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국제학박사학위논문

**Risk Factors in Public-Private Partnerships
of Infrastructure in Developing Countries**

개발도상국 인프라 민관협력(Public-Private Partnerships) 에 대한
리스크 요인 분석

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서울대학교 국제대학원
국제학과 국제통상전공
이 준 희

**Risk Factors in Public-Private Partnerships of
Infrastructure in Developing Countries**

개발도상국 인프라 민관협력(PPPs)에 대한 리스크 요인 분석

by

Jun Hui Lee

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지도교수 김 종 섭

이 논문을 국제학박사 학위논문으로 제출함
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서울대학교 국제대학원 국제학과
이 준 희

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2015년 1월

| | | |
|---------|-------|--|
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| 부 위 원 장 | 김 태 균 |  |
| 위 원 | 김 현 철 |  |
| 위 원 | 곽 재 성 |  |
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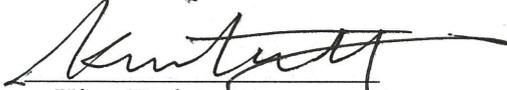
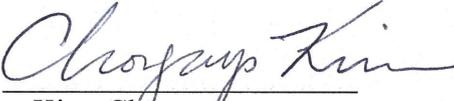
The undersigned, appointed by

**The Graduate School of International Studies
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in Developing Countries**

Presented by **Jun Hui Lee**, candidate for the degree of doctor of philosophy in international studies and hereby certify that the examined thesis is worthy of acceptance:

| | |
|-----------------------------|--|
| <i>Committee Chair</i> |  Moon, Hw-y-chang |
| <i>Committee Vice Chair</i> |  Kim, Taekyoon |
| <i>Committee Member</i> |  Kim, Hyunchul |
| <i>Committee Member</i> |  Kwak, Jae Sung |
| <i>Thesis Advisor</i> |  Kim, Chong-sup |

Date: January 2015

Abstract

Since the 2008 global financial crisis, governments have been seeking strategic tools for sustainable development of infrastructure in developing countries and private sectors have tried to pave the new way of infrastructure business opportunity in developing countries. A number of studies and books focus on the Public-Private Partnerships (PPPs) as a breakthrough for the sustainable and efficient infrastructure development as a public service provision. The concept of PPPs stemmed from the public policy reform in the United Kingdom (UK) in 1980s which was introduced for the efficiency in public work by encouraging the private player to join the public work and investment. By the mid-1990s many governments experienced the pressure of fiscal deficits and increasing public debt burdens especially for large infrastructure. Furthermore, globalization has enlarged the role and function of private sectors after 1990s, the governments introduced PPPs to improve the value for money in public service delivery projects and to bring private finance to public service delivery. During the last decade, governments recognized that PPPs are the useful instruments and network to solve the matter of budgetary limits in accessing the private finance as well as in increasing efficiency of infrastructure investment by partnering with the private sectors. Engaging in a PPPs process ensures the enabling environment for PPPs. The key factors to determine are as follows: how to contract between public and private, how to allocate and manage the risks and sufficient and effective transfer of risk to the private partner. With this regards, government institutional factors such as regulatory

quality, government effectiveness and market institutional factors like market system, for competition and efficient transactions are necessary for creating public-private partnerships. This dissertation describes the risks and contract types in infrastructure PPPs and suggests the analytical framework for risk factors in determining the contract types of PPPs. In the empirical part of this research, it has three hypotheses and takes the proxy variables of risks of infrastructure PPPs and builds the model to explain how different the significant risk factors are in three different types of PPPs for infrastructure in developing countries. PPPs have increasingly acknowledged as strategic tools for infrastructure investment and development from both public and private sides. In the last decade, the more private sectors develop and participate in the public works of infrastructure, the more business environment becomes enabling. This indeed has become more essential for infrastructure PPPs in developing countries, especially in case of Divestiture types. Greenfield types have diverse contract types whose shared risks are wider in range in comparison to the other types, and are significant in designing the structure of contracts and require more governmental institutional factors for sound management and operation of contracts. In conclusion, this empirical study proves hypotheses that developing countries with less business operational risks are more likely to have Divestiture types of PPPs; developing countries with less political and legal risks attract more Greenfield types of PPPs.

Keywords: Public-Private Partnerships, Risk factors of PPPs, Developing countries, Infrastructure, PPPs types, Greenfield, Divestiture

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I. Introduction

I. Introduction

Recently, Public-Private Partnerships (PPPs) are regarded as the breakthrough and an effective tool to sustain the infrastructure investment and development in terms of project financing and implementation. The concept of PPPs has emerged and developed based on various needs and purposes: historically, it has been not only for solving the lack of public finance, fiscal constraint for public works and services but also for increasing the efficiency of the public works and services. Through making private firms and institutions participate in the public infrastructure and social services, government pursues the efficient and effective role and function of public services. Yong (2010) states that governments around the world have embraced PPPs because they offer three main types of benefits: the ability to develop new infrastructure services despite short-term fiscal constraints, value for money through efficiencies in procurement construction and operation; and improved service quality and innovation through the use of private sector expertise and performance incentives. Basically Public-private partnership is the contract-based arrangement for governments and private institutions within one country, especially as the central government performs the public works with local governments or a government tries to get the business opportunities for private sectors to join the public works. Since mid-1990s, the more dynamic structure has been in the global business and international trade, the more important cooperation and partnership between government and private institutions would be with the viewpoint of international perspective. When it comes to PPPs with

international perspective and determinants of PPPs of infrastructure in developing countries, two factors are to be crucial factors for PPPs in infrastructure investment and development: namely, globalization and financial crisis. It is not easy to concretely define PPPs in a single word; nonetheless, the WBI and PPIAF (2012) provide a general definition of PPPs as “a long-term contract between a private party and government agency, for providing a public asset or service, in which the private party bears significant risk and management responsibility.” The concept of PPPs has evolved from ‘contracting-out arrangement’ to ‘partnerships’ in terms of relations between government and private companies, process of production, benefit and key to success and so forth. In developing countries, the demand for PPPs has been continuously increasing. Thus, development of investment finance would be the key in sustainable economic growth and infrastructure development. In supply side, many infrastructure businesses seek more stability and sustainability in long-term infrastructure business with taking guarantee for favorable PPPs environment in developing countries. Consequently, the market for PPPs has been formed and the PPPs industries for infrastructure in developing countries have enlarged accordingly. PPPs present the scheme and channel for public sector to contract for managerial and operational expertise as well as external funds and financing. The perception of risk transfer and sharing between private and public sectors is a core benefits in PPPs; hence, better risk allocations and institutional supports from government are necessary for effective partnerships in infrastructure investment. This study mainly aims to estimate the risks factors in determining PPPs. This dissertation introduces

reclassifications of risks in terms of macro and micro and suggests risk type matrix box for types of PPPs. In the empirical study, it analyzes risk and institutional factors for determining the types of PPPs with setting available proxy variables as risk factor and draw implications.

In terms of forming the PPPs enabling environment to attract more PPPs investment in developing countries and to successfully complete projects, this thesis attempts to define risks of infrastructure PPPs in developing countries and makes the conceptual framework for analysis on the relation between risks and PPPs types. The research questions include the following: what are the new trends and characteristics of infrastructure PPPs in developing countries and how do risk and institutional factors affect the determination of PPPs, particularly for infrastructure PPPs. The public-private partnerships with international perspectives have been studied since 2000s and actively analyzed with empirical study since mid-2000s. The World Bank's Private Participation in Infrastructure (PPI) database, which is currently the only available database providing Infrastructure PPPs in developing countries, covers infrastructure projects in low- and middle-income countries, directly and indirectly serving the public work from the period 1990 to 2013. Chapter II introduces the research background by revisiting the definition of PPPs and reviewing the previous studies with classification framework of PPP researches. In addition, research questions are specified by examining the trend of PPPs in the developing countries, especially focusing on the change of types of PPPs. Chapter III theorizes the key concept of PPPs, risk sharing between public and private sectors, and rearranges the various types and risk factors to

derive the conceptual framework for analysis of types and risk factor. Lastly, based on the conceptual framework, hypotheses are proposed. Continuously, in the Chapter IV, empirical analysis is conducted to estimate the relations between types of PPPs and risk factors. In conclusion, this study provides the PPP policy implications for government of developing countries to promote the PPPs as well as for international institutions and developed countries who plan to support the PPPs of infrastructure investment in developing countries, with consideration of risks and types of PPPs. Chapter V briefly summarizes all chapters and maps the strategic PPPs policy to lead the efficient and effective private participation in infrastructure investment in developing countries.

II. Research Background

II. Research Background

The term ‘public-private partnership’ originated in the United States, initially related to joint public- and private sector funding for educational programs and similar funding for utilities in the 1950s. Since 1960s it has been widely use to refer to much broader concept of publicly-funded provision of social services by non public-sector bodies (Yescome, 2007). PPPs are public policy delivery tools for efficient and effective investment scheme for economic and social infrastructure development with international cooperative partnerships, especially in 1990s with strong globalization. Issues of PPPs can be regarded along the international affairs: the increasing demands for infrastructure in countries during mid-1990s, strategic policy tool to solve the lack of public finance to invest the infrastructure development of developing countries in the late-2000s and multiple PPPs structure¹ in the 2010s. This part firstly defines the meanings and scope of PPPs and overviews the PPPs research fields, reviews the previous literatures on key issues such as risks and PPPs and key feature and trends in PPPs, based on which research questions are derived. This part consolidates the previous research findings for comprehensive understanding of PPPs.

¹ Recently, private institutions and companies take PPPs strategically to penetrate the infrastructure market in developing countries and also governments of developing countries as well as developed countries regard the PPPs as win-win partnerships in international development. So the PPPs market has been actively created with multiple participants from government and private side.

II.1 Definition of PPPs

Public-private partnerships are a worldwide concept but are often not clearly defined. There is no single accepted international definition of what a PPP is and has been executed or financed by the public sector.

Scope of infrastructure

The infrastructure investment has long been functioned as a key factor in economic development and growth. Aschauer (1989) emphasized the importance of an adequate supply of infrastructure services in the economic development. Noumba-Um (2010) emphasized that the catalytic role of infrastructure in growth, social inclusiveness and poverty reduction is widely recognized. Also, the access to basic infrastructure services such as water, sanitation, electricity, transport and telecommunications are as critical as economic development in creating new economic opportunities and lifting millions of people out of the poverty gap as well as social development. In general, when it comes to infrastructure, it can be classified as <Table 1> below, Grimsey & Lewis (2007) classified the economic and social as well as hardware and software. This dissertation

focuses on the hardware infrastructure in terms of economic development and growth, including water and sewerage².

