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QUANTILE ANALYSIS OF INVESTMENT IN PRIVATE PARTICIPATION IN INFRASTRUCTURE PROJECTS

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Understanding the factors influencing investor's decision to participate in a private participation in infrastructure (PPI) project is key to mobilizing private funding and closing up infrastructure financial gap among developing countries. However, inconsistent empirical results have been obtained in the literature regarding the importance of PPI determinants. Different from the existing literature, we propose using a quantile regression method to reconcile the discrepancy and capture a non-homogeneous relationship between various affecting factors and PPI investment based on data from Belt and Road (B&R) countries. As investment size grows, institutional factors, such as country's stability, degree of democracy and regulatory quality, play an increasingly critical part in drawing funds, and investors become more sensitive towards country's governance standard. With regard to multilateral development banks' (MDBs') role in supporting PPI and its underlying mechanisms, our results show that MDBs' aiding role is more significant among medium and large-scaled projects and monetary support is proved to be the most efficient means among other support types offered by MDBs. Further test reveals that instead of hindering PPI investment due to potentially conflicting objectives among multiple MDBs, MDBs' joint effort in one PPI project shows a compounded positive effect on PPI financing, suggesting that an increased collaborations among MDBs may be beneficial. However, no empirical support is found between financial market development of host country and total PPI investments. Overall, this study sheds lights on host country and MDBs' future policy designs along B&R countries.

Keywords: Belt and Road Initiative (BRI); Multilateral Development Banks (MDBs); Private Participation in Infrastructure (PPI); quantile regression.

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1. Introduction

In 2013, the Belt and Road Initiative (BRI) was launched by the Chinese government as a new cooperation model for regional sustainable growth and joint prosperity. Under the initiative, scaling up infrastructure to connect countries along the Belt and Road (B&R)[1] becomes one of the priorities to achieve facilities connectivity.[2] To increase cross-border funding capacity, the Chinese government set up US$40 billion Silk Road Fund and two specially dedicated Multilateral Development Banks (MDBs)–Asian Infrastructure Development Bank (AIIB) and New Development Bank (NDB) as complementary in facilitating infrastructure investment. However, despite the efforts made by government and international organizations, a significant gap exists between current investment funds and infrastructure fundings required by B&R countries. World Bank estimates an additional US$1 trillion infrastructure funding annually to 2020 which is needed to keep pace with demands from developing countries. In order to close up the funding gap at the scale of trillions, there is an urgent need to mobilize more private resources taking part in infrastructure development (World Bank, 2012). One way to attract private funding is to adopt Public–Private Partnership (PPP)[3] mechanism, a widely accepted form of cooperation between the government and private investors to provide public services based on long-term contractual agreements. PPP seeks to combine the advantage of competitive tendering with flexible negotiation and risk allocation so that governments with limited resources can focus on other sector of economy to foster overall growth (Bing *et al.*, 2005). PPP-based projects are gaining considerable attention from fiscally constrained governments in developing countries as a means to meeting the huge domestic demand (Grimsey and Lewis, 2002; Chou *et al.*, 2012), especially for infrastructure projects that involve a large amount of investments. However, the volume of private participation in infrastructure (PPI) projects is still modest along B&R routes.

Understanding the factors identified by private and public agents when making investment decisions is key to bringing in more sources of finance. Researchers have attempted to study the determinants of private participation in PPP projects from different aspects using various samples (Pragal, 2003; Kirkpatrick *et al.*, 2006; Hammami *et al.*, 2006; Araya *et al.*, 2013; Opara, 2017), but empirical results are inconclusive. For example, Banerjee *et al.* (2006) find that countries with higher level of corruption are associated with higher PPI projects, while Hammami *et al.* (2006)'s

[1] Data from B&R Portal official website: https://eng.yidaiyilu.gov.cn/.
[2] One of the five goals of BRI together with the other four: policy coordination, unimpeded trade, financial integration and people-to-people bond.
[3] According to Thomsen (2005), PPP and PPI are used interchangeably.

empirical results indicates that lower level of corruption and more efficient law of rule attract more private funding. One possible explanation to those finding discrepancies is that the sensitivity of factors identified by prior studies does not remain constant but varies under different circumstances. A positive contributing factor may turn into a disadvantage in another investment setting. Chou and Pramudawardhani (2015) conduct a cross-country comparison to find that key drivers and CSFs of PPP projects vary among countries. Similarly, Moszoro *et al.* (2014) find that PPI investment determinants are different at sectoral levels. Recently, the empirical result in Zheng (2017) shows that the sensitivity of investor confidence to country's governance level is dynamic and changing.

In view of the literature, most studies so far have focused on country-level or sectoral-level differences, but few studies pay attention to the project-level characteristics, such as the scale of project. To fill this gap, in this paper, we argue that investment size of the project is also an important factor contributing to the overall financing decision which has been overlooked by prior studies.[4] At different investment amounts, private investors value the costs and risks associated with projects differently and their motivations to take part in PPI projects also vary. It is generally believed that the higher the investment amount, the more cautions are taken by investors due to higher failure costs and thus, decision-making is more sensitive to host countries' investment climate. Besides, a well-developed financial market in host country reduces the financial constrain faced by private investors and hence, contributes positively to PPI investments, especially when the investment size is large. Adopting quantile regression (QR) method, our results prove that large PPI investment is generally more sensitive towards host country's governance level compared with small and medium-sized PPI projects. But this changing relationship does not exist between the development of host country's financial market and PPI investment, probably due to the fact that most PPI projects in developing countries are financed via international capital markets rather than domestic capital market, thus the development of domestic financial market has limited impact on PPI investments.

In addition, we also analyze the role of MDBs in supporting PPI projects cross-different investment quantiles. The contributions and significant potential of MDBs in bringing additional sources of funding in PPI projects are well advertized. For instance, World Bank lent US$25.2 billion for infrastructure-related projects in 2011 which accounts for almost half of the total annual fund disbursed by World Bank. Asia Development Bank (ADB) provided US$7.5 billion for infrastructure

[4]PPP is a complex and lengthy procurement so that researchers have investigated into CSFs of PPP across different various stages, such as feasibility stage, briefing stage, implementation stage, etc. The main focus in this paper is on factors affecting initial financing decision of PPP projects.

in 2012. More importantly, besides direct financial support, MDBs are important providers of policy advice, technical assistance and risk management to enhance credibility of host countries and mitigate perceived risks. According to World Bank PPI database, 33% of the PPI projects in International Development Association (IDA)[5] countries received MDBs' support in different forms from 2011 to 2015 which includes loans, equity, syndication, guarantees or other risk management tools. However, academic research on MDBs' performance is thin and its underlying working mechanism is not fully explored. Our results provide empirical evidence to show that MDBs' participation is beneficial in supporting PPI especially among large and medium-scaled investments. Through further tests, we conclude that monetary support is the most efficient means among other supports offered by MDBs. More importantly, our findings also imply that collaborations among MDBs could actually enhance PPI project's financing ability.

The contributions of the paper are as follows. First, to the best of our knowledge, this paper is one of the first few papers to identify investment size as a valuable contributor in PPI investments by treating the affecting factors under different project scales distinguishably. Using QR method, our study captures heterogeneity issue and empirically tests out the non-homogeneous coefficients of various explanatory variables across investment scales which cannot be done using any mean regression methods. Our findings also partly reconcile the contradicting results obtained by the previous studies. Second, we conduct a systematic test from three aspects, namely institutional factors, financial market development and international development partner aid which provides a broad picture of PPI-affecting factors. Finally, we present empirical evidence to support MDBs' role in bringing in social capitals and promoting PPI projects in developing countries. Further tests have distinguished the effects of different types of MDBs support and found a compounded positive influence of MDBs' joint participation in one project. In short, our paper enables practitioners and policy makers to gain more insights into PPI to solve the funding shortage issue and provides a better way to deliver PPI projects among B&R countries.

