W., Watanabe C. (2008)	A comparison of institutional systems affecting software advancement in China and India: The role of outsourcing from Japan and the United States	Comparative case study	While both countries share certain similarities that enable them to develop advanced software that attracts leading countries, the outsourcing partners of the two countries-China with Japan, and India with the US-are related to disparities in their institutional systems that have an impact on their software development	Instiutional system	Software innovation	Formal

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Author(s)	Title	Methodology	Findings	Dependent Variable	Independent Variable	Type of Institution
Zhou Y. (2014)	Role of Institutional Quality in Determining the R&D Investment of Chinese Firms	Panel data	The key findings suggest that institutional quality positively affects the decision of firms to engage in R&D activities. Once firms start to engage in R&D, the subsequent expansion of firm-level R&D intensity depends on factors such as market structure.	Marketization	R&D activity	Formal
Zhu F., Wei Z., Bao Y., Zou S. (2019)	Base-of-the-Pyramid (BOP) orientation and firm performance: A strategy tripod view and evidence from China	OLS	We find that the effect of BOP orientation is contingent on both the institutional factors and the industry conditions. Specifically, government support strengthens while legal inefficiency weakens this effect; competitive intensity strengthens the effect, while technological uncertainty has no moderating role on this relationship	Government support, legal efficiency	Bricolage innovation	Formal

APPENDIX 2: DATA SOURCES OF INSTITUTIONAL VARIABLES

1.CONTROL OF CORRUPTION:

Control of corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. This table lists the individual variables from each data source used to construct this measure in the Worldwide Governance Indicators

Data Source	***Concept Measured***
Economist Intelligence Unit Riskwire & Democracy Index	Corruption among public officials
World Economic Forum Global Competitiveness Report	Public Trust in Politicians
	Diversion of Public Funds
	Irregular Payments in Export and Import
	Irregular Payments in Public Utilities
	Irregular payments in tax collection
	Irregular Payments in Public Contracts
	Irregular Payments in Judicial Decisions
	State Capture
Gallup World Poll	Is corruption in government widespread?
Institutional Profiles Database	Level of "petty" corruption between administration and citizens
	Level of corruption between administrations and local businesses
	Level of corruption between administrations and foreign companies

Data Source	***Concept Measured***
Political Risk Services International Country Risk Guide	Corruption
Varieties of Democracy Project	Corruption index
Global Insight Business Conditions and Risk Indicators	Corruption
African Development Bank Country Policy and Institutional Assessments	Transparency, accountability and corruption in public sector
Afrobarometer	How much do you think the office of the Presidency is involved in corruption?
	How many judges and magistrates do you think are involved in corruption?
	How many government officials do you think are involved in corruption?
Asian Development Bank Country Policy and Institutional Assessments	Transparency, accountability and corruption in public sector
Business Enterprise Environment Survey	How common is it for firms to have to pay irregular additional payments to get things done?
	Percentage of total annual sales do firms pay in unofficial payments to public officials?
	How often do firms make extra payments in connection with taxes, customs, and judiciary?
	How problematic is corruption for the growth of your business?
Bertelsmann Transformation Index	Corruption
Freedom House	Corruption (FNT)
Transparency International Global Corruption Barometer Survey	Frequency of household bribery: education
	Frequency of household bribery: judiciary

Data Source	***Concept Measured***
	Frequency of household bribery: medical
	Frequency of household bribery: police
	Frequency of household bribery: permit
	Frequency of household bribery: utilities
Global Integrity Index	Accountability
IFAD Rural Sector Performance Assessments	Accountability, transparency and corruption in rural areas
Latinobarometro	Corruption in Judiciary
	Corruption in Government
	Corruption in Parliament
World Bank Country Policy and Institutional Assessments	Transparency, accountability and corruption in public sector
Political Economic Risk Consultancy Corruption in Asia Survey	To what extent does corruption exist in a way that detracts from the business environment for foreign companies?
Vanderbilt University Americas Barometer	Perception of politicians to be corrupt -- % of respondents agreeing with statements: more than half & all politicians are corrupt
Institute for Management and Development World Competitiveness Yearbook	Bribery and corruption do not exist
World Justice Project Rule of Law Index	Factor 2: Absence of Corruption

2.RULE OF LAW

Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. This table lists the individual variables from each data source used to construct this measure in the Worldwide Governance Indicators.