Table 1. Classification and Scope of Infrastructure

| | Hard | Soft |
|----------|--|--|
| Economic | Roads, motorways, bridges, railway, airports, telecommunication, power | vocational training, financial institutions, R&D facilitation, technology transfer and export assistance |
| Social | Hospitals, school, water supply, school, housing, prison aged care homes | export assistance, social security, community services, environmental agencies |

Source: Grimsey & Lewis (2004)

Definitions of PPPs

The concept and theories of PPPs initially emerged in the early 1980s as a part of New Public Management (NPM)³ in the United Kingdom yet the term ‘public-private partnership’ appears to have originated in the United State in the -1950s and 1960s as a relating to joint public- and private-sector funding.⁴ However, there is no universally accepted definition of a PPP; its exact meaning differs between countries and organization, and over time (See Table 2).

2 Water and sewerage is in the social-hardware infrastructure in the classification by Grimsey and Lewis (2004). However, water and sewerage is defined as water treatment plants and utilities to be included in the economic-hardware infrastructure.

3 NPM is implemented by Margaret Thatcher

4 Yescombe (2007)

Table 2. Various Definitions of PPPs

| Institution | Definition |
|---|--|
| World Bank | The term “public-private partnership” has taken on a very broad meaning. The key elements, however, are the existence of a “partnership” style approach to the provision of infrastructure as opposed to an arm’s-length “supplier” relationship...Either each party takes responsibilities for an element of the total enterprise and they work together, or both parties take joint responsibility for each element...A PPP involves a sharing of risk, responsibility, and reward, and it is undertaken in those circumstances when there is a value- for-money benefit to the taxpayers. |
| OECD | An agreement between the government and one of more private partners. |
| European Investment Bank | The relationships formed between the private sector and public bodies often with the aim of introducing private sector resources and/or expertise in order to help provide and deliver public sector assets and services. |
| International Monetary Fund (IMF) | Arrangements where the private sector supplies infrastructure assets and services that traditionally have been provided by the government. |
| European Commission (EC) | Forms of co-operation between public authorities and the world of business which aim to ensure the funding |
| HM Treasury, UK | Arrangements typified by joint working between the public and private sector. In the broadest sense, PPPs can cover all types of collaboration across the interface between the public and private sectors to deliver policies, services and structure, the most common form of PPP is the Private finance initiative ⁵ . |
| Canadian Council for Public Private Partnership | PPP is cooperative venture between the public and private sectors, built on the expertise of each partner that best meets clearly defined public needs through the appropriate allocation of resource, risks and rewards. |

⁵ The private finance initiative related to the UK government initiative on PPPs. A PFI contract is a form of PPP where, in its most common form, the private sector designs, builds, finances and operates (DBFO) facilities based on ‘output’ specification decided by the public sector. The PFI-type model has mainly been applied to social infrastructure projects such as schools and hospitals in the UK (Yong, 2010).

| | |
|--|--|
| Standard and Poor's (S&P) | Any medium- to long-term relationship between the public and private sector. |
| Infrastructure Australia ⁶ | The Private sector provides public infrastructure and any related services; and there is private investment of financing; PPPs as a procurement method are part of a broader spectrum of contractual relationships between the public and private sectors to produce an asset and/pr deliver a service. They are distinct from early contractor involvement, alliance, managing contractor, traditional procurement (design and construct) and other procurement methods. |
| Government of India ⁷ | Partnership between a public sector entity(Sponsoring Authority) and a private sector entity(a legal entity in which 51% or more of equity is with the private partner/s) for the creation and/or management of infrastructure for public purpose for a specified period of time(concession period) on commercial terms and in which the private partner has been procured through a transparent and open procurement system |
| National Treasury PPP Unit (South Africa) ⁸ | Public-private partnership means a commercial transaction between an institution and a private party in terms of which the private party; (a) performs an institutional function on behalf of the institutions; and/or, (b)acquires the use of state property for its own commercial purposes; and (c)assumes substantial financial, technical and operational risks in connection with the performance of the institutional function and/or use of state property; and (d) receives a benefit for performing the institutional function or from utilizing the state property. |
| Public-private Infrastructure Advisory Facility ⁹ | A public-private partnership (PPP) involves the private sector in aspects the provision of infrastructure assets or of new or existing infrastructure services that have traditionally been provided by the government |

Source: Reproduced based on OECD (2008), Kwak et al. (2009), Yong (2010)

6 National PPP Guidelines: Policy Framework(2008), Infrastructure Australia

7 Public Private Partnerships: Creating and Enabling Environment for State Project(2007), Department of Economic Affairs, Ministry of Finance, Government of India

8 Treasury Regulation 16 of Public Finance Management Act, Public Private Partnership Manual (2002), South Africa National Treasury

13 PPIAF, World Bank

The reason for the lack of definitional clarity may result from the fact that PPPs imply a broad scope to fill the gap between traditionally procured government projects and full privatization. Yong (2010) states that it is important to note the different use of the term PPP, across countries and organizations. Yescombe (2007) argues the development of PPPs can be described as two schemes: one is 'policy-based' or 'program-based', the other is 'project-based' or 'contract-based.' Yescombe (2007) underlines that the PPPs are more likely to be project-based and quite simply summarizes the definitions of PPPs as a contract between a public and a private sector party with four elements; 1) a long-term contract between; 2) for the design, construction, financing, and operation of public infrastructure by the private-sector party; 3) with payments over the life of the PPP contract to the private-sector party for the use of the facility, made either by the public-sector party or by the general public as users of the facility; and 4) with the facility remaining in public-sector ownership, or reverting to public-sector ownership at the end of the PPP Contract. Furthermore, Yong (2010) defines PPPs with the main features including risk transfer, long-term contracts and partnership agreement.

II.2 Literature Review

Since 1990s many researchers have attempted to improve the structure of PPPs contract and operation of PPPs projects by defining the concepts and rationale of PPPs with international perspectives. As global spreads of PPPs, governance and infrastructure development tool win the popularity with the internationalized infrastructure investment, the concepts are not classic public policy issues (Hodge et.al, 2007). Identifying key aspects of PPPs projects (Grimsey and Lewis, 2002; Li et al., 2005), many different academic disciplines and theoretical perspectives have been used to analyze the issues of infrastructure PPPs. Most studies focus on either micro economic policy or project-financed business management, which present only a partial understanding of the PPPs¹⁰. There are new insights from political science and management studies, accounting studies, and encouraging new work from economics and legal studies (Hodge et.al, 2010). This part reviews literatures with different approaches and perspectives; economic theoretical approach, public policy and business management and statistical analysis and develops some points to generate a new analysis framework. An extensive literature review was conducted to gain a comprehensive understanding of PPPs, in infrastructure development, and many literatures' approaches for PPPs commonly imply a broad range of uncertainties and risks associated with the PPPs (Kwak et al., 2009). Conceptually, literature topics on

¹⁰ There is no clear definition and concepts with one single accepted definition and general model for Public-Private Partnerships in developing countries because of available data and information sources as well as complicated structure and issues implementing the PPPs

efficiency of PPPs are divided into three: risks, governance and finance on the determinants of PPPs and success factors for PPPs (See Appendix A).

Theoretical Approach in Efficiency

The key theoretical concept of PPP focuses on the ‘efficiency’, which is to be tracked back to the theory of ‘X-efficiency¹¹’ developed by Leibenstein (1966). Leibenstein (1966) assesses the inefficiencies in public institutions or enterprises, which result from distortionary government interventions as well as highly bureaucratic structure and concludes from the data that increasing allocative efficiency is trivial while increasing X-efficiency is frequently significant. The economic theoretical approach underpins contract-based PPPs to analyze the optimal condition for sharing risks with the micro economic perspective. It is argued that PPPs are better than the traditional unbundling public provision with regards to the quality control of service (Hart, 2003). In terms of contract bundling, there is expectation of positive externality of quality to improve the efficiency of cost-saving (Benett and Issoa 2006; Issoa and Martimore 2009; Martimort and Pouyet, 2008). Issoa and Martimort (2014) take the microeconomics to analyze the main incentive issues in PPPs and the shape of optimal contracts, discussing three main features of PPPs: tasks bundling, risk transfer and long-term contract. Regarding optimal resource commitments to PPPs, Besley and

¹¹ X-efficiency simply means that no incentive to control costs in production in terms of cost-benefit.

Ghatak (2001) and Francesconi and Muthoo (2004) examine the optimal ownership of the public provision to the party that relatively values more of the benefits from public goods.

Risks and PPPs

Grimsey and Lewis (2002) present a framework for investigating and carrying an analysis of the risks, and systematically review project risk from the perspectives of various entities related to PPPs contract. Li et al. (2005) identify three levels of risk: macro-, meso-, and micro- level, in terms of which there are arguments macro- and mico-level risks should mainly be managed within the public sector or shared with the private sector. However, it is argued that the majority of meso-level risks should be allocated to the private sector. Thomas et al. (2003) discuss eight types of risks: traffic revue risk, delay in land acquisition, demand risk, delay in financial closure, completion risk, cost overrun risk, debt serving risk, and direct political risk. Wang et al. (2000) discuss risk factors within political, foreign exchange and revenue, financial, and legal risk categories. Unfortunately, these literatures above focus only on specific regions and different PPP types¹²; thus, it is not possible to compare the relation between risk factors and types of PPPs under the comprehensive framework.

¹² PFI (Private Finance Initiative) of UK in Grimsey and Lewis (2002); BOOT types of Australia in Le et al. (2005), BOT of India in Thomas et al. (2003); BOT of various countries in Wang et al. (2000).

Risk Allocation and Management

The PPPs arrangements have been recognized as the preferred way to provide public service in many countries, more so in developing countries which demand more infrastructure investment for their economic growth. While PPPs are perceived as a means for creating public infrastructure with increased efficiency and effective investment, some literatures argue for negative impacts and failure PPPs based on a number of case studies¹³ (Kumaraswamy and Zhang, 2001). With the different perspective from the public sector on the failure of PPP performance, political obstacles are often pointed out as a major hindrance in the way of using PPPs. Effectiveness means that appropriate risks are transferred to the private sector and is capable of operating and providing services more efficiently. Therefore, it is the key to make the PPPs contract between public party and private party to allocate risks efficiently as well as to manage the PPPs with public policy, as buttressed by many studies which discuss the significance of efficient risk allocation in privately financed infrastructure projects and suggest policy implication with the classification of risks in public-private partnerships (Akintoye et al., 2002; Grimsey and Lewis, 2002; Li et al., 2005; Thomas et al., 2003; Wang et al., 2000). Regarding risks management for PPPs, a number of studies propose the appropriate ways for managing the important risks associated with PPP projects. Moreover, these studies argue that risks in PPPs can be

¹³ BOT(Build-Operate-Transfer) which is a typical type of PPPs runs into problems due to cost overruns, unrealistic price, income projections and legal dispute.

clustered according to the conventional risk management process.¹⁴ Li et al. (2005) study on the effective risk management measures of international construction joint ventures and investigate the risk strategies adopted by the public and private sectors. Shen et al. (2006) analyze the typical risks in public projects and the role of PPPs to manage risks in public sector project based on the case of Hong Kong. Grimsey and Lewis (2002) present a framework for assessing the risks using a case study of waste water treatment facility in Scotland. Ng and Loosemore (2007) focus on the risk classifications and review the Sydney's railway case and emphasize the role of government to allocate the risk appropriately in successful PPPs. Most all literatures highlight the risks and policy or management for risks for PPPs; nevertheless the previous literatures tend to lack consideration for types and comprehensive conceptual work.