2. Literature Review

PPP is a contractual agreement between government and private sectors to share resources, skills, funding and expertise of each sector in public service provision such as transportation, telecommunication, energy and sanitation (Bloomfield, 2006). The core of PPP arrangement lies in risk sharing between project stakeholders. It is critical for parties involved to fully evaluate, communicate and

[5] The IDA is part of World Bank that helps the world's poorest countries.

understand risks associated with PPP project (Carbonara *et al.*, 2014). Liu *et al.* (2014) indicate that investor's confidence is greatly influenced by risks. Drawing upon the existing literatures, there is a whole realm of risk factors identified by prior studies that could have an impact on private investors' decisions, ranging from macro elements such as economic performance, government support to organizational capacities such as compatibility skills of both parties, technology innovation and choosing the right partner (Hammami *et al.*, 2006). Osei-Kyei and Chan (2015) carry out a systematic review on CSFs of PPP publications from 1990 to 2013 and identify appropriate risk allocation and sharing, strong private consortium, political support, public support and transparency procurement as top five most cited CSFs for PPP projects. However, this review is only a qualitative research and does not distinguish the relevance of CFSs in developed and developing countries or further analyze the project-based characteristics in determining the ranking of influential factors.

As pointed by Gupta *et al.* (2013), main contributing factors vary under different settings so that understanding ranking of determinants is essential in achieving PPP objectives. There is another vein of studies focusing on prioritizing contributing factors under different contexts. For instance, developing countries especially those from low income group are facing more specific challenges in implementing PPP projects than that of developed countries. Factors influencing private investors to take part in a PPP project in an advanced country might be quite different from that in a developing country where country risk is high and financial market is underdeveloped. Yang *et al.* (2013) state that special attention should be paid to CSFs among transitioning economies with an unstable environment and weak institutional control. With increasing popularity of PPP model in developing countries, there is a growing body of research on PPI determinants among emerging countries. Hammami *et al.* (2006) is the first empirical paper to use World Banks' PPI database to analyze the determinants of entering infrastructure sectors among low and middle-income countries. The empirical results indicate that larger market size and higher customers' purchasing power have positive effects on attracting private funding while solvency risk, exchange-rate risk, political risk and policy risk are main concerns among investors when joining in a PPP project. Using the same database, Luo *et al.* (2017) analyze how quality of institution and multilateral financial institutions have an influence on the success of PPP project. Indeed, the existing literature tells that institutional environment is of central importance for PPP in developing countries. In fact, PPP is a contractual agreement by definition which requires a working of strong institutions and well-defined legal system to ensure smooth contract execution as well as dispute resolution. Compared with developed countries, institutional environment is often a soft spot for most developing countries yet a fostering institutional framework is necessary for private

sectors to execute the contract and generate profits in the future (Medda, 2007). B&R countries, especially those with huge infrastructure demand, are mainly developing countries. Thus, in this study, we identify institutional environment as a most critical factor affecting PPI investment decisions along B&R route. Apart from that, the degree of financial sector development is another essential variable. Private sector's inability to secure funding may be a major stumbling block in developing countries. Ba *et al.* (2010) investigate the development of financial sector's influence on private participation in developing countries' power industry using a dynamic panel model. Their results show that a well-developed financial market, especially the capital market coupled with strong economy and good governance, has significantly enhanced the private sector involvement in infrastructure. Similarly, many other studies on PPI in developing countries also state that financial market maturity attributes to investment decision greatly (Dulaimi *et al.*, 2010; Ismail, 2013). Therefore, in this study, the focus is on two aspects of PPI determinants which are critical to developing countries — the institutional standards and financial market development of host countries.

Apart from the aforementioned influencing factors, project characteristics — investment size are taken into consideration in this paper to analyze how size of project affects the contribution of each influencing factor to overall investment decision. Due to information asymmetry of PPP projects, there is a room for opportunism behavior of stakeholders — both private and public agents in PPP projects (Medda, 2007) and moral hazard problem may raise in building and managing activities (Martimort and Pouyet, 2006). When input for the investment is small, investors tend to be more opportunistic and even view it as an opportunity for rent seeking and might even prefer to investing in countries where regulation is weak. For instance, Banerjee *et al.* (2006) find that private investors tend to invest in countries with higher level of corruption. But as the size of investment grows, the cost of opportunism behaviors also increases. According to the investment model of commitment — a widely applied model in psychological studies on interpersonal relationships, investment size is a key component in determining a person's commitment in a relationship (Rusbult, 1980). The investment size here refers to "the magnitude and importance of the resources that are attached to a relationship — resources that would decline in value or be lost if the relationship were to end" (Rusbult *et al.*, 1998). With the more resource a partner puts into a relationship, the cost of ending a relationship is higher and thus, it serves as a powerful psychological inducement to enhance partner's commitment. Similarly, it is common to see in the organizational settings that large projects often require more careful selection and investigation than small projects as the cost of failure is more expensive. This model can be applied to PPP projects too. PPP is a contractual agreement which means both agents' commitment level is crucial. In this

regard, involving each party and maintaining a good cooperation throughout the course of PPI project is similar to keeping a well-functioned relationship. Infrastructure represents a large sunk-cost that is location-specific and highly illiquid. The larger investment implies greater amount of potential risk. By weighing costs and benefits of the project, investors tend to be less opportunistic and exercise more cautions when making big investment decisions. A favorable institutional control could mitigate the uncertainties associated with the project and reduce information asymmetries. With improved contract credibility, both parties also have less incentives to renege. Thus, it is expected that private investors have higher requirements for host country's investment climate and the total PPI investment in developing countries is more sensitive towards countries' institutional quality and financial market development in larger PPI project than the case when investment size is small. Thus, it is believed that investment size is an important component in determining PPI investment. At different investment scales, various determinants contribute to the total amount of investment differently. Countries with better institutional framework and well-developed financial market tend to attract more capital when the project size is big but the advantage is less salient when the scale of investment is small.

An aid from international development partner is another unique and considerable feature of PPI projects in developing countries, especially for low-income countries where the government is incapable of meeting domestic infrastructure needs without the help from international organizations. MDBs act as a catalyst to unlock private funds into infrastructure projects and generate "multiplier effect" (World Bank, 2016). Besides financial aids, MDBs also offer a range of non-financial assistances which have far-reaching effects on enhancing PPI in transitioning economies. Jandhyala (2016) studies 2117 PPI projects in 45 developing countries and finds that with the lower presence of MDBs, the likelihood of a project goes into distress caused by ex-post contract re-negotiation and this effect is stronger in host countries with weak intuitional development and greater MDBs' leverage. Bhattacharyay (2009) emphasizes MDB's contribution on mobilizing private capital in PPP through deepening financial development, designing tailor-made financial products and using risk management tools in emerging countries. Moore and Kerr (2014) show that MDBs' participation promotes infrastructure activities in developing countries by creating an enabling investment climate to attract global capital and strengthen international cooperation. Studies also demonstrate that MDBs have a different aiding role to play in the diversity of developing countries. For example, MDB's financing role is more meaningful for countries with limited access to the international capital market while MDBs' role of technical assistance is more valuable for middle-income countries that are lack of skills and expertise. Among conflict-affected states, MDB's role of risk

guarantee is more critical. Thus, it is expected that the moderating role of MDBs also varies across different project sizes and different types of MDBs' support, namely the monetary support, risk management support and technical support also contribute differently in various situations. Hence, the above discussions might lead to the following conclusions that MDB's participation has positive effects on increasing total investment but its contribution varies according to different project sizes. Different support types attribute differently under various investment amounts.