Data Source	***Concept Measured***
Economist Intelligence Unit Riskwire & Democracy Index	Violent crime
	Organized crime
	Fairness of judicial process
	Enforceability of contracts
	Speediness of judicial process
	Confiscation/expropriation
	Intellectual property rights protection
	Private property protection
World Economic Forum Global Competitiveness Report	Business Cost of Crime and Violence
	Cost of Organized Crime
	Reliability of Police Services
	Judicial Indepdendence
	Efficiency of Legal Framework for Challenging Regulations
	IPR protection
	Property Rights

Data Source	***Concept Measured***
	Informal Sector
Gallup World Poll	Confidence in the police force
	Confidence in judicial system
	Have you had money property stolen from you or another household member?
	Have you been assaulted or mugged?
Heritage Foundation Index of Economic Freedom	Property Rights
Institutional Profiles Database	Degree of security of goods and persons
	Violent activities by criminal organizations (drug trafficking, weapons, prostitution...)
	Degree of judicial independence vis-à-vis the State
	Degree of enforcement of court orders
	Timeliness of judicial decisions
	Equal treatment of foreigners before the law (compared to nationals)
	Practical ability of the administration to limit tax evasion
	Efficiency of the legal means to protect property rights in the event of conflict between private stakeholders?
	Generally speaking, does the State exercise arbitrary pressure on private property (e.g. red tape...)?
	Does the State pay compensation equal to the loss in cases of expropration (by law or fact) when the expropriation concerns land ownership?

Data Source	*Concept Measured*
	Does the State pay compensation equal to the loss in cases of expropration (by law or fact) when the expropriation concerns production means?
	Degree of observance of contractual terms between national private stakeholders
	Degree of observance of contractual terms between national and foreign private stakeholders
	In the past 3 years, has the State withdrawn from contracts without paying the corresponding compensation... vis-à-vis national stakeholders?
	In the past 3 years, has the State withdrawn from contracts without paying the corresponding compensation... vis-à-vis foreign stakeholders?
	Respect for intellectual property rights relating to… trade secrets and industrial patents
	Respect for intellectual property rights relating to… industrial counterfeiting
	Does the State recognize formally the diversity of land tenure system?
Political Risk Services International Country Risk Guide	Law and Order
US State Department Trafficking in People report	Trafficking in People
Varieties of Democracy Project	Liberal component index (measuring rule of law, judicial independence, checks and balances)
Global Insight Business Conditions and Risk Indicators	Expropriation
	State contract alteration
	Contract enforcement

Data Source	***Concept Measured***
African Development Bank Country Policy and Institutional Assessments	Property rights and rule based governance
Afrobarometer	Over the past year, how often have you or anyone in your family feared crime in your own home?
	Over the past year, how often have you or anyone in your family had something stolen from your house?
	Over the past year, how often have you or anyone in your family been physically attacked?
	How much do you trust the courts of law?
	Trust police
Asian Development Bank Country Policy and Institutional Assessments	Property rights and rule based governance
	How often is following characteristic associated with the court system: Fair and honest?
	How often is following characteristic associated with the court system: Enforceable?
	How often is following characteristic associated with the court system: Quick?
	How problematic is crime for the growth of your business?
	How problematic is judiciary for the growth of your business?
Bertelsmann Transformation Index	Rule of Law
Freedom House	Judicial Accountability
Global Integrity Index	Public Management
	Rights
	Gender

Data Source	***Concept Measured***
IFAD Rural Sector Performance Assessments	Access to land
	Access to water for agriculture
Latinobarometro	Trust in Judiciary
	Trust in Police
	Have you been a victim of crime?
World Bank Country Policy and Institutional Assessments	Property rights and rule based governance
Vanderbilt University Americas Barometer	Trust in supreme court
	Trust in justice system
	Trust in police
	Have you been a victim of crime?
Institute for Management and Development World Competitiveness Yearbook	Tax evasion is not a threat to your economy
	Justice is fairly administered
	Personal security and private property rights are adequately protected
	Parallel (black-market, unrecorded) economy does not impair economic development
	Intellectual property rights are adequately enforced
World Justice Project Rule of Law Index	Factor 5.1: Crime is effectively controlled (Order and Security)
	Factor 7: Civil Justice
	Factor 8: Criminal Justice

3. POLITICAL STABILITY AND ABSENCE OF VIOLENCE/TERRORISM

Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politicallymotivated violence, including terrorism. This table lists the individual variables from each data source used to construct this measure in the Worldwide Governance Indicators.

Data Source	***Concept Measured***
Economist Intelligence Unit Riskwire & Democracy Index	Orderly transfers
	Armed conflict
	Violent demonstrations
	Social Unrest
	International tensions / terrorist threat
World Economic Forum Global Competitiveness Report	Cost of Terrorism
Cingranelli Richards Human Rights Database and Political Terror Scale	Political terror scale
iJET Country Security Risk Ratings	Security Risk Rating
Institutional Profiles Database	Intensity of internal conflicts: ethnic, religious or regional
	Intensity of violent activities…of underground political organizations
	Intensity of social conflicts (excluding conflicts relating to land)

Data Source	***Concept Measured***
Political Risk Services International Country Risk Guide	Government stability
	Internal conflict
	External conflict
	Ethnic tensions
Global Insight Business Conditions and Risk Indicators	Protests and riots
	Terrorism
	Interstate war
	Civil war
Institute for Management and Development World Competitiveness Yearbook	The risk of political instability is very low
World Justice Project Rule of Law Index	Factor 5.2: Civil conflict is effectively limited (Order and Security)

4.VOICE AND ACCOUNTABILITY

Voice and accountability captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. This table lists the individual variables from each data source used to construct this measure in the Worldwide Governance Indicators.