Determinants and Success Factor of PPPs

Kwak et al. (2009) emphasize that success of a PPPs project is dependent on a number of factors such as the competence of the government, an appropriate allocation between the public and private sectors, and a sound financial package. Also the research recommends public policy of developing the database and procurement process of PPPs, communication channels with the private sector and ways to establish and maintain the strategic network with public sectors. In addition, Kateja (2012)

¹⁴ Risk area, risk analysis and risk strategies.

suggests the public policy to facilitate the private sectors in the infrastructure PPPs in the BRICs¹⁵ cases. Using project information database, no clear evidence on the relation between risks and types of PPPs has been found. Lastly, Marques and Berg (2011) examine how risk is reflected in infrastructure regulatory contracts, using two types of PPPs: concession and mixed companies. However, few studies on the risks and types are based on a clear definition and concepts of two factors: risks and types. Instead of finding the new determinants in PPPs for infrastructure in developing countries, this study focuses on the risk factors and types of PPPs in the few selected developing countries¹⁶. In this regards, this study aims to estimate the risks with proxy variables to represent the risk factors and prove their influence on the different types of PPPs.

Research Question from Literature Review

Consequently, from the literature review on risks, types and determinant, success factors of PPPs, this study draws two broad research questions: 1) *What factors affect more on what types of PPPs; and 2) how do they affect differently?*. Based on these research questions, this dissertation provides the comprehensive conceptual framework for analysis and conduct empirical study on three specific hypotheses¹⁷.

¹⁵ Brazil, , Russia, Indonesia, China.

¹⁶ Selected 31 countries who ranked top 40 during over two decades (1990-2013)

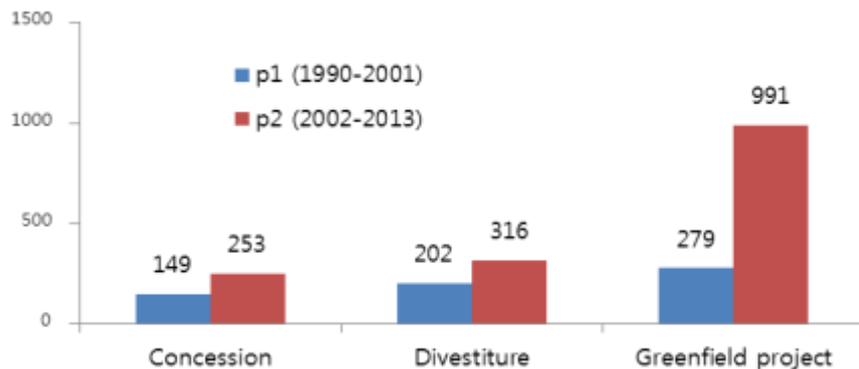
¹⁷ Chapter III.3

II.3 Key Features in Types of PPPs

When public and private parties conclude a long-term contract for the infrastructure investment, various types of risks are to be considered. Likewise, a PPP type is determined according to the risks-sharing between public and private sectors. Since 2000s, the Greenfield type has been dramatically increased. According to the PPI database, the Greenfield types capture 63 percent of world PPPs projects during the last 10 years¹⁸, which is much higher portion than that of to the past¹⁹(See Figure 1). Especially, energy and telecom sectors are both dominated by Greenfield type while the transport and water sector are occupied by Concession type. A Divestiture types are secondly preferred in the sector of energy and telecom²⁰ (See Appendix B).

Figure 1. Comparison two periods by types

(Unit: US billion \$)



Source: PPI (Private Participation in Infrastructure), World Bank

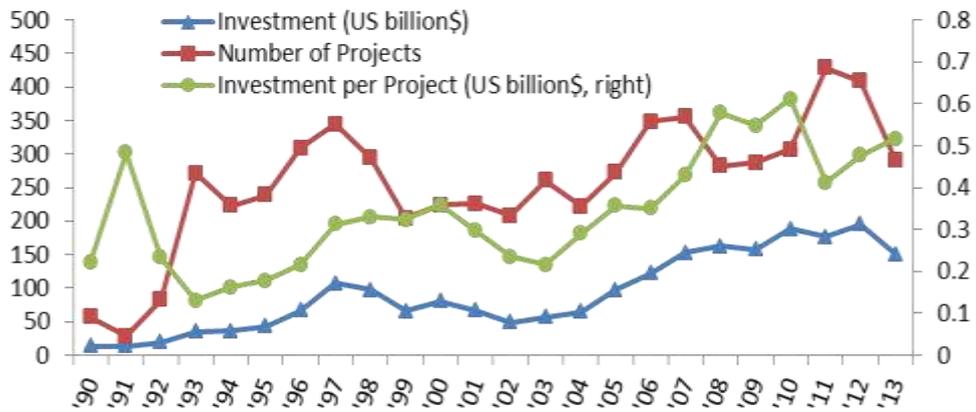
¹⁸ The periods: from 2002 to 2013.

¹⁹ The Greenfield is 44percent in the world PPP projects from the year of 1990 to 2001.

²⁰ See Appendix B.

Considering the two major trends in infrastructure, PPP market increases as the size of infrastructure projects increases (See Figure 2). As shown below, Greenfield types are dominant in PPPs contract (See Figure 3) and risks matters in PPP types display even more significant dominance. In other words, the bigger the size of PPPs is, the more sub-contracts and the more negotiations on risk-sharing between contractors of public and private sectors are to be concluded, which ultimately will increase the necessity of understanding risk factors on types of PPPs.

Figure 2. Trends of PPPs investment in developing countries (1990-2013)

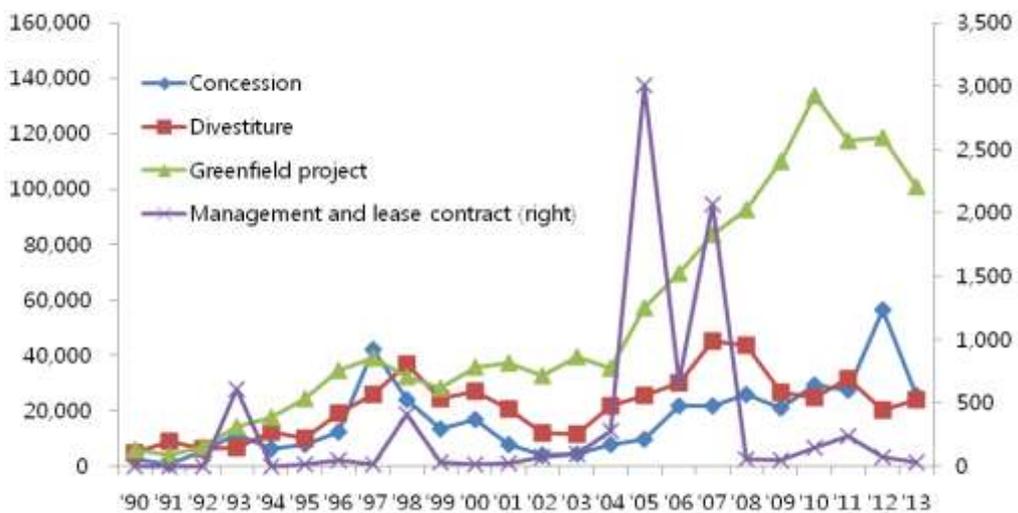


Source: PPI (Private Participation in Infrastructure), World Bank

According to <Figure 1>, the Greenfield increases dramatically and it charges over 50 percent²¹ in total investment, despite its deterioration due to the financial crisis in 2008. Concession is for 18 percent and Divestiture accounts for 28 percent. However, management and lease contract is too small portion, under 0.5 percent, to compare with other types in regions. There are two remarkable peaks in the year of 2005 and 2007 due to the investments of transport and water sectors in East Europe and Central Asia.

Figure 3. Trends of PPPs types in developing countries

(Unit: US million\$)



Source: PPI (Private Participation in Infrastructure), World Bank

As indicated, Greenfield type of PPPs is rapidly emerging in accordance with the increase demand in developing countries. Therefore, developing countries need to

²¹on average in 1990- 2013.

prepare well-designed the policy plans and well-organized strategic institutional regulations for successful PPPs, in which identifying the relation between risks and types is critical.

III. Conceptual Theorization

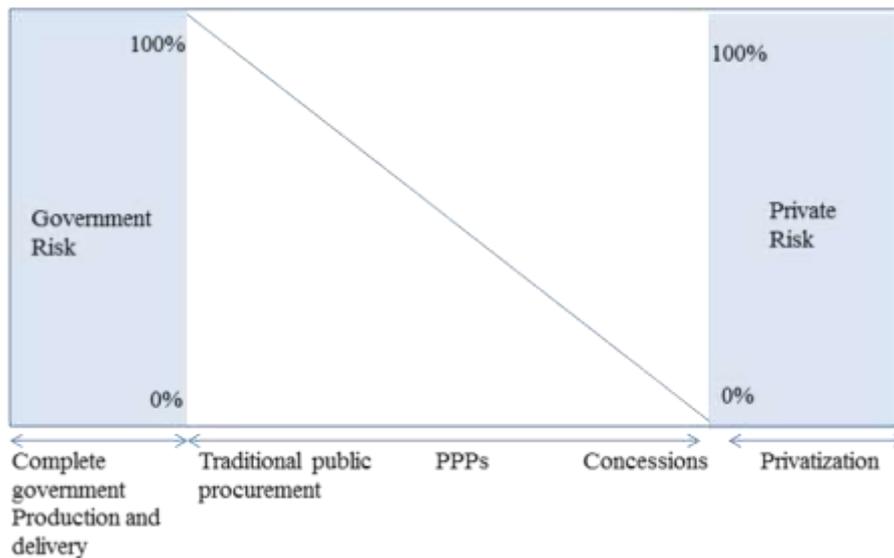
III. Conceptual Theorization

III.1 Typology and Risks of PPPs

The Concept of PPPs

To solve the research questions, it is necessary to revisit the concept and types of PPP. Public-private partnerships typically encompass a series of activities such as design, build, operate and finance (OECD, 2008). According to <Figure4>, the degree of risk sharing changes in order to make different types of PPPs. In doing so, classifications by risk and mode of delivery are used.