3. Econometric Model

It is common to use the following panel data model to study the effects of institutional factors, financial market development and role of development partners on PPI investments:

$$y_{i,t} = \beta_0 + \beta_1 x_{i,t} + \beta_2 z_{i,t} + \beta_3 u_{i,t} + \sum_{k=4}^{d} \beta_k v_{k,i,t} + \varepsilon_{i,t}, \tag{1}$$

where $y_{i,t}$ denotes investment, $x_{i,t}$ is the institutional factor, $z_{i,t}$ stands for the financial market development index, $u_{i,t}$ represents the MDB participation and $\{v_{k,i,t}\}_{k=4}^{d}$ is a set of other control variables. Here, subscripts i and t denote the specific PPI project and financial closure year of the project, respectively. The dependent variable $y_{i,t}$ is the scale of PPI project, measured by the total investment amount of a project to host country's GDP. While institutional factors are measured using six worldwide governance indicators (WGIs) and financial market development index is represented by two proxies chosen from Global Financial Development Database (GFDD). The role of MDBs is a dummy variable indicating whether there is MDB joining in the project. In the above econometric model, we also add in host country's population, region in which the PPI project is located, industrial sectors and year as control variables (see Appendix B for more details).

A mean regression model (1) assumes an unchanging association at different investment sizes while our paper predicts that the relationship between affecting factors and total investment is changing under different investment scales. Econometrically, the estimation of linear model or fixed effect model is only accurate when dependent variable follows a normal distribution or the central tendency. But in our sample, the distribution of PPI investment is highly skewed (see Fig. 1), which means that the mean regression estimation is likely to be biased and not be able to truly reflect the behavior of data in tail regions.

To overcome the aforementioned issue, a truncated model is one of the ways to test out the non-homogeneous relationship by sub-dividing the sample into

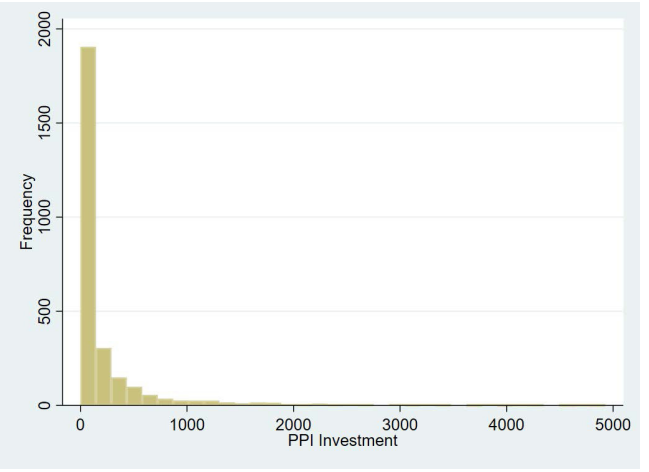

Figure 1. The histogram of PPI investment (in millions of dollars).

different groups according to project scales and running regression separately. However, this method suffers from sample truncation problem and regression results are likely to be inaccurate due to the loss of information. Compared with mean regression and truncated model, a QR is a more appropriate method to meet our goal and provides a desirable estimation result. QR gains the effects of explanatory variables on the dependent variable across whole dependent variable's distribution. Indeed, QR technique has drawn much attention from researchers recently and has been widely applied to financial market, corporate finance and other areas of studies, to name just a few, Klomp and Haan (2012), Krüger and Rösch (2017), Lee and Li (2012), Conyon and He (2017) and Fattouh *et al.* (2005), and the references therein. There are several advantages to adopting QR regression in our study. First, QR is designed to account for heterogeneity and produces noise-free estimation results. PPI sample in our study consists of 2760 projects in 47 B&R countries which are highly heterogeneous in terms of regional, national, sectoral and program-level characteristics. Second, the ordinary least-squared (OLS) method only estimates the average behavior of sample and assumes a non-changing relationship across dependent variable distribution, while QR model describes the variation of marginal effects across the whole spectrum of dependent variable and goes far beyond mean prediction to provide a complete picture of changing relationship under different scales. In addition, it is well documented that QR produces a robust estimation against outliers.

Instead of considering model (1), a QR model is used to model the relationship between $y_{i,t}$ and $X_{i,t}$, where $X_{i,t}^T = (1, x_{i,t}, z_{i,t}, u_{i,t}, v_{4,i,t}, \ldots, v_{d,i,t})$. To this end, for

any $\tau \in (0,1)$, the τ quantile of $y_{i,t}$, $Q_\tau(x,z,u,v)$ is given by

$$P(y_{i,t} \leq Q_\tau(x_{i,t}, z_{i,t}, u_{i,t}, v_{i,t}) \,|x_{i,t}, z_{i,t}, u_{i,t}, v_{i,t}) = \tau$$

and $Q_\tau(x_{i,t}, z_{i,t}, u_{i,t}, v_{i,t})$ can be modeled as a linear function as

$$Q_\tau(x_{i,t}, z_{i,t}, u_{i,t}, v_{it}) = \beta_{0,\tau} + \beta_{1,\tau} x_{i,t} + \beta_{2,\tau} z_{i,t} + \beta_{3,\tau} u_{i,t} + \sum_{k=4}^{d} \beta_{k,\tau} v_{k,i,t} \equiv \beta_\tau^T X_{i,t}, \tag{2}$$

where $\beta_\tau^T = (\beta_{0,\tau}, \beta_{1,\tau}, \ldots, \beta_{d,\tau})$. The unknown parameter vector β_τ is estimated by minimizing the sample loss function $\sum_{i=1}^{n} \sum_{t=1}^{T} \rho_\tau(y_{i,t} - \beta_\tau^T X_{i,t})$, where $\rho_\tau(x) = x[\tau - I(x < 0)]$ with $I(A)$ being the indicator function of event A, that is,

$$\hat{\beta}_\tau = \arg \min_{\beta_\tau \in \mathbb{R}^{d+1}} \sum_{i=1}^{n} \sum_{t=1}^{T} \rho_\tau(y_{i,t} - \beta_\tau^T X_{i,t}). \tag{3}$$

In (3), $\rho_\tau(\cdot)$ is not differentiable at the origin so that there is no explicit solution to $\hat{\beta}_\tau$. Instead, the solution can be obtained by minimizing weighted residuals of the asymmetric loss function (3). In (3), it is clear that positive residuals in the right tail of the distribution are stronger weighted by $\tau \in (0.5, 1)$ than negative residuals by $1 - \tau$. Also, it follows Koenker and Bassett (1978) that $\hat{\beta}_\tau$ is an asymptotically unbiased, consistent and normally distributed estimator (Krüger and Rösch, 2017).

4. Data Description

We gather panel data regarding 47 B&R countries (see Appendix A) from World Bank's PPI database from year 1996 to 2016. It consists of project details, source and destination of investment flows as well as knowledge on main sponsors and various stakeholders. Table 1 shows that PPP is most commonly used in energy sector followed by water and sewerage sector, transport sector and ICT sector. East Asia has the highest number of PPI projects which accounts for more than half of the total projects among B&R countries.

Table 1. PPP projects by region and sector along B&R countries.

