

Determinants of Public-Private Partnerships in Infrastructure Provision: Evidence from Muslim Developing Countries

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This paper investigates the determinants of private involvement in public infrastructure provision in Muslim developing countries. The issue is considered important due to the persistent gap between the demand for and supply of public infrastructure in most of the Muslim developing countries. In this regard, an important infrastructure provision scheme increasingly utilised by the developing nations is Public-Private Partnership (PPP). Nevertheless, the policy outcomes of this scheme are diverse. Hence, when such schemes are implemented in those countries, improvements in public infrastructure and higher achievements in development expected from the policy seem to be limited.

Based on that perspective, this study employs advanced panel estimators to develop a cross-country analysis of private finance determinants in 48 Muslim developing countries for the period 2002-2011. The findings suggest that market conditions, institutional qualities and country risks are the most crucial factors determining the private involvement in infrastructure financing in the Muslim countries. It is hoped that the findings will encourage policy-makers in these countries to prioritise this agenda in their efforts to attract private investment in public infrastructure, which in turn will contribute to higher economic growth and better development in the Muslim region.

1. Introduction

It is generally known that a well-functioning and efficient infrastructure is instrumental in economic growth and development. It supports a more efficient production process, attracts more businesses and increases living standards. It also strengthens economic integration and facilitates trade as it eases the access to goods and services. Furthermore, infrastructure projects can create a demand for skilled labour, potentially

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reducing the unemployment problem and benefiting the economy in the long term (SESRIC, 2013a). As such, in a wider perspective, many studies such as those by Aschauer (1989), Munnell (1990), Prud'homme (1993), Canning and Fay (1993), and Easterley and Rebelo (1993) suggest that there is a link between the provision of public infrastructure and economic growth and development.

The key roles of public infrastructure availability in supporting economic growth, distributing wealth and reducing poverty have been among the main reasons why governments of developing countries, including Muslim countries, have strongly prioritised infrastructure development in their agendas. Several efforts have been made by a number of Muslim countries to accelerate infrastructure provision, particularly roads, railways, ports, power generation and water treatment. Unfortunately, many of these countries are constrained by a lack of government resources (limited budgets), inefficient state-owned enterprises, unskilled labour and low level of technology. Therefore, they are unable to expand the development of public infrastructure facilities to the level required to increase the quality standards of life (SESRIC, 2013a).

As limited budget capacity is believed to be the main constraint on public infrastructure provisions, an alternative form of financing to conventional public funding is considered an important remedy for the problem. In recent years, private financing has been regarded as a potential alternative for developing public infrastructure. In addition to providing supplementary sources of funding, it is seen as having more advantages than public financing, particularly in terms of improving projects' value-for-money, shortening delivery times and reducing projects' costs (Yescombe, 2007). This sort of arrangement has been applied in many parts of the world in different guises. The most common type is usually called Public-Private Partnership (PPP), while in some Commonwealth countries such as the UK and Malaysia it is well known as Private Finance Initiative (PFI). In other countries, the arrangement is often called Private Participation in Infrastructure (PPI), Private Sector Participation (PSP), Privately-Financed Projects (PFP), P3, or P-P Partnership (Yescombe, 2007). For the purpose of clarity, this paper will mainly use the term PPP to cover all types of arrangements for private participation in the kind of public infrastructure mentioned above.

In the Islamic world, a number of developing countries have also been identified as countries attempting to adopt PPP policies for their public infrastructure development. Some notable developments of PPP implementations have been seen in countries such as Turkey, Egypt, Morocco, Pakistan, Malaysia, Indonesia and Bangladesh. The projects conducted commonly include provisions for energy, transport, telecoms, and water/sewage infrastructure. However, the achievement of such implementation differs from one country to another. While some countries have been making rapid progress in attracting private investment in infrastructure, others are still developing very slowly (SESRIC, 2013b).

Few studies, however, have attempted to investigate the reasons behind the success of some countries in attracting private finance for the development of public infrastructure. Hammami *et al.* (2006) analysed determinants of PPP implementations across low-income and middle-income countries from 1990 to 2003. Banerjee *et al.* (2006) conducted an empirical study to investigate the institutional structures and their effects on the implementation of PPP in developing countries, while Reside and Mendoza (2010) focused on the key risks affecting PPP in Asian countries. More recently, Sharma (2012) has looked at the determinants of PPP in developing economies covering the period 1990-2008.