Data Source	***Concept Measured***
Economist Intelligence Unit Riskwire & Democracy Index	Democracy Index
	Vested interests
	Accountablity of Public Officials
	Human Rights
	Freedom of association
Freedom House	Political Rights (FRW)
	Civil Liberties (FRW)
	Press Freedom Index (FRP)
	Media (FNT)
	Civil Society (FNT)
	Electoral Process (FNT)
World Economic Forum Global Competitiveness Report	Transparency of government policymaking
	Freedom of the Press

Data Source	***Concept Measured***
	Favoritism in Decisions of Government Officials
	Effectiveness of Law-Making Body
Gallup World Poll	Confidence in honesty of elections
Institutional Profiles Database	Freedom of elections at national level
	Are electoral processes flawed?
	Do the representative Institutions (e.g. parliament) operate in accordance with the formal rules in force (e.g.Constitution)?
	Freedom of the Press (freedom of access to information, protection of journalists, etc.)
	Freedom of Association
	Freedom of assembly, demonstration
	Respect for the rights and freedoms of minorities (ethnic, religious, linguistic, immigrants...)
	Is the report produced by the IMF under Article IV published? Reliability of State budget (completeness, credibility, performance...)
	Reliability of State accounts (completeness, audit, review law...)
	Reliability of State-owned firms' accounts
	Reliability of basic economic and financial statistics (e.g. national accounts, price indices, foreign trade, currency and credit, etc.)
	Reliability of State-owned banks' accounts
	Is the State economic policy (e.g. budgetary, fiscal, etc.)… communicated?
	Is the State economic policy (e.g. budgetary, fiscal, etc.)… publicly debated?

Data Source	***Concept Measured***
	Degree of transparency in public procurement
	Freedom to leave the country (i.e. passports, exit visas, etc.)
	Freedom of entry for foreigners (excluding citizens of countries under agreements on free movement, e.g. Schengen Area, etc.)
	Freedom of movement for nationals around the world
	Genuine Media Pluralism
	Freedom of access, navigation and publishing on Internet
Political Risk Services International Country Risk Guide	Military in politics
	Democratic accountability
Reporters Without Borders Press Freedom Index	Press Freedom Index
Varieties of Democracy Project	Freedom of Expression
	Freedom of Association
	Clean Elections
Afrobarometer	How much do you trust the parliament?
	Overall, how satisfied are you with the way democracy works in your country?
	Freeness and fairness of the last national election

Data Source	***Concept Measured***
Bertelsmann Transformation Index	Political Participation (SI)
	Stability of Democratic Institutions (SI)
	Political and Social Integration (SI)
Global Integrity Index	Elections
	Public Management
	Access to Information and Openness
	Rights
IFAD Rural Sector Performance Assessments	Policy and legal framework for rural organizations
	Dialogue between government and rural organizations
IREEP African Electoral Index	Africa Electoral index
Latinobarometro	Satisfaction with democracy
	Trust in Parliament
International Research and Exchanges Board Media Sustainability Index	Media Sustainability Index
International Budget Project Open Budget Index	Open Budget Index
	Trust in parliament

Data Source	***Concept Measured***
	Satisfaction with democracy
Institute for Management and Development World Competitiveness Yearbook	Transparency of government policy is satisfactory
World Justice Project Rule of Law Index	Factor 1: Limited Government Powers
	Factor 4: Fundamental Rights
	Factor 5: Open Government

5.GOVERNMENT EFFECTIVENESS

Government effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. This table lists the individual variables from each data source used to construct this measure in the Worldwide Governance Indicators.