	Energy	ICT	Transport	Water and sewerage	Total
East Asia	967	45	318	456	1786
Europe	363	198	73	26	660
MENA	37	29	15	4	85
Other area	175	31	23	0	229
Total	1542	303	429	486	2760

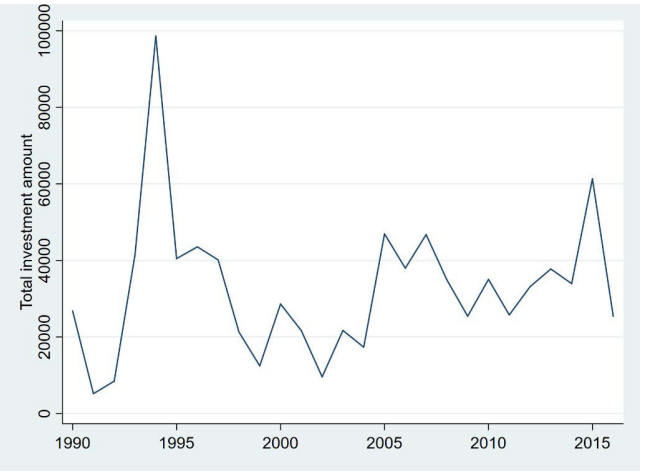

Figure 2. PPI total investment along B&R countries from 1990–2016 (in millions of dollars).

In terms of investment amount displayed in Fig. 2, the annual commitment to PPI projects along B&R routes reached a peak of $98.66 billion USD in year 1994 as PPP became a popular form of cooperation among developing countries in the early 1990s. However, from the period of 1994 to 1998, there is an abrupt fall in the total spending, due to, among other factors, the Asian Financial Crisis in 1997 and unforeseen problems arising from PPP model adoption in developing countries. Similarly, it is clear that a fall in PPP expenditure occurred during the burst of dotcom bubble in year 2000 and the subprime mortgage crisis in year 2008, which suggests that total PPI investment is sensitive to the global economic conditions. Although there is a moderate increase in overall spending around year 2014 after the announcement of B&R initiative, yet investment in PPI remains lukewarm in B&R regions after 1997.

Table 2 presents MDBs' participation in PPI projects in B&R countries by regions and sectors. Total number of PPI projects involving multilateral banks is

Table 2. MDBs participation in PPI by sector and region.

	Energy	ICT	Transport	Water and sewerage	Total
East Asia	61	4	19	11	95
Europe	71	26	19	15	131
MENA	20	6	2	3	31
Other area	50	9	2	0	61
Total	202	45	42	29	318

Table 3. MDBs support types.

	MDB	MDB_monetary	MDB_equity	MDB_riskmgmt
Energy	202	169	38	44
ICT	45	35	18	8
Transport	42	38	5	4
Water and sewerage	29	21	2	7
Total	318	263	63	63

318, which only takes up 1/9 of the total number of projects. Energy sector has the highest number of projects that received help from MDBs. Also, Europe is the region with the most number of MDBs-aided PPI projects. Table 3 summarizes different forms of support offered by MDBs, including loan, syndication, guarantee, equity, quasi-equity, risk management. Among all, monetary support (loan and syndication) is the most practised support compared with equity and other type of risk management support. Furthermore, it is clear that many projects are receiving more than one type of support or from more than one MDB.

Institutional proxies are taken from WGI, a dataset based on World Bank Group long-standing research programs, which measures the quality of governance from six different dimensions over 200 countries since 1996, namely control of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, rule of law and voice and accountability (see Appendix for detailed definition). Each indicator is assigned an aggregate estimate, ranging from approximately -2.5 to 2.5.

The financial development index is chosen from GFDD — a database consisting of various indicators covering financial system characteristics of 203 countries from 1960 onwards. GFDD captures the development of financial institutions (e.g. banks) and financial market (e.g. stock market) in each countries. We chose one proxy from each segment to measure the overall financial development level. Bank credit to bank deposit (%) represents liquidity available to private sectors domestically which includes financial resources form commercial banks and other financial institutes. Stock market turnover ratio reflects the activeness of capital market in each country. The other economic variables are taken from World Development Indicator (WDI) Database. By eliminating missing and invalid data, we have finally obtained 1903 valid data.

5. Empirical Results and Discussion

Table 4 provides the descriptive statistics of main variables. The mean of investment is 3.63% and the median is 0.05%, indicating that small-sized projects take

Table 4. Summary statistics for key variables.

Variables	*N*	Mean	Std. Dev.	Min	Median	25%	75%	Max
Investment	2760	3.63	20.08	0.00	0.05	0.01	0.79	664.28
MDB	2760	0.12	0.32	0.00	0.00	0.00	0.00	1.00
Voice	2199	−1.01	0.73	−2.23	−1.44	−1.63	−0.32	0.69
Stability	2197	−0.65	0.60	−2.97	−0.54	−0.92	−0.39	1.26
Lawrule	2199	−0.44	0.35	−1.86	−0.51	−0.59	−0.22	0.58
Corruption	2199	−0.48	0.33	−1.66	−0.51	−0.61	−0.27	0.91
Regulation	2198	−0.21	0.39	−2.19	−0.24	−0.34	−0.11	0.92
Effectiveness	2198	−0.07	0.38	−1.70	0.00	−0.26	0.18	1.27
CD_ratio	2573	92.29	11.31	12.47	97.40	92.72	98.35	100.00
Turnover_ratio	2376	124.49	113.71	0.15	95.05	36.54	170.65	557.04

up a large proportion in PPI projects along B&R regions. MDB's mean is 0.12, meaning that only about 12% of total PPI projects are receiving help from MDBs, which clearly has much room for further improvement. The average of six institutional factors are all below zero, reflecting that the governance standard of B&R countries is relatively poor. As for financial development indicators, Bank credit to bank deposit has a mean value of 92.29% and a median of 97.4% which is close to the world's average number of 97.26% in year 2015.[6] Stock market turnover ratio's mean is 124.49%. Given the average stock market turnover ratio around the world is 38.99% in 2016, this average turnover ratio is considered as high in both developing and developed countries. This abnormal high average ratio might be attributed by a few extreme figures in certain markets, such as the turnover ratio of 557.04% in Chinese market in 1995 and the ratio of 538.31% in Russian market in 1994.

Table 5 presents both mean regression result in the last column (Table 5, last column) and the QR results from Columns 2–7 (Table 5, Columns 2–7). As expected, the finding suggests that the sensitivity of institutional factors, financial factors and the effect of MDB involvement to PPI total investment is conditional on the sale of investment which are unable to capture using mean regression methods. OLS results indicate that stability, corruption and regulation have a positive impact on PPI investment while law of rule and effectiveness, on the other hand, have an adverse impact and voice is found to be statistically insignificant. Compared with mean regression results, QR has revealed more valuable information by taking investment sizes into consideration. Four out of six institutional indicators are showing notable quantile-varying coefficients. At low quantiles, the attributes of

[6] *Source*: TheGlobalEconomy.com, The International Monetary Fund

Table 5. QR estimate of (2) together with OLS estimate in (1).

	0.1	0.3	0.5	0.7	0.9	OLS
MDB	0.031*	0.165*	0.568**	1.688***	2.147	1.496***
	(2.475)	(2.422)	(2.704)	(3.420)	(1.296)	(3.653)
Voice	0.016	0.050**	0.170***	0.455**	2.223***	0.004
	(1.563)	(3.242)	(3.785)	(3.230)	(3.659)	(0.011)
Stability	0.014*	0.060**	0.212***	0.639***	2.769***	0.878**
	(2.426)	(2.592)	(3.341)	(5.125)	(3.304)	(3.054)
Lawrule	−0.019	−0.022	−0.212	−0.706**	−1.900	−3.136**
	(−0.706)	(−0.338)	(−1.555)	(−2.623)	(−1.886)	(−3.197)
Corruption	0.006	0.032	0.132	0.365	0.497	3.328***
	(0.659)	(1.587)	(1.844)	(1.314)	(0.604)	(4.215)
Regulation	0.007	0.053	0.151	0.685***	2.727***	5.003***
	(0.778)	(1.921)	(1.849)	(5.803)	(3.412)	(6.599)
Effectiveness	−0.001	−0.023	0.089	0.370**	0.316	−3.327***
	(−0.029)	(−0.482)	(0.891)	(2.687)	(0.306)	(−3.545)
CD_ratio	0.002	0.000	−0.001	−0.022	−0.042	0.065**
	(0.920)	(0.096)	(−0.228)	(−0.995)	(−0.521)	(2.768)
Turnover_ratio	−0.000*	−0.000*	−0.001*	−0.002*	−0.002	−0.005**
	(−2.318)	(−2.120)	(−2.478)	(−2.084)	(−0.888)	(−3.004)
Log_Pop	−0.002	−0.003**	−0.010**	−0.026*	−0.044	−0.159***
	(−1.667)	(−3.169)	(−2.977)	(−2.344)	(−1.203)	(−5.225)
Constant	−0.033	0.356	1.268*	5.156*	14.154	0.671
	(−0.189)	(1.353)	(2.026)	(2.444)	(1.767)	(0.275)
Area	Control	Control	Control	Control	Control	Control
Sector	Control	Control	Control	Control	Control	Control
Year	Control	Control	Control	Control	Control	Control
N	1903	1903	1903	1903	1903	1903