In view of the above, this paper aims to investigate the factors that determine private financing involvement in public infrastructure provision in Muslim developing countries. Muslim developing countries are selected for this study primarily due to the wide and persistent gap between the demand for and supply of public infrastructure in most of the Muslim developing countries. On the one hand, the countries wanted to improve the quality and quantity of the provision of public infrastructure such as energy, transport, telecoms, and water/sewage infrastructure to their people. On the other hand, they have been attempting to provide such infrastructure but have achieved limited results. Despite this, to the best of our knowledge, no previous study has explored this issue in the case of Muslim developing countries. Therefore, this study attempts to fill the gap in the literature by examining the determinants of PPP in these countries. The findings of the study are also expected to encourage the policy-makers to prioritise the agenda in their efforts to attract private investment in public

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infrastructure, which in turn will contribute to higher economic growth and better development in Muslim regions.

Additionally, the paper is interested in exploring the practice of involving the private sector in infrastructure development in Muslim developing countries, particularly based on the perspective that private participation is conceptually supported and suggested by Islamic financing principles. As outlined by Khan (2002), partnership schemes between the authorities and the private sector in developing infrastructure are consistent with Islamic financing principles as they ensure greater justice and equity. Iqbal and Khan (2004) also suggested that infrastructure financing using PPP schemes might help countries to avoid direct debt. Very similar support for such arrangements is also offered by Kahf (2002) and Hassan and Soumare (2007). In relation to this, our paper intends to examine how such views are actually implemented in developing countries with large Muslim populations.

Although this study focuses on cases of Muslim developing countries, the findings are not limited to those countries and can also be applied to cases in non-Muslim developing countries. Indeed, the importance of market conditions and institutional quality in determining PPP implementation found in this study are in line with the findings of previous research investigating PPP implementation in developing countries in general (see, among others, Hammami *et al.* (2006), Banerjee *et al.* (2006) and Sharma (2012)). Such findings are generally expected to stimulate policy-makers in the developing countries to improve the policy and implementation of PPP in the region, which are ultimately expected to increase economic growth and the level of development in the countries.

To achieve its objectives, the paper analyses the determinants of a number of PPP projects and the amounts of PPP investment while considering various critical factors such as government budget constraints, macroeconomic conditions, market conditions and institutional factors (government and political conditions) in the region. The analysis involves 48 Muslim developing countries during the period 2002-2011. To obtain robust estimation results, the study utilises various panel data estimation methods including the Random-Poisson and Generalised Least Squares regression models.

The rest of the paper is organised as follows. The second and third sections discuss the theoretical perspectives and previous studies on the determinants of PPP arrangements in developing countries. Section four explains the data and methodologies used in this study. Empirical results as well as policy implications and recommendations are elaborated in the subsequent sections. The final section concludes the study.

2. PPP Arrangements and Infrastructure Development in Muslim Developing Countries

Most governments that embark on PPP generally justify their policy based on two main reasons. The first reason is the belief that a government might gain a budgetary benefit by involving private funding; thus, the development of infrastructure will not be dependent on public debt (Grimsey & Lewis, 2007). This is the case because the government is able to avoid the advance capital cost of infrastructure projects which can be spread out over their lifetimes (Kwak, *et al.*, 2009; Yescombe, 2007). The second motive comes from the idea that PPP might also improve the value for money due to its more efficient allocation of risks, based on the belief that the risks are likely to be managed better by the private sector than by the public sector (Grimsey & Lewis, 2007). Nevertheless, some studies see PPP as more of a short-term ‘quick fix’ that may be an expensive option for the public in the longer term since the financial burden will potentially be passed on to the next generation (ACCA, 2002; Parker, 2012).

From an Islamic economics and finance perspective, it is widely known that Islamic financing modes have been used to finance public infrastructure projects since the medieval era (Ebrahim, 1999; Hassan & Lewis, 2007). The infrastructure investment also fits well with Islamic finance since both are generally concerned with social investments and are typically characterised by asset-backed and equity-based financing (Ahmed, 2010b; Ismail, 2013). Moreover, in terms of involving private financing in the development of public infrastructure, diverse Islamic financing schemes are consistent with the various needs of infrastructure project finance which involves the private sector (Kahf, 2002).

In contemporary times, this sort of arrangement is strongly supported as an alternative financing structure for Muslim countries. The involvement of private funding has been found to help countries avoid public debt

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when financing the development of public facilities (Iqbal & Khan, 2004). Furthermore, governments do not have to spend their money on infrastructure investments, as this task can be left to the private sector (Kahf, 2002). Additionally, good interplay between governments, private entrepreneurs and multilateral agencies might enhance Islamic financing for large-scale capital-intensive infrastructure projects such as power plants, roads, ports and tunnel projects (Hassan & Soumaré, 2007), which eventually contribute to higher economic growth and the development of Muslim countries.