Figure 4. Spectrum of combinations of public and private participation



Source: OECD (2008)

The Risk Classification

There are different classifications of risks; Grimsey and Lewis (2002, 2004) divide the risks into nine categories for infrastructure projects: technical, construction, operation, revenue, financial, force majeure, regulatory/political, environmental and project default risks. These categories are largely divided into two levels of risks: 1) global, which includes the risk associated with the project agreement, such as political, legal, commercial and environmental risks; and 2) element, which is related to the project level, namely, construction, operation, finance and revenue generation risk. Ng and Loosemore (2007) take two categorizations of risks: project and general risks. Project risks stem from the events with the microenvironment associated in each project whereas general risks are external element of the PPPs project. Li et al. (2005) suggest three levels of PPPs: macro, meso and micro level risks. Macro risks generated externally are not related to the meso risks which are endogenous to the process. The micro level risks are generated during the process of procurement, associated with stakeholder relationships and different contextual understanding level and perspectives between public sector and private sector. Furthermore, Marques and Berg (2011) classify the risks based on the origins of risks: production, commercial and context. They argue that risk related to the production process are almost always created by the private sector, while the commercial and contextual ones are usually generated by

mixed factors; however, risks often are generated by the private sector, thus, risk mitigation cannot be chosen by the private sectors.

However, in the real term the risks depend on the project and contextual environment (Ng and Loosemore, 2007). For instance, Marques and Berg (2011) argue that consumption (demand) and unilateral policy change risks matters the most in PPPs infrastructure projects. Considering the contract-based projects, the renegotiation on the contract is likely to generate the cost and inefficiency in PPPs. Indeed, these are the critical risks associated with the PPPs in the developing countries.

Based on the previous studies, the risks classification into macro and micro level, which specifically appear on the process of decision, selection, design, operation, and completion, can be identified. Moreover, there are related risk factors based on various exiting classification (See Table 3).

Table 3. Risk classification

| Risks | | Specific risk factors |
|---|--------------------------------------|---|
| Public (Government)/ Macro | Political / Public policy | Unstable government Expropriation Nationalization of assts Poor public decision –making process Strong political opposition |
| | Macroeconomic/ | Poor financial market Inflation/ Interest rate volatility |
| | Legal | Influential economic events Legislation change Change in tax regulation |
| | Social | Industrial regulatory change Lack of private provision of public services Level of public opposition to project |
| Private (Business)/ Micro | Construction | Uneven engineering techniques Construction cost overrun Construction time delay Material/labor availability Late design changes Poor quality workmanship Excessive contract variation Insolvency/default of sub-contractors or suppliers Business strategic management, operation competitiveness |
| | Construction-Completion | Delay by Construction Subcontractor Other causes of delay |
| | Operation | Usage/ demand risk Revenue payment Operation cost overrun Operational revenues below expectation Low operating productivity Maintenance more frequent than expected Maintenance more frequent than expected |
| | Project-Termination | Project Company Default Termination by the Public authority |
| | Partnership/ Relationship | Organization and co-ordination risk Inadequate experience in PPPs Inadequate distribution of authority in partnership |

| | | |
|------------------------|-----------------------------------|---|
| | | Difference in working method and know-how between partners Lack of commitment from either partner |
| Meso level risk | Endogenous(controllable) | Project selection: level of demand, land acquisition Project finance: availability of finance Residual risk: residual risks, finance cost Delay in project approvals and permits |
| | Exogenous (uncontrollable) | Natural: Force majeure |

Source: Reproduced from Akintoye et al. (2002), Bing et al. (2005), Kalidindi et al., (2003), Ke et al. (2010) and Yescombe (2007)

The Types of PPPs

Typology of PPPs, based on the finance and operation for PPPs has various combinations of operation and finance mix between public and private sectors. A public-private partnership refers to an agreement between the government and one or more private partners, of which the private partners deliver the service in such a manner that the service delivery objectives of the government are aligned with the profit objectives of the private partners and where the effectiveness of the alignment depends on a sufficient transfer of risk to the private partners (OECD, 2008). There are a number of models of private sector participation in infrastructure, primarily distinguished by two factors: the degree of risk allocation between the public and private sector; and the length of the contract period (Yong, 2010). <Table 4>

provides a summary of the different ways of providing public infrastructure and shows how PPPs lie on the spectrum from wholly public-sector projects (and risk) to wholly private sector projects.

Table 4. Models for private participation in infrastructure and their key features

| | Type of model | Description | Level of risk assumed by the private sector | Length of contract (number of years) | Capital investment | Asset Ownership | Most common sector in developing countries | |
|--------------------------|-----------------------------------|--|--|--------------------------------------|--------------------|-----------------|--|---|
| | Service contract | Contract for infrastructure support services such as billing | Low | 1-3 | Public | Public | Water utilities Railways services | |
| Broad definition of PPPs | Management contract | Contract for management of a part/ whole of the operations | Low/ Medium | 2-5 | Public | Public | Water utilities | |
| | Lease contract | Contract for management of operation and specific renewals | Medium, | 10-15 | Public | Public | Water sector | |
| | Core PPPs | Build-operate-transfer contract | Contract for investment in and operation of a specific component of the infrastructure service | High | Varies | Private | Public/ Private | Energy sector IPPs Highways Sanitation Desalination Plants |
| | | Concession | Contract for financing and operation and execution of specific investment | High | 25-30 | Private | Public/ Private | Airport/ports/rail Energy networks |
| | Divestiture /Privatization | Contract of transfer of ownership of public infrastructure to the private sector | Complete | Indefinite | Private | Private | Telecoms | |

Source: Yong (2010)

Promoting PPPs projects requires political support, government effectiveness and regulatory system to control and management risks (Kalidindi et al., 2003). Likewise,

Yescombe (2007) provides five elements²² in consisting the PPP types, reflecting the concepts of risk sharing between public and private sector. PPPs can be classified by the legal nature of private-sector involvement in the types as BOT (Build-Operate-Transfer), BTO (Build-Transfer-Operation), and DBFO (Design-Build- Finance-Operate) (See Table 5).

²² Construction, operation, ownership, who pays, who is paid are the element to determine the types of PPPs.

Table 5. Public and private provision of infrastructure

| Public projects | | | | Private projects | | |
|-----------------------------|------------------------------|--------------------------------|--------------------------------------|--|--|---|
| Public- Private Partnership | | | | | | |
| Contract Type | Public-sector procurement | Franchise (<i>Affermage</i>) | Design-Build-Finance-Operate (DBFO)* | Build-Transfer-Operate (BTO)** | Build-Operate-Transfer (BOT)*** | Build-Own-Operate (BOO) |
| Construction | Public sector ⁽²⁾ | Public sector ⁽²⁾ | Private sector | Private sector | Private sector | Private sector |
| Operation | Public sector ⁽³⁾ | Private sector | Private sector | Private sector | Private sector | Private sector |
| Ownership ⁽¹⁾ | Public Sector ⁽⁴⁾ | Public sector | Public sector | Private sector during construction, then public sector | Private sector during Contract, then public sector | Private sector |
| Who pays? | Public sector | Users | Public sector or users | Public sector or users | Public sector or users | Private-sector offtaker public sector ⁽⁵⁾ , or users |
| Who is paid? | n/a | Private sector | Private sector | Private sector | Private sector | Private sector |

Source: Yescombe (2007)

Note²³:

*known as Design-Construct-Manage-Finance(DCMF) or Design-Build-Finance Maintain(DBFM), ** known as Build-Transfer-Lease(BTL), Build-Lease-Transfer(BLOT) or Build-Lease-Transfer(BLT), ***known as Build-Own-Operate-Transfer (BOOT)

- (1) In all cases, ownership may be in the form of a joint venture²⁴ between the public and private sector
- (2) Public sector normally designs the Facility and engages private-sector contractors to carry out construction on its behalf (design-bid-build)
- (3) Public sector may enter into service (outsourcing) contracts (for operation and maintenance) with private-sector contractors
- (4)Ownership may be through an independent publicly-owned Project Company
- (5)The BOO contract form applied to PPPS in the minority of cases where ownership of the Facility does not revert to the Public Authority at the end of the PPP Contract

²³ All notes are quoted from Yescombe (2011) p. 12.

²⁴ Joint-Venture PPPs (also known as Institutional PPPS) are Project Companies jointly-owned by public- and private-sector parties. (Yescombe, 2011)

<Table 5> above describes the scope of PPPs types, which is not a generalized typology for the contract types of PPP. Typically, BOT (Build-Operate-Transfer) and concession types are regarded as representative PPPs in project-based infrastructure project. Public-private partnership is an organizational structure that brings together a number of parties for an infrastructure investment in the form of a ‘special purpose vehicle’ (SPV) created specifically for the project (Grimsey and Lewis, 2004).

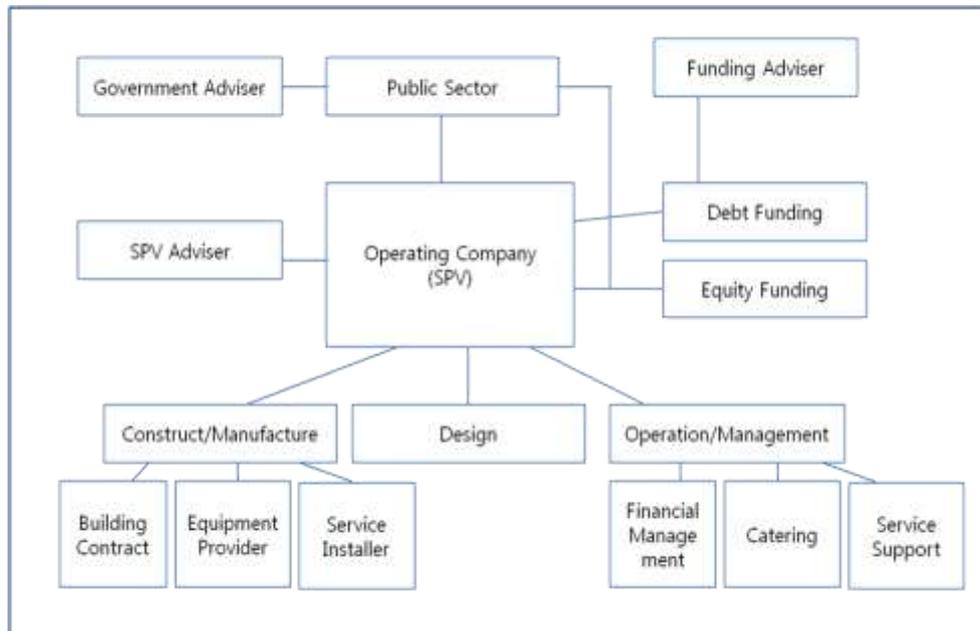
Table 6. Typology of PPPs

| Source | Public ←-----→ Private | | | | | |
|--------------------|---------------------------|--|--|---------------------------------|------------------------------|---|
| | Yong(2010) | Service Contract | Management Contract Lease Contract | Build-Operate-Transfer contract | | Concession Divestiture/ Privatization |
| Hodge et al.(2010) | | Build-Lease-Transfer and Maintain (BLTM) | Build-Operate-Lease (BOL) Design-Build-Finance-Operate-Maintain (DBFOT) Build-lease-transfer (BLT) Build-Own-Operate-Transfer (BOOT) Build-Operate-Transfer (BOT) Rehabilitate-Operate-Transfer (ROT) | | | Build-Own-Operate(BOO) |
| OECD(2008) | | | Design-Build- Operate (DBO) Design-Build-Finance-Operate (DBO) Build-Own-Transfer (BOT) Build-Own-Operate-Transfer (BOOT) | | | Build-Own-Operate(BOO) Build-Own-Maintain(BOM) |
| Yescombe (2007) | Public-sector procurement | Franchise | Design-Build-Finance-Operate (DBFO) | Build-Transfer-Operate (BTO) | Build-Operate-Transfer (BOT) | Build-Own-Operate (BOO) |
| PPIAF | | | Greenfield Build-Lease-Transfer (BLT) Build-Operate-Transfer(BOT) Build-Operate-Operate (BOO) Merchant Rental | | Concession | Divestiture Partial Full |

Source: Reproduced from Yong(2010), Hodge et al.(2010), OECD(2008), Yescombe (2007), PPIAF(http://ppi.worldbank.org/resources/ppi_glossary.aspx)

<Figure 5> shows the typical structure of SPV structure in PPPs, which is established under a number of organizations and entities to undertake the activity defined in a contract between the SPV and its client.