Notes: t statistic in parentheses; *means the p-value < 0.05, **$p < 0.01$, ***$p < 0.001$.

critical factors to total PPI investment amount are mostly not statistically significant. Although voice and stability are showing a slight positive impact, the magnitude is rather small. This result means that investors are less responsiveness to the changes of institutional factors when project scale is small.

But as the size of investment grows, voice, stability and regulation, which have no obvious effect at low quantiles, show an increasingly positive influence at high quantiles. The marginal effect of these three attributes in bringing in more capital is rising with investment sizes. Under a large project, improved institutional factors attract more investment while declining governance standards bring in a significant drop in overall investment amount. Stability measures the likelihood of a country goes into a destabilized situation by violence or terrorism. As mentioned earlier, infrastructure investment involves fixed and illiquid assets, political instability may

pose the greatest threat of losing all money invested. Thus, it is natural that investors are more sensitive towards stability level of a country when the size of investment is big. While voice is a measure of democracy degree in a country, reflecting the government's attitude towards freedom of speech, freedom of association and free media could serve as useful signals to potential investors in evaluating the possibility of establishing a credible partnership with the government in the future. A more democratic government is often associated with better protection of individual rights and more evenly distributed political power which could be useful in settling contract disputes, one of the highly cited reasons for PPP project failures. Similarly, regulation captures the government's ability to formulate and implement sound policies. Constant policy changes are harmful for the long-term contractual agreement like PPP and often lead to costly contract renegotiations. Thus, it is important to have well-planned and organized policies in place to attract investors taking part in large-scale projects. As a whole, it reveals that the higher the investment amount, the more essential for host country's to create a favorable institutional environment in order to attract more funds. Interestingly, we also found a slightly negative relationship between law of rule and the total investment amount at high quantiles. Law of rule represents the extent to which agents have confidence in and abide by the rules of society, as well as the likelihood of crime and violence. The reason behind this negative relationship may be due to the fact that in practice, some PPI projects may be beneficial to majorities in the long run at the cost of minority groups' interests in the short term. For instance, in the case of residence relocation for highway or railway buildings, in this case, overly strict or rigid legal systems may become the roadblock and reduce the project efficiency. Both corruption and effectiveness proxies are mostly not statistically significant across investment sizes under QR. Overall, the regression on institutional proxies supports our hypothesis that country's governance level matters in different sizes of projects and investors are more sensitive to investment climate as their inputs increase. While for small projects, institutional factors are less important to have a huge impact on investment decisions. These results may partly reconcile inconsistent empirical results found in the previous studies.

Among financial indicators, the ratio of Bank credit to bank deposit (%) is not statistically significant across whole investment size and it might be the reason that domestic credits are insufficient to meet funding requirements of infrastructure projects. Most infrastructure projects in B&R countries heavily rely on international debts or social capitals, which again prove the importance of involving private sectors into infrastructure provisions. The other proxy stock market turnover ratio shows a slightly negative significance across the investment sizes but the magnitude is rather small. As shown in Table 4, the average stock turnover ratio is

already high in B&R countries, the further increase in turnover ratio might imply the existence of opportunistic behavior among investors rather than a sign of active capital markets, which could be harmful for projects requiring a steady flow of capital. In general, both indicators do not lend any support to the hypothesis that domestic financial development enhances total PPI investments. This result may reveal that financial markets in B&R countries are still underdeveloped or inadequate to support their PPI projects at current stage. But nonetheless, our results do not deny the importance of developing a sound domestic financial market in improving country's infrastructure buildings. A well-developed domestic financial market is essential for developing country to have an independent and sustainable infrastructure plan in the long run.

The coefficient associated with MDBs' participation dummy is positively significant almost throughout the quantiles (Table 5), indicating that the presence of MDBs helps improving investors' participation in PPI across different investment sizes. Although OLS results also show a significant positive result of 1.496, it is unable to capture changing coefficients across investment scales which carries informative messages. The increasing positive trend from low quantiles to high quantiles indicates that MDBs plays a more critical role as the size of investment grows. More resources are required to support bigger projects, thus, B&R countries tend to rely more on MDBs for large projects due to their lower capacity in mobilizing external private finance. Help from MDBs is critical in linking up social capitals and infrastructure projects. Although MDBs only have limited funds themselves. Participation of MDBs itself boosts up investors' confidence to take part in the project and creates leveraging effects. This credit enhancement effect is more salient and significant among large projects. At the same time, MDBs could be very useful in providing consultant information at the preparation stage which is especially valuable for small and medium-scaled projects that investors are unwilling to spend too much on project investigations.

To further explore the working mechanism of MDBs in enhancing PPI projects, MDBs' different support types are added to the existing model as explanatory variables to test the efficiency of each support type (Table 6). As mentioned earlier, MDB offers a range of financial and non-financial help to developing countries through different forms. Based on the nature of support offered by MDBs, we adopt two grouping methods. First, we distinguish them into monetary and non-monetary categories. Monetary category includes cash supports, such as loan and syndication which is the most commonly used way of support. Its effect is often immediate and could be measured easily. Non-monetary category includes indirect support such as insurance, guarantee, equity, risk management and technical support. These are normally more subtle type of support but have far-reaching impacts in the future. The QR results demonstrate that monetary type of support

resembles the shape of MDBs' participation, showing an upward positively significant trend. It means that the positive effects of MDB participation are mainly driven by monetary type of supports. Besides, it is worth noting that the positive effect of monetary tools on total investment does not disappear at high quantiles like what MDB participation dummy displays, but rising quickly from 2.257 to 5.001 from 70th quantile to 90th quantile. It might imply that MDB's financial support has a "multiplier effect" in raising funds and this leveraging effect is more pronounced for large-scaled projects where funding shortage problem is more serious. But on the other hand, non-monetary supports, despite of its importance, show no obvious effect across all projects. Compared with

Table 6. QR to test MDBs' different support types.