Despite some positive encouragement in the development of public infrastructure from the Islamic perspective, the current figures show that deficiencies in infrastructure services are one of the main problems faced by Islamic developing countries. Table 1 shows the infrastructure indicators for some developing countries listed as members of the Islamic Development Bank (IDB), particularly in terms of electricity, water provision, sanitation and telecommunications as representations of infrastructure service fulfilment. It can be inferred from the Table that infrastructure services provision in some Muslim countries is generally lagging behind the average value of each respective group or area, although there are also some figures showing satisfactory achievements. It is also found that access to electricity is still deficient in countries such as Bangladesh, Yemen, Cameroon and Indonesia. In water provision, Azerbaijan, Kyrgyz Republic, Yemen, Mozambique, and Nigeria are also still far below the average. In the case of telecommunications, Bangladesh, Kyrgyz Republic, Egypt, Syria, and Sudan are all undersupplied compared to their neighbouring countries. In recent decades, following the global trend of involving the private sector in public infrastructure, there has been a growing awareness in Muslim countries of opportunities to implement PPP schemes. Notable developments can be found in Malaysia, Pakistan, Turkey, Indonesia, Jordan and other MENA countries, with some varieties in progress.

Table 1: Infrastructure Indicators in Selected Muslim Countries, 2011

Country	GNI per capita (current US\$)	Access to electricity (% of population)	Electric power consumption (kwh per capita)	Improved water source (% of population with access)	Improved sanitation facilities (% of population with access)	Total telephone subscribers per 100 inhabitants
<i>South Asia Average</i>	<i>1,305</i>	<i>29</i>	<i>304</i>	<i>77</i>	<i>47</i>	<i>27</i>
Bangladesh	470	20	136	80	36	14
Pakistan	870	na	456	90	58	25
<i>Europe and Central Asia Average</i>	<i>5,795</i>	<i>Na</i>	<i>2,907</i>	<i>94</i>	<i>90</i>	<i>100</i>
Azerbaijan	2,550	Na	2,407	78	80	53
Kyrgyz Republic	590	Na	1,842	89	93	32
Turkey	8,020	Na	1,898	97	88	96
<i>Middle East and North Africa Average</i>	<i>3,825</i>	<i>87</i>	<i>1,934</i>	<i>89</i>	<i>80</i>	<i>53</i>
Algeria	3,620	98	899	85	94	71
Egypt, Arab Rep.	1,580	94	1,245	98	66	38
Iran, Islamic Rep.	3,470	98	2,117	94	Na	53
Jordan	2,850	95	1,676	98	85	85
Lebanon	5,770	95	2,242	100	98	49
Morocco	2,250	71	644	83	72	56

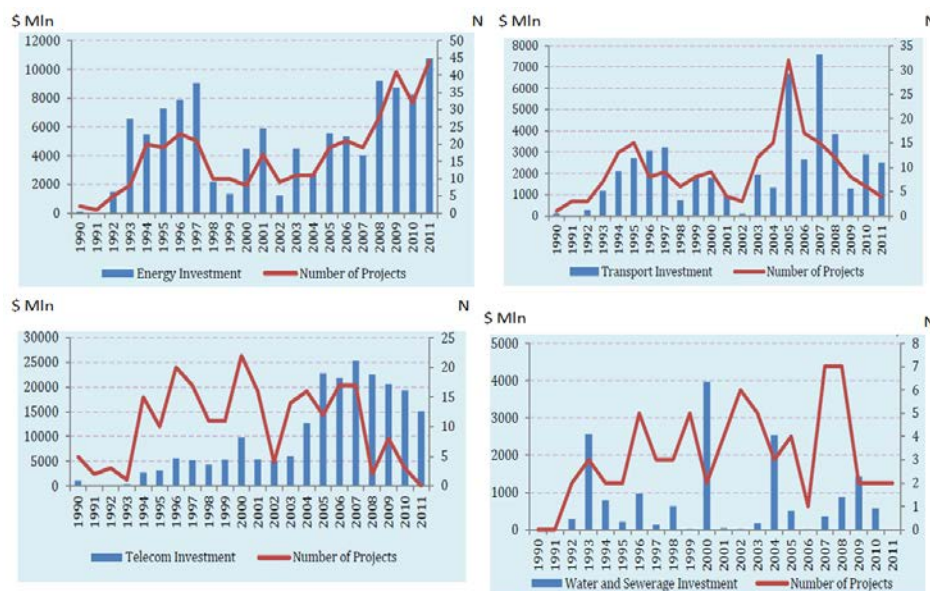
Table 1: Infrastructure Indicators in Selected Muslim Countries, 2011(Cont.)