Figure 5. Typical type of PPPs

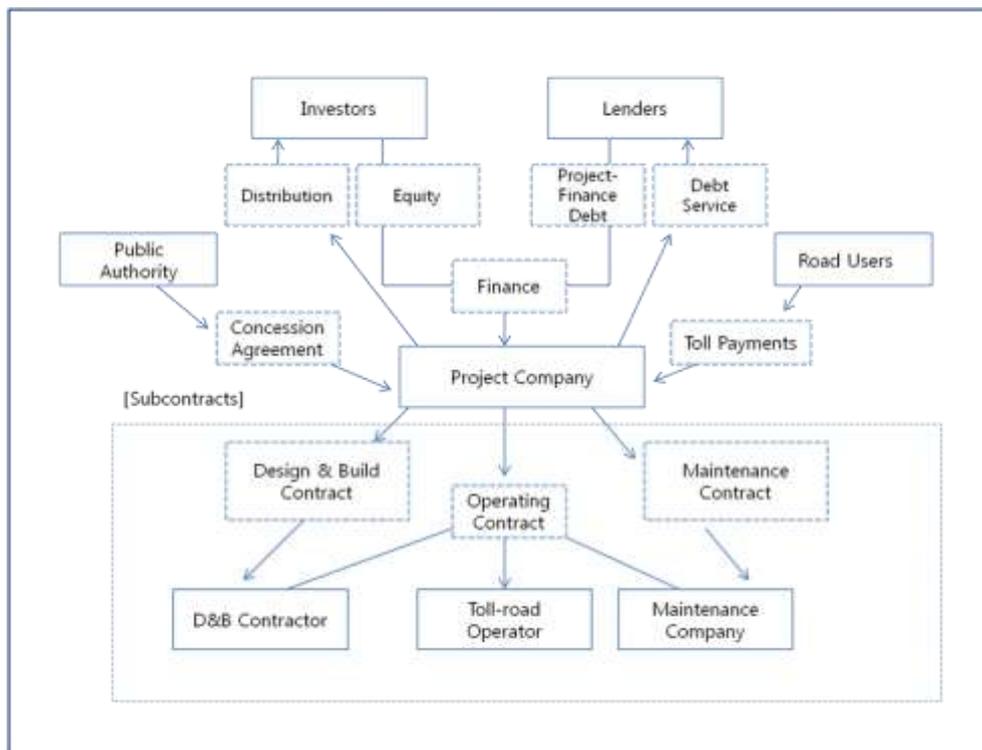


Source: Reproduced from Grimsey and Lewis (2004)

<Figure 6> provides a summary of the different ways of providing public infrastructure and shows how private sectors participate in public infrastructure project, which consider largely two dimensions: finance and operation.

Creating a third company as SPC (Special Purpose Company) to provide an infrastructure construction and services or selling existing public company's part of shares to private sector, public sector actively participates in the process of financing and operational contracting.

Figure 6. Private participation in the project-based infrastructure



Source: Yescombe (2007)

III.2 Conceptual Framework

Considering the two schemes of finance and operation under a typical process of PPPs contract in previous <Figure 6>, risks from different literatures (Table 3) can be rearranged into <Figure 7> as below. It shows four types of risk factors in PPPs, which builds up the hypotheses and its proxy variables available to explain the risk factors are identified in the later part.

Figure 7. Risk matrix for identifying risk factors in PPPs

| | Macro/Public | Micro/Private |
|------------------|--|---|
| Finance | Government budget deficit Fiscal constraint | Financing Financial market |
| Operation | Political stability Institutional quality | Market system/regulations Market/competition |

Source: Author's analysis

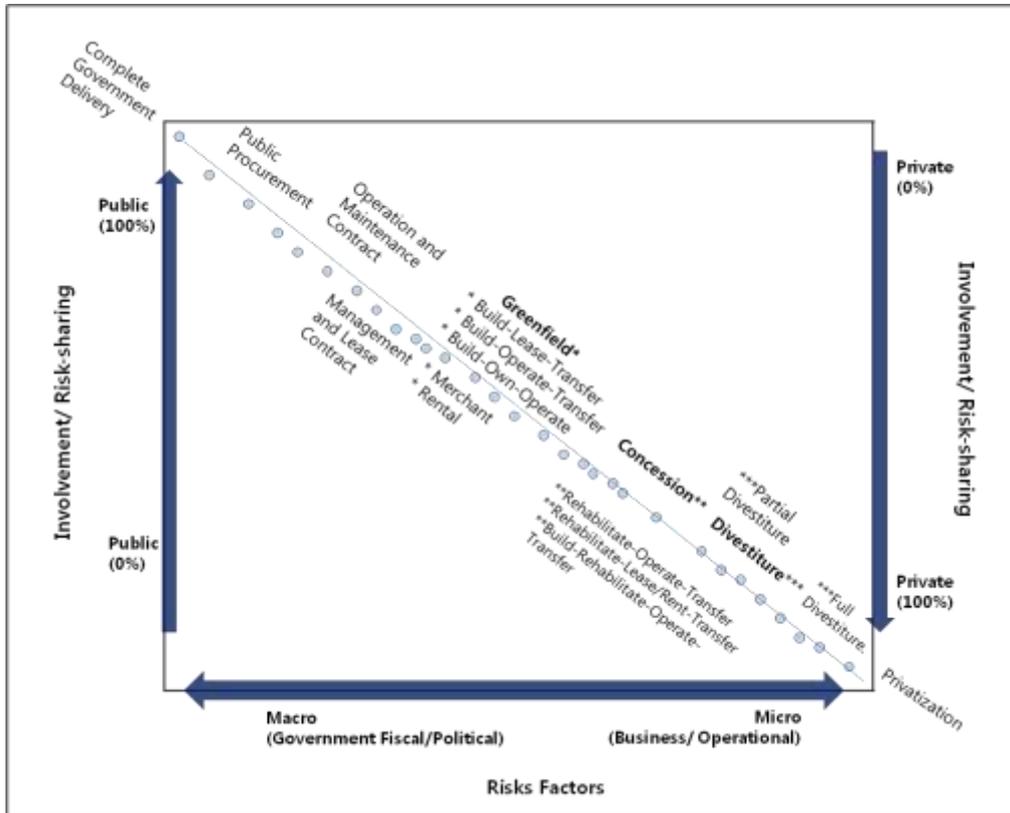
As discussed in the types of PPP, typically infrastructure PPPs is contract-based projects with two dimensions of finance and operation. And many previous studies classified the risks according to the level of macro and micro or macro and operational phase²⁵.

Considering research questions- *what are the risk factors for the determination of PPP types and how do these risk factors affect the types of PPPs?*- and conceptual

²⁵Akintoye et al. (2002), Bing et al. (2005), Ke et al. (2010) and Yescombe (2007)

framework suggested previously, this part turns to discuss the theoretical background and builds an estimation model for an empirical analysis. There are quite a few literature and previous studies suggesting the PPP types and risks with a single general conceptual framework in analyzing the critical factors for types of PPPs. Providing definitions, concepts and types of PPPs, the previous studies reproduce the classification of risk factors in infrastructure PPPs. Moreover, these studies introduce the risk-type conceptual framework and risk matrix for analyzing the risks and types of PPPs framework. In doing so, a number of PPP frameworks imply clearly that the more private sectors are involved in the risk-sharing and the project operation, the more micro and business-related risk factors become critical.

Figure 8. Conceptual analysis framework on risk factors and PPPs



Source: Author’s analysis based on OECD (2008), Grimsey and Lewis (2004), Yong (2010) and Akintoye et al. (2002).

The vertical axis of <Figure 8> represents the level of risk-sharing and the involvement of private and public sector. The horizontal axis represents the risk factors in macro and economic dimensions. According to the conceptual framework above, PPP types are situated in the middle of box, which conceptually shows the combination of risk factors and level of risk-sharing to form contract types in various ways. From the top left to the bottom right of the box, <Figure 8> indicates the complete

government delivery and public procurement, Greenfield, Concession and Divestiture and Privatization. As demonstrated above, micro risks tend to influence the type of PPPs of which private sectors are involved more so than do the macro risks. When private sectors participate in the infrastructure business in developing countries, the business environment is critical to determine the entry mode of PPPs to avoid the business risks and sustain the business growth. In this regards, the private investment responds more sensitively to the business operational risks than other risk factors. Considering the typical structure of PPPs as contract-based, namely, Greenfield type²⁶, the legal and institutional systems for managing subcontracts are essential to complete the infrastructure projects. Some classification has no clear cut between Concession types and Greenfield, with full responsibility for the contractor to finance, build and operate 100% risk transferring to the private sector, price regulation possible. With the perspective of risks, the demand risk encompasses mainly demand-side operation risk and arises, among other things, from changes in consumer preferences, the emergence or disappearance of substitute or complementary products and changes in income and demographics²⁷ (OECD, 2008).

²⁶ See <Figure 5>.

²⁷ In addition, demand risk also includes financial market risks stemming from changes in macro financial market such as interest rate, consumer inflation and so forth.

III.3 Empirical Hypothesis

Hypothesis 1. Developing countries with less political and legal risk attract more Greenfield types of PPPs.