	0.1	0.3	0.5	0.7	0.9	OLS
MDB_ monetary	0.031*	0.225*	0.684*	2.257***	5.001*	1.797***
	(2.358)	(2.495)	(2.408)	(4.508)	(2.019)	(4.090)
MDB_ nonmonetary	0.008	0.085*	0.121	0.084	0.006	−0.123
	(0.178)	(2.411)	(0.934)	(0.147)	(0.031)	(−0.129)
Voice	0.016**	0.054***	0.161***	0.403*	2.162***	0.006
	(2.687)	(3.343)	(4.766)	(2.360)	(3.729)	(0.015)
Stability	0.013*	0.060**	0.223***	0.588***	2.438***	0.890**
	(2.193)	(3.020)	(4.675)	(3.503)	(4.048)	(3.098)
Lawrule	−0.021	−0.027	−0.240	−0.785**	−1.385	−3.171**
	(−0.807)	(−0.555)	(−1.645)	(−3.114)	(−1.406)	(−3.235)
Corruption	0.007	0.031	0.141*	0.440	0.006	3.372***
	(0.994)	(1.560)	(2.330)	(1.217)	(0.006)	(4.271)
Regulation	0.008	0.048*	0.165**	0.640***	2.476***	4.926***
	(1.064)	(1.993)	(3.018)	(3.489)	(5.674)	(6.493)
Effectiveness	−0.002	−0.022	0.107	0.444*	0.295	−3.256***
	(−0.074)	(−0.466)	(1.054)	(2.344)	(0.317)	(−3.469)
CD_ratio	0.002	0.000	−0.001	−0.019	0.002	0.065**
	(1.925)	(0.099)	(−0.252)	(−0.752)	(0.033)	(2.770)
Turnover_ratio	−0.000*	−0.000*	−0.001*	−0.002*	−0.002	−0.005**
	(−2.513)	(−2.199)	(−2.168)	(−2.110)	(−0.518)	(−3.024)
Log_Pop	−0.002*	−0.003*	−0.010*	−0.030*	−0.038	−0.158***
	(−2.139)	(−2.224)	(−2.554)	(−2.338)	(−0.781)	(−5.209)
Constant	−0.034	0.347	1.277*	5.063	9.743	0.767
	(−0.389)	(1.605)	(2.158)	(1.776)	(1.456)	(0.314)
Area	Control	Control	Control	Control	Control	Control
Sector	Control	Control	Control	Control	Control	Control
Year	Control	Control	Control	Control	Control	Control
N	1903	1903	1903	1903	1903	1903

Notes: t statistics in parentheses; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

non-monetary tools, direct cash input is better at boosting investors' confidence, attracting funds and producing an immediate effect.

The second type of the grouping we adopt is to further distinguish non-monetary category into equity and risk management types. The reason we separate these two types of non-financial supports is that country risk, political risk, policy risk and exchange rate risk are often major reasons shying away private investors. Different from direct financial supports, equity participation has further aligned the long-term interests of MDBs with various stakeholders and enables a better

Table 7. QR to test further MDBs' different support types.

	0.1	0.3	0.5	0.7	0.9	OLS
MDB_monetary	0.031*	0.188**	0.489	2.108***	2.228	1.484**
	(2.567)	(3.118)	(1.437)	(5.515)	(1.001)	(3.249)
MDB_equity	0.115	0.247	0.535	3.327	6.751*	2.424*
	(0.579)	(0.990)	(0.361)	(0.860)	(2.029)	(2.247)
MDB_riskmgmt	0.010	0.164	0.127	0.083	0.074	0.780
	(0.173)	(1.339)	(0.330)	(0.218)	(0.090)	(0.872)
Voice	0.016*	0.051	0.178***	0.438*	2.042***	−0.027
	(2.473)	(1.904)	(4.856)	(2.555)	(3.418)	(−0.073)
Stability	0.014***	0.061	0.224***	0.618***	2.514***	0.867**
	(3.691)	(1.913)	(6.552)	(3.781)	(3.877)	(3.023)
Lawrule	−0.019	−0.022	−0.230	−0.714*	−1.519	−2.986**
	(−1.035)	(−0.390)	(−1.524)	(−2.102)	(−1.487)	(−3.042)
Corruption	0.006	0.031	0.136*	0.393	0.319	3.291***
	(0.701)	(1.204)	(2.525)	(1.162)	(0.292)	(4.171)
Regulation	0.007	0.050*	0.160***	0.679***	2.689***	4.921***
	(1.249)	(2.184)	(3.493)	(4.332)	(5.810)	(6.497)
Effectiveness	−0.001	−0.021	0.094	0.376	−0.256	−3.381***
	(−0.044)	(−0.515)	(0.931)	(1.151)	(−0.427)	(−3.602)
CD_ratio	0.002	0.000	−0.001	−0.019	−0.055	0.067**
	(1.422)	(0.142)	(−0.339)	(−1.100)	(−0.889)	(2.859)
Turnover_ratio	−0.000***	−0.000*	−0.001*	−0.002	−0.002	−0.005**
	(−5.250)	(−1.976)	(−2.476)	(−1.797)	(−0.618)	(−3.008)
Log_Pop	−0.002***	−0.003*	−0.009**	−0.027*	−0.035	−0.160***
	(−4.283)	(−2.525)	(−3.025)	(−2.076)	(−1.062)	(−5.277)
Constant	−0.033	0.339	1.246**	4.960*	13.504*	0.328
	(−0.300)	(1.516)	(2.642)	(2.365)	(2.203)	(0.134)
Area	Control	Control	Control	Control	Control	Control
Sector	Control	Control	Control	Control	Control	Control
Year	Control	Control	Control	Control	Control	Control
N	1903	1903	1903	1903	1903	1903

Notes: t statistics in parentheses; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

position of MDBs to take part in project management throughout the course which might reduce investors' concerns about long-term risks. Table 7 shows that MDB's equity support is only statistically significant at high quantile which supports our guess that equity support does play a part in enhancing PPI investment under large projects. However, we do not find any evidence to show that risk management is a useful tool in helping PPI investments. Overall, MDBs' support type regressions confirm our previous results that PPI projects determinants are showing different sensitivities across investment sizes. MDBs' help is more salient among large projects as more funds are required for large projects.

We also note that many projects are receiving helps from more than one MDBs. However, does the participation of more than one MDB help or hinder the PPI investment? It is argued that different MDBs may have distinct ideologies on

Table 8. QR to test the effect of different MDBs' numbers.

	0.1	0.3	0.5	0.7	0.9	OLS
MDB_num	0.045**	0.135*	0.366*	1.138*	1.758**	1.081***
	(3.207)	(2.545)	(2.101)	(2.249)	(3.178)	(5.356)
Voice	0.015*	0.048*	0.162***	0.449**	1.818**	0.009
	(2.564)	(2.576)	(3.863)	(2.771)	(2.951)	(0.025)
Stability	0.013*	0.059***	0.241***	0.652***	2.066**	0.853**
	(2.166)	(4.421)	(4.912)	(4.736)	(2.660)	(2.981)
Lawrule	−0.010	−0.021	−0.213	−0.727*	−1.067	−2.947**
	(−0.567)	(−0.479)	(−1.319)	(−2.343)	(−0.704)	(−3.014)
Corruption	0.005	0.029	0.136	0.380	0.086	3.316***
	(0.994)	(1.263)	(1.713)	(1.365)	(0.094)	(4.216)
Regulation	0.007	0.050*	0.182**	0.693***	2.647**	4.950***
	(1.098)	(2.457)	(3.001)	(4.530)	(3.225)	(6.560)
Effectiveness	−0.008	−0.025	0.100	0.374	−0.738	−3.468***
	(−0.361)	(−0.647)	(0.947)	(1.120)	(−0.793)	(−3.715)
CD_ratio	0.002	0.000	−0.002	−0.027	−0.058	0.064**
	(1.552)	(0.207)	(−0.317)	(−1.304)	(−0.929)	(2.742)
Turnover_ratio	−0.000**	−0.000**	−0.001*	−0.002*	−0.001	−0.005**
	(−3.272)	(−3.272)	(−2.003)	(−1.976)	(−0.491)	(−2.902)
Log_Pop	−0.002***	−0.003**	−0.009*	−0.025*	−0.033	−0.157***
	(−3.519)	(−3.104)	(−2.486)	(−2.306)	(−0.854)	(−5.174)
Constant	−0.029	0.324	1.330*	5.589*	12.335	0.287
	(−0.298)	(1.476)	(2.237)	(2.387)	(1.838)	(0.118)
Area	Control	Control	Control	Control	Control	Control
Sector	Control	Control	Control	Control	Control	Control
Year	Control	Control	Control	Control	Control	Control
N	1903	1903	1903	1903	1903	1903