Data Source	***Concept Measured***
Economist Intelligence Unit Riskwire & Democracy Index	Quality of bureaucracy / institutional effectiveness
	Excessive bureacucracy / red tape
World Economic Forum Global Competitiveness Report	Infrastructure
	Quality of primary education
Gallup World Poll	Satisfaction with public transportation system
	Satisfaction with roads and highways
	Satisfaction with education system
Institutional Profiles Database	Coverage area: public school
	Coverage area: basic health services
	Coverage area: drinking water and sanitation
	Coverage area: electricity grid
	Coverage area: transport infrastructure
	Coverage area: maintenance and waste disposal

Data Source	***Concept Measured***
Political Risk Services International Country Risk Guide	Bureaucratic quality
Global Insight Business Conditions and Risk Indicators	Infrastructure disruption
	State failure
	Policy instability
African Development Bank Country Policy and Institutional Assessments	Quality of public administration
	Quality of budgetary and financial management
	Efficiency of revenue mobilization
Afrobarometer	Handling improving basic health services
	Handling addressing educational needs
Asian Development Bank Country Policy and Institutional Assessments	Quality public administration
	Efficiency of revenue mobilization
	Quality of budgetary & financial management
	How problematic are telecommunications for the growth of your business ?
	How problematic is electricity for the growth of your business?

Data Source	***Concept Measured***
	How problematic is transportation for the growth of your business?
Bertelsmann Transformation Index	Consensus building (MI)
	Steering capability (MI)
	Efficient use of resources
	Efficient use of assets
	Policy coordination
Global Integrity Index	Civil Service Integrity
	Public Management
	Business Environment & Infrastructure
	Welfare
	Health and Education
IFAD Rural Sector Performance Assessments	Allocation & management of public resources for rural development
Latinobarometro	Trust in Government
World Bank Country Policy and Institutional Assessments	Quality of public administration
	Quality of budgetary and financial manangement
	Efficiency of revenue mobilization

Data Source	***Concept Measured***
Institute for Management and Development World Competitiveness Yearbook	Adaptability of government policy to changes in the economy is high
	Government decisions are effectively implemented
	Bureaucracy does not hinder business activity
	The distribution infrastructure of goods and services is generally efficient

6.REGULATORY QUALITY

Regulatory quality captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. This table lists the individual variables from each data source used to construct this measure in the Worldwide Governance Indicators.

Data Source	***Concept measured***
Economist Intelligence Unit Riskwire & Democracy Index	Unfair competitive practices
	Price controls
	Discriminatory tariffs
	Excessive protections
	Discriminatory taxes
World Economic Forum Global Competitiveness Report	Burden of government regulations
	Extent and effect of taxation
	Prevalence of Trade Barriers
	Intensity of Local Competition
	Ease of starting a new business
	Effectiveness of anti-trust policy
	Stringency of environmental regulations
Heritage Foundation Index of Economic Freedom	Investment Freedom
	Financial Freedom
Institutional Profiles Database	Ease of starting a business governed by local law?
	Ease of setting up a subsidiary for a foreign firm?
	Share of administered prices

Data Source	*Concept measured*
	Does the State subsidize commodity prices (i.e. food and other essential goods, excluding oil)?
	Does the State subsidize the price of petrol at the pumps?
	Importance, de facto, of barriers to entry for new competitors in markets for goods and services (excluding the financial sector and beyond the narrow constraints of the market)… related to the administration (red tape etc.)
	Importance, de facto, of barriers to entry for new competitors in markets for goods and services (excluding finance and beyond the narrow constraints of the market)… related to the practices of already established competitors
	Efficiency of competition regulation in the market sector (excluding financial sector)
Political Risk Services International Country Risk Guide	Investment profile
Global Insight Business Conditions and Risk Indicators	Regulatory burden
	Tax inconsistency
African Development Bank Country Policy and Institutional Assessments	Trade policy
	Regional integration
	Business regulatory environment
Asian Development Bank Country Policy and Institutional Assessments	Trade policy
	Business regulatory environment
Business Enterprise Environment Survey	How problematic are labor regulations for the growth of your business?
	How problematic are tax regulations for the growth of your business?
	How problematic are customs and trade regulations for the growth of your business?

Data Source	***Concept measured***
Bertelsmann Transformation Index	Organization of the Market and Competition
IFAD Rural Sector Performance Assessments	Enabling conditions for rural financial services development
	Investment climate for rural businesses
	Access to agricultural input and product markets
World Bank Country Policy and Institutional Assessments	Business regulatory environment
	Trade policy
Institute for Management and Development World Competitiveness Yearbook	Protectionism does not impair the conduct of your business
	Competition legislation is efficient in preventing unfair competition
	Capital markets (foreign and domestic) are easily accessible
	Ease of doing business is supported by regulations
	Customs' authorities do facilitate the efficient transit of goods
	The legal and regulatory framework encourages the competitiveness of enterprises
	Foreign investors are free to acquire control in domestic companies
	Public sector contracts are sufficiently open to foreign bidders
	Real personal taxes do not discourage people from working or seeking advancement
	Real corporate taxes do not discourage entrepreneurial activity
	Finance and banking regulation is sufficiently adequate
	Labor regulations (hiring/firing practices, minimum wages, etc.) do not hinder business activities
	Subsidies do not distort fair competition and economic development
World Justice Project Rule of Law Index	Factor 6: Regulatory Enforcement