Greenfield type describes the PPP of which private entity or a public-private joint venture builds and operates a new facility for the period specified in the project contract²⁸. The most targeted industrial sectors taken by Greenfield types in developing countries are energy and telecom sector, which directly link infrastructure development to the users or customers in the chosen market (See Figure 9). Here, the facility may return to the public sector at the end of the contract period. In the type of Greenfield, private sectors are largely at their own risks as they build and operate during the contract periods and transfer to the public sectors. Usually, private sectors require the guarantee system for revenue and profit from the government. In other words, the private firms may be attracted in a country where governments are more effective (Sharma, 2012) and private sectors prefer to invest in politically stable countries in order to ensure their legal right. Since PPPs are a bundle of financial and nonfinancial contracts-which are naturally incomplete and prone to opportunistic behavior (Basilio, 2011) - PPP businesses have a priority on the efficient management of long term contracts. Particularly, types of Greenfield vary on the wide spectrum of mix of public and private risk sharing in financing and operation under the contract forms; therefore, political and legal risks to management are crucial in types of Greenfield. For

²⁸ World Bank (http://ppi.worldbank.org/resources/ppi_glossary.aspx)

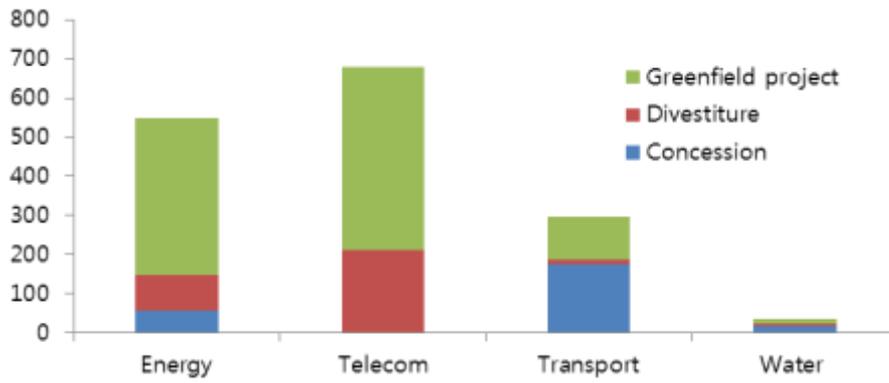
managing the PPP contracts, WDI and PPIAF (2013) lay out the responsibilities of government institutions for the management of the PPP arrangements in detail: identifying the candidate project structuring and appraising the project, designing the PPPs contract, implementing the PPPs transaction and managing the PPPs contract. The generic governance for PPPs includes implementing projects, approving projects, regulating and controlling the process. When analyzing the most successful PPP programs, a certain set of features can be observed: the appropriate agencies in the government involved, transparent communication channels for the decision-making with the information needed, and the concrete policy of authorities for PPP contracts²⁹. Consequently, as a typical type of PPPs for infrastructure in developing countries is Greenfield with subcontracts with various private sectors³⁰, managing the contracts and arrangements of process in PPPs is a key for attracting more private participations.

²⁹ WDI and PPIAF (2014)

³⁰ <Figure 5>, typically SPC (Special Purpose Company)- based investment structure

Figure 9. Changes in type-portfolio by sectors (2002-2013)

(Unit: US billion \$)



Source: PPI (Private Participation in Infrastructure), World Bank

Hypothesis 2. Developing countries with less business operational risks are more likely to have Divestiture types of PPPs.

Divestiture type describes the PPP of which a private entity buys shares in a state-owned enterprise through an asset sale, public offering, or mass privatization program³¹. Considering private sectors' PPPs in infrastructure in developing countries, the success of PPP projects depends substantially on the market conditions for private investment: regulatory environment in the country and market system for stable and profitable business operations. Ensuring strong private sector responses in PPPs involves establishing a clear rationale for PPP policy, backed by well-thought-out legal, regulatory, and investment framework (Farquharson et al., 2011). Types of private businesses like Divestiture have strategic approaches to control management and operations with availability of capital and opportunities for leverage and risk sharing, which is competitive in the market.³² Those developing countries that have less risky business environment tend to attract more private investment and private participation in the market.

³¹ World Bank (http://ppi.worldbank.org/resources/ppi_glossary.aspx)

³² IMF (2004)

IV. Empirical Analysis

IV. Empirical Analysis

A considerable number of studies have spilt much ink on the topic of risks factors and risk management. However, existing studies on the determinants and critical factors of PPPs are unable to take the empirical analysis due to lack of database information. The Public-Private Infrastructure Advisory Facility (PPIAF) of World Bank provides the projects database of infrastructure PPPs in developing countries.³³ Some studies have sought to conduct an empirical study with the PPI database. For instance, Hammami et al. (2006) published the first working paper with statistical test for determinant of PPPs, and Sharma (2012) empirically proved the determinants for public-private partnerships, whose model has dependent variables as the number or investment volume³⁴.The result emphasizes determinants as the government fiscal constraint, macro-economic condition, political stability and quality of regulation. Besides, Reside (2009) uses the PPI database to prove the global determinants of stress and risk in public private partnerships in infrastructure, where dependant variable is the dummy as whether the projects has failed or not. Moreover, it estimates the risks, such as political, and governance quality that affect a broader set of projects over time and argues that PPPs situated in a new market, Greenfield projects and management contract are associated with higher failure rates. Lastly, Basilio (2011) emphasizes the

³³ The database covers 138 developing countries from year of 1990 to 2013, including four types of PPPs and four sectors of infrastructures. Types are Management and Lease, Concession, Greenfield and Divestiture and sectors are energy, telecommunication, transport and water.

³⁴ Unit as Millions of US dollars

risk factors in PPPs and argues the different country risk factors affect PPP arrangements and the private investment intensity, which takes the proxy as risk factors. In brief, only a few studies consider the types of PPPs and risk factors in terms of the efficient allocation and management between public sector and private sector.

IV.1 Data Description

Database

This study mainly is based on three international databases: PPI (Private Participation in Infrastructure), WDI (World Development Indicator) and WGI (World Governance Indicator). For the data regarding PPPs, this study uses the PPI (Private participation in infrastructure) database provided by the World Bank. This empirical analysis is for 31 developing countries³⁵, which are in the top 40 among 135 total countries over 20 years, which charges over 85% of world PPPs. PPI provides information on more than 6,000 infrastructure projects as investment³⁶ from 1984 to 2013, in four sectors³⁷ and by four types: Divestiture, Greenfield, Concession and

³⁵ Algeria, Argentina, Bangladesh, Brazil, Bulgaria, Cambodia, Chile, China, Colombia, Ecuador, Ghana, India, Indonesia, Iraq, Jordan, Kenya, Lao PDR, Malaysia, Mexico, Nigeria, Pakistan, Peru, Philippines, Romania, Russia, South Africa, Thailand, Turkey, Uganda, Ukraine, Vietnam

³⁶ Unit of US million dollars and the number of projects.

³⁷ Each sector has sub-sectors, in which Energy is consisted of electricity generation, transmission, and distribution; and natural gas transmission and distribution. Telecommunications include fixed or mobile local telephony, domestic long-distance telephony, and international long-distance telephony. Transportation covers airport and terminals, railway

Management and Lease Contracts.³⁸ Total investment from 1990 to 2013 is estimated to be 2,199 billion US dollars, annually creating 250 projects on average. Most of the PPP projects in low- and middle-income countries are in Latin America and the Caribbean (30%), followed by East Asia and Pacific (28.9%), Europe and Central Asia (13.8%). Meanwhile, South Asia (16.6%), Sub-Saharan Africa (8.2%) as well as the Middle East (2.5%) lag well behind. The investment unit size increases in the overall period, which could imply an increase of the size of the infrastructure project contracts.³⁹

The WDI provided by the World Bank is the collection of development indicators, officially recognized as official development sources about 20 topics⁴⁰ for 214 countries with time coverage from 1960 to 2013. In this study, the economic indicators

fixed assets, freight, and intercity and local passenger service; toll roads, bridges, highways, and tunnels; and seaport channel dredging and terminals. Water sector is consisted of portable water generation and distribution, as well as sewage collection treatment.

³⁸ PPI identifies four types; 1) *Management and Lease Contracts* - A private entity takes over the management of a state-owned enterprise for a fixed period while ownership and investment decisions remain with the state; 2) *Concessions* - A private entity takes over the management of a state-owned enterprise for a given period during which it also assumes significant investment risk; 3) *Greenfield Projects* - A private entity or a public-private joint venture builds and operates a new facility for the period specified in the project contract. The facility may return to the public sector at the end of the concession period; 4) *Divestitures* - A private entity buys an equity stake in a state-owned enterprise through an asset sale, public offering, or mass privatization program (http://ppi.worldbank.org/resources/ppi_glossary.aspx).

³⁹ This phenomenon stems from the fact the global construction market has prioritized the turnkey or a turnkey project, which is a type of project that is constructed so that it could be sold to any buyer as a completed product. Global construction companies like Siemens pursues strengthening the business function as a developer in the market to increase the efficiency in infrastructure business.

⁴⁰ Agriculture & Rural Development, Aid Effectiveness, Climate Change, Economy Growth, Education, Energy and Mining, Environment, External Debt, Financial Sector, Gender, Health, Infrastructure, Labor and Social Protection, Poverty, Private Sector, Public Sector, Science and Technology, Social Development, Trade, Urban development.

are taken and used as the explanatory variables⁴¹ in estimation model. The WGI (Worldwide Governance Indicator)⁴² provides six dimensions of governance starting from 1996: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Governance Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. The aggregated WGI is measured in two ways: in the standard normal units of the governance indicator, ranging from around -2.5 to 2.5, and in percentile rank terms, ranging from 0 (lowest) to 100 (highest) among all countries worldwide.

Generally, economic and financial risks are used for the assessments of market size, external debt and macro financial condition (Cantor and Packer; 1997)⁴³. In this empirical model, the variables of External Debt as percentage of GDP and Fuel export as percentage of merchandise exports are explained as the macro financial conditions, implying the downside risks of public finance and the existence of natural resources expected to attract much more private investment. The variables for political and legal risks are taken from WGI (World Governance Indicator). Political stability is the likelihood of political instability and politically motivated violence, for which political risks are measured as the democratic regime and democratic governance, meaning the process whereby government make and implement legally binding decision. This includes security risks assessed by not only internal conflicts but also external conflicts,

⁴¹ The independent variables are external debt, fuel export, population, GDP per capita and GDP deflator, bank nonperforming loans to total gross, inflow of foreign direct investment.

⁴² See Appendix.

⁴³ Macroeconomic fundamentals are important as explanatory variables of the capital flows for investment in emerging market.

including social conflicts and ethnic tensions. As for legal risks, two indicators are taken: rule of law and control of corruption. The indicator of rule of law is the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property right, the police, and the courts, as well as likelihood of crime and violence⁴⁴. The other variable is control of corruption to indicate the extent to which public power is exercised for private gain, including both petty and grand forms of corruption. In the management and control of PPPs contracts, which are usually bundled contract types, the government role and responsibility are important (Kwak et al., 2009). Therefore, the transparent structure of governance is necessarily required to make PPPs completely implemented. As determining the PPPs in developing countries the economic factors are key issues such as the economic size and development (GDP per capita) and dimension of market (Population). Considering sustainability and profitability in private investment on infrastructure, the market size and condition are to be critical in terms of service users with returns of operation. The variable “Bank” represents available and accessible private financing in the financial system as bank nonperforming loans to total gross loans as percentage. Hence, it is used as a proxy variable to measure the condition of financial market for private investors in terms of channel of financing. As for the investment and business risks, many economic and institutional elements are required to attract the private investment into PPPs market. The variable “InFDI” refers to the foreign direct investment of net

⁴⁴ WDI defines the rule of law with the elements of legal system, government commitment for the long term contract, regulatory market system, construction/operation risk.

inflow in percentage of GDP whereas “ICSID” refers to the legal disputes between international investors. These two variables represent institutional factors for business environment, reflecting the investment and business risks in that FDI flows into the countries. This means sustainable business market and growth prospects, business operation condition with wage-adjusted productivity of labor and the availability of infrastructure (IMF, 2004). <Table 7> describes the explanatory variables of risk factors as determining the infrastructure PPPs. Explanations for each variables of risk factor are as follow.