Notes: t statistics in parentheses; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

development or inconsistent objectives to fulfill, which may result in a conflicted interest among stakeholders. According to this view, more than one MDB players may have an adverse effect on the overall performance of PPI projects as it is harder to align interests among stakeholders. While others argue that more than one MDB taking part in one project could further improve investor's confidence and draw in more social capital by combining different MDBs' resources. Therefore, we carried out a further test to evaluate the impact of several MDBs' joint efforts on PPI investments. We use a new dummy MDB_num to represent number of MDBs taking part in one project and replace the dummy MDBs in Eq. (2). By comparing the coefficient of MDBs' dummy in Table 5 and coefficient of MDB_num in Table 8, we see that multi-MDB participation has a higher positive impact on PPI investment compared with single MDB-participated projects under the same scale of investment. This magnified positive effect is more significant among medium and large-sized projects. Overall, our results lend support to the argument that MDBs' joint effort has a compounded beneficial effect on improving PPI investments.

We also conduct several tests to establish the robustness of our results. First, we apply QR using full sample in PPI dataset and the results remain solid.[7] It shows that our findings are not limited to B&R countries but applicable to all developing countries in general. Second, we change the key proxies for financial development and the results remain robust.

6. Conclusion

How to engage private investors in PPP arrangements and utilize both domestic and international sources of capital to fill up the infrastructure financial gap is one of the major challenges faced by emerging countries. Using B&R country sample, this study discusses the impact of institutional factors, financial development and the role of MDBs on PPI projects by taking one of the project-level characteristics — the scale of investment into consideration. Adopting a QR method, we capture the varying non-homogeneous relationship between various determinants and overall investments across investment sizes. Depending on the size of the investment, investors put different weights on these affecting factors and thus, factors contribute to investment decision differently. Our results show that institutional factors, such as country's stability, democracy degree of host country and regulation level, have a positive impact on attracting funds when investment size is large but this positive relationship is not significant or less salient when investment size is small. No empirical evidence is found between the developments of

[7] The results are available upon on request.

financial market and PPI overall investments. Besides, we also observe an increasingly positive impact of MDBs' participation across all projects and monetary support is proved to be the most efficient means among other type of supports offered by MDBs. Furthermore, we present evidence to show that several MDBs' joint participation in one project compounds the positive contributions, especially among medium and large-scaled projects.

As PPP has been an increasingly popular mechanism in infrastructure projects under BRI, these results have several implications for both practitioner and policymaker. First, empirical results provide a strong evidence on the importance of country's institutional quality in attracting funds, especially for large projects. Investors are more sensitive towards host country's governance level as the size of project increases. A more stable, democratic and regulated investment climate is more likely to receive long-term government support for PPI projects and thus, draw more funds. It is critical for B&R countries to foster a more stable institutional environment and provide more reliable government support to PPI projects. At the same time, results imply that governments should adopt distinguished strategies to attract investors under different investment scales to address investors' distinct concerns. Second, this study demonstrates that MDBs have a positive impact on PPI investments, yet we also find that participation rate of MDBs is still low among B&R countries. MDBs should step up efforts to reach out those needs by making best possible use of their existing aiding tools and provide innovative financing solutions to respond to specific needs of those countries. At the same time, B&R countries should be more open and cooperative in working with MDBs and take the initiative to seek help from development partners in solving the financial and non-financial challenges posed in PPP adoptions. Third, despite the differences in missions and objectives, MDBs' joint effort proves to be more effective in improving PPI investments. Encouraging cooperations among MDBs may be one of the effective ways to solve the funding shortage problem under BRI and to help developing countries achieving sustainable and inclusive long-term growth. In short, our results also shed lights on MDBs' future policy designs and infrastructure investment plan in countries under BRI.

One of the possible drawbacks in this study is its inability to separate private capital flow in each project due to insufficient data. It remains a challenge to measure the real size of private inputs as private funding could be invested into a project through different channels and in different forms.

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Appendix A. B&R Country List

Afghanistan	Jordan	Philippines
Albania	Kazakhstan	West Bank and Gaza
Armenia	Kyrgyz Republic	Romania
Azerbaijan	Cambodia	Russian Federation
Bangladesh	Lao PDR	Serbia
Bulgaria	Lebanon	Syrian Arab Republic
Bosnia and Herzegovina	Sri Lanka	Thailand
Belarus	Moldova	Tajikistan
Bhutan	Maldives	Turkmenistan
China	Macedonia, FYR	Timor-Leste
Egypt, Arab Rep.	Myanmar	Turkey
Georgia	Montenegro	Ukraine
Indonesia	Mongolia	Uzbekistan
India	Malaysia	Vietnam
Iran, Islamic Rep.	Nepal	Yemen, Rep.
Iraq	Pakistan	

Appendix B. Variable Description

Variable name	Definition	Source
Investment	Total investment of PPI project/host country's GDP of the project financial closure year	PPI Database
MDB	Dummy Variable. If there is MDB or MDBs participation in PPI project, MDB takes the value of 1; otherwise, MDB takes 0.	
Voice Stability, Lawrule, Corruption, Regulation, Effectiveness	Refer to http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1682130.	WGI
CD_ratio	Total assets held by deposit money banks as a share of sum of deposit money bank and Central Bank claims on domestic nonfinancial real sector.	GFDD

(*Continued*)

Variable name	Definition	Source
Turnover_ratio	Total value of shares traded divided by the average market capitalization	
MDB_monetary	Dummy Variable. When MDB support type is loan or syndication, MDB_monetary takes the value of 1, otherwise takes the value of 0.	PPI Database
MDB_nonmonetary	Dummy Variable. When MDB support type is equity, quasi-equity, guarantee, insurance or risk management, MDB_non-monetary takes the value of 1, otherwise takes the value of 0.	
MDB_equity	Dummy Variable. When MDB support type is equity or quasi-equity, MDB_equity takes the value of 1, otherwise takes the value of 0.	
MDB_riskmgmt	Dummy Variable. When MDB support type is guarantee, insurance or risk management, MDB_riskmgmt takes the value of 1, otherwise takes the value of 0.	
MDB_num	Dummy Variable. MDB_num takes the value of number of MDBs participating in one project.	
Log_Pop	Log of host country's population number of the project update year.	WDI
Area	Dummy Variable. *Eastasia* takes the value of 1 when the project located in Eastasia area; *Europe* takes the value of 1 when the project located in Europe area; *MENA* takes the value of 1 when the project located in Middle East & North Africa area; otherwise takes value of 0.	PPI Database
Sector	Dummy Variable. *Energy* takes the value of 1 when the project falls into energy sector; *ICT* takes the value of 1 when the project falls into ICT sector; *Transport* takes the value of 1 when the project falls into transport sector; otherwise takes value of 0.	Shen (2011)
Year	Dummy Variable. Year 1 takes the value of 1 when financial closure falls in 1990–1996. Year 2 takes the value of 1 when financial closure year falls in 1997–1999; Year 3 takes the value of 1 when 2000–2006; Year 4 takes the value of 1 when financial year falls in 2007–2009; Year 5 takes the value of 1 when financial year falls in 2010–2017.	

Appendix C. Key Variables Correlations

	Investment	MDB	Voice	Stability	Lawrule	Corruption	Regulation
Investment	1						
MDB	0.116***	1					
Voice	0.0230	0.275***	1				
Stability	0.073***	−0.047**	−0.152***	1			
Lawrule	−0.098***	0.081***	0.427***	0.292***	1		
Corruption	−0.114***	0.0140	0.189***	0.316***	0.832***	1	
Regulation	−0.144***	0.087***	0.482***	0.203***	0.777***	0.703***	1
Effectiveness	−0.198***	−0.127***	−0.066***	0.266***	0.706***	0.747***	0.674***
CD_ratio	−0.127***	−0.148***	−0.236***	0.339***	0.358***	0.465***	0.330***
Turnover_ratio	−0.159***	−0.163***	−0.481***	0.072***	−0.0310	0.218***	−0.049**
	Effectiveness	CD_ratio	Turnover_ratio				
Effectiveness	1						
CD_ratio	0.544***	1					
Turnover_ratio	0.417***	0.239***	1				

Notes: t statistics in parentheses; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

References

Araya, G, J Schwartz and L Andres (2013). The effects of country risk and conflict on infrastructure PPPs. Policy Research working paper, no. WPS 6569, Washington, DC: World Bank. http://documents.worldbank.org/curated/en/241991468159603304/The-effects-of-country-risk-and-conflict-on-infrastructure-PPPs. Accessed 16 January 2019.

Ba, L, F Gasmi and P Noumba (2010). Is the Level of Financial Sector Development a Key Determinant of Private Investment in the Power Sector? Policy Research Working Paper (5373).

Banerjee, SG, JM Oetzel and R Ranganathan (2006). Private provision of infrastructure in emerging markets: Do institutions matter? *Development Policy Review*, 24(2), 175–202.

Bhattacharyay, BN (2009). *Infrastructure Development for ASEAN Economic Integration*. Tokyo: Asian Development Bank Institute.

Bing, L, A Akintoye, PJ Edwards and C Hardcastle (2005). The allocation of risk in PPP/PFI construction projects in the UK. *International Journal of Project Management*, 23(1), 25–35.

Bloomfield, P (2006). The challenging business of long-term public–private partnerships: Reflections on local experience. *Public Administration Review*, 66(3), 400–411.

Carbonara, N, N Costantino and R Pellegrino (2014). Concession period for PPPs: A win–win model for a fair risk sharing. *International Journal of Project Management*, 32(7), 1223–1232.

Chou, JS and D Pramudawardhani (2015). Cross–country comparisons of key drivers, critical success factors and risk allocation for public–private partnership projects. *International Journal of Project Management*, 33(5), 1136–1150.

Chou, JS, HP Tserng, C Lin and CP Yeh (2012). Critical factors and risk allocation for PPP policy: Comparison between HSR and general infrastructure projects. *Transport Policy*, 22(3), 36–48.

Conyon, MJ and L He (2017). Firm performance and boardroom gender diversity: A quantile regression approach. *Journal of Business Research*. Elsevier, 79(C), 198–211.

Dulaimi, MF, M Alhashemi, FYY Ling and M Kumaraswamy (2010). The execution of public–private partnership projects in the UAE. *Construction Management and Economics*, 28(4), 393–402.

Fattouh, B, P Scaramozzino and L Harris (2005). Capital structure in South Korea: A quantile regression approach. *Journal of Development Economics*, 76(1), 231–250.

Grimsey, D and MK Lewis (2002). Evaluating the risks of public private partnerships for infrastructure projects. *International Journal of Project Management*, 20(2), 107–118.

Gupta, PD, S Guha and SS Krishnaswami (2013). Firm growth and its determinants. *Journal of Innovation and Entrepreneurship*, 2(1), 1–14.

Hammami, M, JF Ruhashyankiko and EB Yehoue (2006). Determinants of Public–Private Partnerships in Infrastructure. IMF working paper, Washington, DC: World Bank. http://documents.worldbank.org/curated/en/936961468338942251/Determinants-of-public-private-partnerships-in-infrastructure. Accessed 16 January 2019.

Ismail, S (2013). Critical success factors of public private partnership (PPP) implementation in Malaysia. *Asia-Pacific Journal of Business Administration*, 5(1), 6–19.

Jandhyala, S, (2016). International organizations and political risk — The case of multilateral development banks in infrastructure projects. Working Paper.

Kirkpatrick, C, D, Parker and YF Zhang (2006). Foreign direct investment in infrastructure in developing countries: Does regulation make a difference? *Transnational Corporations*, 15(1), 143–171.

Klomp, J and JD Haan (2012). Banking risk and regulation: Does one size fit all? *Journal of Banking and Finance*, 36(12), 3197–3212.

Krüger, S and D Rösch (2017). Downturn LGD modeling using quantile regression. *Journal of Banking and Finance*, 79, 42–56.

Lee, BS and MYL Li (2012). Diversification and risk-adjusted performance: A quantile regression approach. *Journal of Banking and Finance*, 36(7), 2157–2173.

Liu, J, X Yu and CYJ Cheah (2014). Evaluation of restrictive competition in PPP projects using real option approach. *International Journal of Project Management*, 32(3), 473–481.

Luo, Y, F Wang and X Chen (2017). How the quality of system and the international financial institutions influence the effectiveness of PPP projects: A study based on 46 the Belt and Road countries' empirical data. *Journal of Financial Research*, 4, 61–77.

Martimort, D and J Pouyet (2008). To build or not to build: Normative and positive theories of public–private partnerships. *International Journal of Industrial Organization*, 26(2), 393–411.

Medda, F (2007). A game theory approach for the allocation of risks in transport public private partnerships. *International Journal of Project Management*, 25(3), 213–218.

Moore, R and S Kerr (2014). On a highway to help: Multilateral development bank financing and support for infrastructure. *Economic Roundup*, 1, 21–32.

Moszoro, M, G Araya, F Ruiz Nunez and J Schwartz (2014). Institutional and political determinants of Private Participation in Infrastructure. International Transport Forum Discussion Paper, No. 2014–15, Organisation for Economic Cooperation and Development (OECD), International Transport Forum, Paris.

Opara, M, F Elloumi, O Okafor and H Warsame (2017). Effects of the institutional environment on public-private partnership (P3) projects: Evidence from Canada. *Accounting Forum*, 41, DOI: 10.1016/j.accfor.2017.01.002.

Osei-Kyei, R and APC Chan (2015). Review of studies on the critical success factors for Public–Private Partnership (PPP) projects from 1990 to 2013. *International Journal of Project Management*, 33(6), 1335–1346.

Pragal, S (2003). Regulation and private sector participation in infrastructure. Policy Research Working Paper, no. 3037.

Rusbult, CE (1980). Commitment and satisfaction in romantic associations: A test of the investment model. *Journal of Experimental Social Psychology*, 16(2), 172–186.

Rusbult, CE, JM Martz and CR Agnew (1998). The investment model scale: Measuring commitment level, satisfaction level, quality of alternatives, and investment size. *Personal Relationships*, 5(4), 357–387.

Shen, Z (2011). The change of world economic cycle and analysis of its synchronism. *Journal of International Economic Corporation*, 2, 75–79.

Thomsen, S (2005). Encouraging PPP in the utilities sector: The role of development assistance. NEPAD/OECD Investment Initiative, Investment for African Development: Making it Happen, Background Information in Support of Session 5 Roundtable.

World Bank (2012). Transformation through infrastructure. Infrastructure Strategy Update FY2012-2015. https://siteresources.worldbank.org/INTINFRA/Resources/Transformation-throughinfrastructure.pdf. Accessed 16 January 2019.

World Bank (2016). Multilateral Development Banks. Issue Brief of Inter-agency Task Force on Financing for Development.

Yang, Y, Y Hou and Y Wang (2013). On the development of public–private partnerships in transitional economies: An explanatory framework. *Public Administration Review*, 73(2), 301–310.

Zheng, Z (2017). Government governance and PPP project investments: Empirical analysis from panel data of developing countries. *World Economy Studies*, 279(5), 62–77 (in Chinese).