Table 7. Risk factors and explanatory variables

| Risk factors | | Proxy variables | Explanations | Source | |
|-----------------|----------------------------------|---|---|---|-------|
| Public /Macro | Public Finance | (1) Fiscal risk | E debt: External Debt (% of GDP) | Downside risk on fiscal deficit | WDI |
| | | | Fuel: Fuel export(% of merchandise exports) | Government fiscal stability with less financing risks | |
| | Government Operation, Management | (2) Political risk | Political: Political stability | Political stability and stability of investment | WGI |
| | | (3) Legal/Regulation risk | Rule: Rule of Law | Regulatory and institutional risks for PPPs business operation | |
| | | | Control: Control of Corruption | Government effectiveness including public power to implement the PPPs investment and policy | |
| Micro/ Business | Business Finance | (4) Financing risk | GDP deflator (annual %) | Inflation Financing and operation cost | WDI |
| | | | Bank : Non-performing loans to total gross loans (%) | Soundness of banking and private financing | |
| | Business Operation | (5) Market Institutional Environment risk | Legal disputes between international investors | Institutional and regulatory development and efficiency with less operation risks | ICSID |

Source: World Development Indicator (WDI), Worldwide Governance Indicator (WGI) and International Centre Settlement Investment Dispute (ICSID)

IV.2 Estimation Model

This empirical study takes the multiple regression models to prove the effects of risks factors on the different types of PPPs. Based on the above theoretical considerations and available data, three hypotheses are proved empirically. In determinants of PPPs and risks as determining the infrastructure PPPs, market size, economic growth and business environment for more investment are controlled. This part mainly focuses on two types of PPPs; Divestiture and Greenfield.

Model 1. Case of Greenfield

1.1 Number of Greenfield Project = f(E_debt, Fuel, POP, GDP_cap, Inflation, Bank, InFDI, ICSID, Control)

1.2 Number of Greenfield Project = f(E_debt, Fuel, POP, GDP_cap, Inflation, Bank, InFDI, ICSID, Control, Political)

1.3 Number of Greenfield Project = f(E_debt, Fuel, POP, GDP_cap, Inflation, Bank, InFDI, ICSID, Rule)

The first case is the most important estimation for suggesting PPP policy implication in developing countries. The Greenfield type of PPPs is the most typical and dominant model in infrastructure PPPs in developing countries. As mentioned before, Greenfield type is complicated as it is based on long-term contract-based projects; thus,

institutional factors to manage and decrease the risks of finance and operation are significant. In other words, institutional risks, namely, political risks and regulatory risks are critical in determining the Greenfield type of PPPs. As the hypothesis states “*Developing countries with less political and legal risk attract more Greenfield types of PPPs,*” the Greenfield types positioned in the wider area of the conceptual frame have various combinations of risk-sharing between public and private. The variables of political and legal risks are WGI (Worldwide Governance Indicator), which reflect institutional risks related to political stability and regulation quality for managing and arranging the PPPs contracts. Better indicator implies less risk and ultimately positive relations with PPP type of Greenfield. The variable “Control” is an indicator of control of corruption, which explains the effectiveness of government and transparent communication and information channels in the process of PPPs to make a commitment of PPPs contract.

Model2. Case of Divestiture

2.1 Volume of Divestiture Project = f(E_debt, POP, GDP_cap, Inflation, Bank, InFDI, ICSID)

2.2 Volume of Divestiture Project = f(E_debt, POP, GDP_cap, Inflation, Bank, InFDI, ICSID, Political)

2.3 Volume of Divestiture Project = f(E_debt, Fuel, POP, GDP_cap, InFDI, ICSID)

The second case is for relations between the micro business risks and the Divestiture types of PPPs. As the hypothesis states “*Developing countries with less business operational risks are more likely to have Divestiture types of PPPs,*” the Divestiture types are positioned the privatization.⁴⁵ This particular type tends to respond to the investment risk and business risk more than other risks. The variables of operational risks are ICSID (Legal disputes between international investors), which reflect investment environment with institutional quality and business environment, taking a control variable of InFDI (Foreign direct investment, net inflows, percentage of GDP). More inflow of FDI forms more business friendly market system and institutional quality. Furthermore, it induces more private firms to enter the market. The variables of ICSID have negative relations with Divestiture investment and the countries with higher frequency of legal disputes between international investors have unreliable market system and regulations.

IV.3 Result and Implication

Result and Implication 1. Greenfield type

The empirical results show that developing countries with less political and legal risks attract more Greenfield types of PPPs. <Table 8> presents the results for the Greenfield types of PPPs, whose rows report the results for each of the eleven variables

⁴⁵ See <Figure10>.

as the risk factors when entered separately in estimation models. The dependent variables are measured by the number of Greenfield types of PPPs. All the regressions in <Table 8> show that the variable “WDI as “Control”, “Political” and “Rule” remains significant. The variables “lnFDI”, “ln_POP” and “ln_GDP_cap” as investment risk, demand and economic risks respectively, are significant. Less political risks and less legal risks make PPPs contracts more sustainable; hence, Greenfield types with a bundle of contracts have strong relation with political and legal risks.

Table 8. Regression result of Greenfield

| Dependent Independent | Greenfield | | |
|--------------------------|-------------------------|-------------------------|-------------------------|
| | (1) | (2) | (3) |
| (Constant) | -162.427*** (-13.81) | -157.036*** (-13.61) | -162.951*** (-13.78) |
| E_debt | .055 (2.39) | .044* (1.93) | .051** (2.22) |
| Fuel | -.068*** (-2.69) | -.044* (-1.74) | -.065** (-2.43) |
| In_POP | 8.758*** (16.58) | 8.998*** (17.36) | 8.530*** (16.53) |
| In_GDP_cap | 1.447** (2.10) | .562 (0.79) | 1.968*** (3.08) |
| Inflation | -.081 (-1.46) | -.104* (-1.90) | -.076 (-1.37) |
| Bank | -.004 (-0.07) | -.016 (-0.36) | -.0004 (-0.01) |
| InFDI | .601*** (3.72) | .533*** (3.36) | .612*** (3.76) |
| ICSID | -.067 (-0.68) | -.127 (-1.30) | -.091 (-0.92) |
| Control | 4.436*** (3.31) | 2.333* (1.65) | |
| Political Rule | | 3.846*** (3.91) | 3.627*** (2.86) |
| Adjusted R ² | 276 | 276 | 276 |
| Number of Obs. | 0.55 | 0.58 | 0.55 |

Note: a) t-values in parentheses.

b) ***, **, * indicate coefficient estimates statistically significant at 1%, 5%, 10% levels, respectively

Source: World Development Indicator (WDI), World Governance Indicator (WGI) and PPI (Private Participation in Infrastructure), World Bank

Result and Implication 2. Divestiture

<Table 9> presents the results for the types of PPPs. The rows of this table report the results for each of the variables as the risk factors when entered separately in estimation models. The dependent variables are measured by the volume of Divestiture types of PPPs. All the regressions in <Table 9> show that the variable “InFDI (Foreign direct investment, net inflows as percentage of GDP)” remains significant, while the “ICSID” variable is not significant. “POP (Population)” variable is robustly significant in all of the regressions and the variable of “GDP_cap”, “E_debt” are significant in all models.

Table 9. Regression result of Divestiture

| Dependent | Divestiture | | |
|-------------------------|----------------------|-----------------------|------------------------|
| Independent | (1) | (2) | (3) |
| (Constant) | -27.88*** (-7.85) | -27.856*** (-7.78) | -33.630*** (-12.22) |
| E_debt | .028*** (4.14) | .028*** (4.10) | .029*** (5.45) |
| Fuel | | | -.014*** (-2.61) |
| POP | 1.114*** (7.36) | .1.112*** (7.19) | 1.291*** (10.54) |
| GDP_cap | 1.383*** (7.66) | 1.371*** (6.81) | 1.652*** (11.81) |
| Inflation | -.010 (0.62) | -.010 (-0.62) | |
| Bank | -.018 (-1.26) | -.018 (-1.26) | |
| InFDI | .142*** (3.00) | .141*** (2.92) | .157*** (3.84) |
| ICSID | -.018 (-0.63) | -.019 (-0.64) | -.025 (-0.92) |
| Political | | .015 (0.06) | |
| Adjusted R ² | 0.26 | 0.26 | 0.38 |
| Number of Obs. | 276 | 276 | 370 |

Note: a) t-values in parentheses.

b) ***, **, * indicate coefficient estimates statistically significant at 1%, 5%, 10% levels, respectively

Source: World Development Indicator (WDI), World Governance Indicator (WGI) and PPI (Private Participation in Infrastructure), World Bank

V. Conclusion

V. Conclusion

Many different academic perspectives seek for a better answer in search of more efficient infrastructure PPPs in developing countries in terms of risk allocation and management. For this, identifying risks and designing the structure of risk-sharing between public and private sectors with various contracts from the sides of finance and operation of PPPs are studied on the macro policy level as well as in the micro business level. Especially, many developing countries try to encourage more private sectors to participate in the infrastructure investment and seek to answer the question of whether specialist public-private partnership (PPP) Unit⁴⁶ contributes to successful PPPs. In this regards, this study emphasizes the importance of institutional factors and enabling business environment to achieve success in infrastructure PPPs in developing countries. Furthermore, the risk factors classified in this study and integrated conceptual framework for types and risks factor have availability directly on the policy makers and business strategist can reflect on their policy and strategy.

Providing the framework for analysis on risks and types with theorization of concept, this dissertation firstly attempts to conduct an empirical study, using PPI database. It shows different mix of risks in terms of risk-sharing and finally resulting types of PPPs.

⁴⁶ According to the definition of the World Bank, the PPP Unit is to promote or improve PPPs, which may manage the number and quality of PPPs by trying to attract more PPPs, or trying to ensure that the PPPs meet specific quality criteria such as affordability, value for money, and appropriate risk transfer.

When government makes the policy or institutions for promoting PPPs of infrastructure in developing countries, strategically, types of PPPs with different risk factors are to be considered to increase the competitiveness of PPPs market and to maximize the efficiency of PPPs. Considering that the growing number of countries participating in infrastructure PPPs and the enlarged size of contract package of PPPs, the Greenfield types can be formed with more involvement from private sector. Therefore, improving institutional quality and strengthening the functions of public sector in terms of governing the PPPs contracts are evermore salient in the success of PPPs. Last but not least, the technology and labor markets should be considered with more specified types of PPPs in the further study and making policy with analysis on the industrial sectors.

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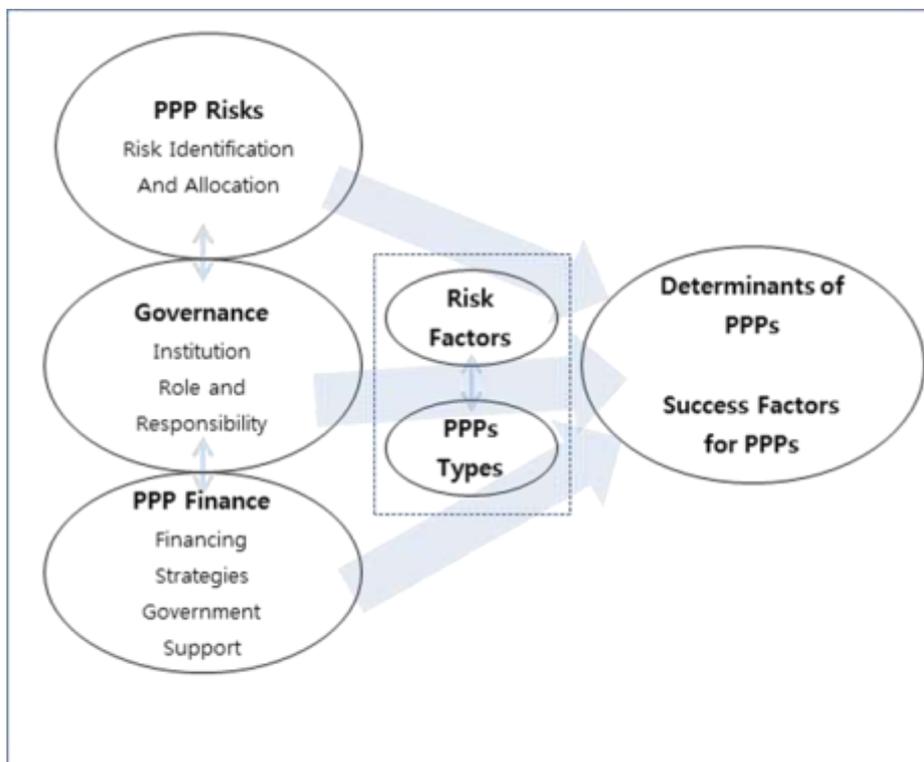
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WDI, <http://data.worldbank.org/data-catalog/world-development-indicators>

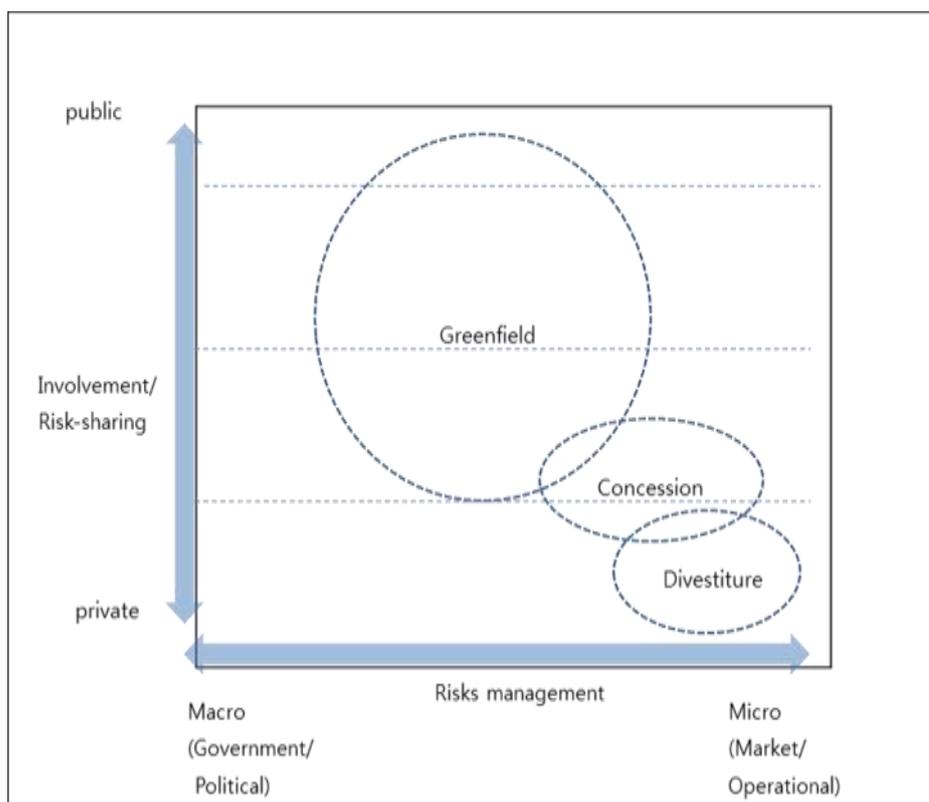
WGI, <http://data.worldbank.org/data-catalog/worldwide-governance-indicator>

Appendix A.

Conceptual framework on Literatures review on PPPs



Appendix B.



Appendix C.

| Rank | Volume of Investment | | Number of Projects | |
|-------------|----------------------|--------------------|--------------------|--------------------|
| | 1990-2001 | 2002-2013 | 1990-2001 | 2002-2013 |
| 1 | Brazil | Brazil | China | China |
| 2 | Argentina | India | Russian Federation | India |
| 3 | China | Russian Federation | Brazil | Brazil |
| 4 | Mexico | Turkey | Argentina | Turkey |
| 5 | Malaysia | Mexico | Mexico | Mexico |
| 6 | Philippines | China | India | Chile |
| 7 | Indonesia | Indonesia | Colombia | Vietnam |
| 8 | India | Nigeria | Thailand | Russian Federation |
| 9 | Thailand | South Africa | Chile | Peru |
| 10 | Chile | Philippines | Malaysia | Philippines |
| 11 | Turkey | Pakistan | Philippines | Sri Lanka |
| 12 | Russian Federation | Malaysia | Indonesia | Bulgaria |
| 13 | Colombia | Argentina | Peru | Pakistan |
| 14 | Morocco | Colombia | Kazakhstan | Colombia |
| 15 | Peru | Peru | Pakistan | Indonesia |
| 16 | South Africa | Thailand | South Africa | Bangladesh |
| 17 | Venezuela, RB | Chile | Ukraine | Thailand |
| 18 | Pakistan | Romania | Bolivia | Nigeria |
| 19 | Egypt, Arab Rep. | Egypt, Arab Rep. | Guatemala | Argentina |
| 20 | Bolivia | Morocco | Costa Rica | South Africa |
| 21 | Kazakhstan | Bulgaria | Sri Lanka | Romania |
| 22 | Romania | Ukraine | Dominican Republic | Ukraine |
| 23 | Panama | Algeria | Turkey | Malaysia |
| 24 | Guatemala | Vietnam | Egypt, Arab Rep. | Algeria |
| 25 | Dominican Republic | Iraq | El Salvador | Georgia |
| 26 | Algeria | Belarus | Panama | Uganda |
| 27 | El Salvador | Bangladesh | Venezuela, RB | Nepal |
| 28 | Ecuador | Lao PDR | Tanzania | Albania |
| 29 | Serbia | Kenya | Bangladesh | Cambodia |
| 30 | Ukraine | Kazakhstan | Cambodia | Ecuador |
| 31 | Côte d'Ivoire | Jordan | Côte d'Ivoire | Jordan |
| 32 | Bangladesh | Ghana | Ecuador | Kenya |
| 33 | Nigeria | Venezuela, RB | Vietnam | Lao PDR |
| 34 | Lithuania | Tunisia | Nigeria | Tanzania |
| 35 | Sri Lanka | Ecuador | Georgia | Costa Rica |
| 36 | Cuba | Iran, Islamic Rep. | Ghana | Ghana |
| 37 | Vietnam | Uganda | Kenya | Dominican Republic |
| 38 | Tanzania | Panama | Romania | Honduras |
| 39 | Jordan | Sudan | Uruguay | Uruguay |
| 40 | Uruguay | Guatemala | Morocco | Armenia |
| Sub total | 626,072 | 1,464,292 | 2,218 | 3,337 |
| World total | 646,167 | 1,522,547 | 2,505 | 3,671 |

Appendix D.

Descriptions of institutional variables and implications for risks and issues in PPPs

| Variables | Measured Concepts/ Perceptions | Related issues or risks |
|------------|---|--|
| Political | The likelihood of political instability and politically motivated violence | -Political risks -Macro business environment |
| Voice | The extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of associate, and a free media | -Government communication mechanism and openness -Market democratization |
| Rule | The extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property right, the police, and the courts, as well as likelihood of crime and violence. | -Legal system -Government commitment for the long term contract -Regulatory market system -Construction/operation risk |
| Control | 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. | -Competitiveness of Market -Market risk control, efficiency -Clear market payment system -Soundness in administrations and business development process |
| Government | The quality of public services, the quality of the civil service and the degree of its independence from political pressure, the quality of policy formation and implementation, and the credibility of the government to such polices. | -Quality of bureaucracy -Efficient decision-making process -institutional effectiveness -operation risk control and commitment to contract |
| Regulatory | The ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. | -Competitiveness of Market -Business-friendly Market -Efficient and effectiveness of marker system -Policy and system for attracting private investment |

Source: Worldwide Governance Indicator (WGI)

국문초록 (Abstract)

개발도상국의 인프라 민관협력에 대한 리스크 분석

1990년대 중반 이후 세계화와 FDI 증가 등 민간기업 역할과 활동이 커지는 현상과 개도국 성장에 따른 인프라 수요 증대에 따른 공공자금의 부족 등으로 국제적 관점에서의 민관협력(Public-Private Partnerships: PPPs) 현저하게 증가하였다. 특히 개발도상국의 인프라 민관협력(PPPs)에 대한 성공적인 모델을 개발하기 위해 미시경제정책, 공공정책, 산업공학, 프로젝트 경영 관리 등 다양한 학문적 분야에서 각 분야의 이슈 및 관점에 따른 민관협력(PPPs)에 대한 선행연구가 이뤄지고 있다. 주요한 연구동향은 리스크 요인(risk factor)에 대한 민간과 공공의 분담(risk sharing)과 민관협력 모델(Types of PPPs)에 대한 거시적이고 미시적 측면에서의 정책 및 비즈니스 전략이다. 본 논문은 기존의 민관협력(PPPs)에 대한 개념, 리스크 및 모델(types)에 대한 통합적인 개념 틀을 제시하였으며, PPI(Private Participation in Infrastructure) 데이터를 활용하여 두 가지 민관협력(Greenfield and Divestiture) 형태 결정에 영향을 미치는 주요한 리스크 요인을 분석을 하였다.

주요어: 개발도상국 인프라 민관협력(Public-Private Partnerships), 리스크 요인, 민관협력(PPPs) 유형, Greenfield, Divestiture

학번: 2007-30663