Syrian Arab Republic	1,760	86	1,411	89	92	41
Tunisia	3,200	95	1,194	94	85	84
Yemen, Rep.	870	50	174	66	46	18
<i>Sub-Saharan Africa Average</i>	1,670	27	812	67	33	22
Benin	570	22	69	65	30	13
Cameroon	1,050	20	196	70	51	20
Côte d'Ivoire	910	50	170	81	24	23
Gabon	6,670	31	999	87	36	57
Gambia, The	320	na	na	86	52	29
Mozambique	320	7	450	42	31	12
Nigeria	930	40	127	47	30	25
Senegal	820	30	151	77	28	27
Sudan	960	30	94	70	35	14
<i>East Asia and Pacific Average</i>	2,358	63	1,182	79	62	33
Indonesia	1,650	53	509	80	52	35
Malaysia	6,540	97	3,262	99	94	92

- Data are collected and the presentations are modified from Private Participation in Infrastructure Database, The World Bank Group and PPIAF available at <http://ppi.worldbank.org> accessed 1 August 2013.
The methodology and classification refer to the same source.
- n.a: data not available

The government of Malaysia, for instance, has officially announced a PFI program under the National Privatisation Plan of the 9th Malaysia Plan (2006 – 2010) which was followed by the completion of a significant number of PPP projects (Takim, *et al.*, 2009). Examples of such projects include the development of Kuala Lumpur International Airport and the Kuala Selangor Expressway (Ismail, 2013). Pakistan has developed a PPP program under the Infrastructure Project Development Facility (IPDF) (ADB, 2008). A similar framework was issued by the Government of Indonesia in 2005 and some transportation projects have been offered to the private sector in that country (Wibowo, 2006). In Jordan, the building of Queen Alia International Airport was financed by a PPP scheme (Mahmud, 2012). More recently, the Arab countries have established an initiative to promote private financing for public infrastructure development in the region through the Arab Financing Facility for Infrastructure (AFFI), which is facilitated by the World Bank and the IDB (World Bank, 2012).

Figure 1: Total Investments through Private Participation in Selected Muslim Countries³, 1990-2011



Source: Compiled from SESRIC's Report (2013b)

³ The Muslim countries here comprise 49 members of the Organisation of Islamic Conference (OIC), which is explained later in the SESRIC's report.

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Given the above development, the amount of PPP investments and the numbers of PPP projects in Muslim countries have increased in the past decades. As shown in Figure 1, there are four major sectors where the private sector participates in building public infrastructure, namely energy⁴, transport⁵, telecoms,⁶ and water and sewage sectors.⁷ The largest investment amounts have been channelled into telecoms infrastructure, while the smallest investment sums have been allocated to water and sewerage infrastructure. Specifically, between 1990 and 2011, telecom infrastructure projects with private involvement received contractual investments amounting to \$214.6 billion through 226 projects. At the same time, only around 70 water and sewage infrastructure projects reached contractual or financial closure with investment amounts of \$16 billion (SESRIC, 2013b). Nevertheless, it is also notable that there have been large fluctuations in the number and amounts of PPP investments in the region, particularly in the last two decades.

All of these developments raise expectations of positive progress towards infrastructure improvements in the region. Despite that, issues such as governments' credibility and capacity may still potentially decelerate the infrastructure provision process. These conditions definitely raise concerns regarding the extent and challenges of implementing PPP arrangements in Muslim developing countries. One particular question that becomes the central theme of this research work concerns the determinants of PPP implementations in Muslim developing countries.

3. Theoretical Perspectives

As explained earlier, most of the governments that opted for PPP arrangements for financing public infrastructure generally justified their policy based on budgetary benefits and value for money (efficiency) arguments. These claims have been evident in many cases of PPP

⁴ Energy infrastructure covers natural gas and electricity generation, transmission and distribution.

⁵ Transport infrastructure consists of airport runways and terminals, railways, toll roads, bridges, highways, tunnels, port infrastructure, terminals, superstructures, and channels.

⁶ Telecom infrastructure involves fixed or mobile local telephony, domestic long-distance telephony, and international long-distance telephony.

⁷ Water and sewage infrastructure consists of sectors related to drinkable water generation and distribution as well as sewage collection and treatment.

implementation, particularly in developed countries such as the UK, Australia and Canada (Grimsey & Lewis, 2007). However, the evidence is not particularly convincing in developing countries primarily due to various complex and dynamic factors determining the success of PPP implementations in those parts of the world (Banerjee, *et al.*, 2006).

The literature suggests that there are many factors potentially influencing and explaining the various outcomes of private financing arrangements in public infrastructure provision. The determining factors include, among others, government budget constraints, macroeconomic conditions, market conditions and institutional factors such as government and political factors (Banerjee, *et al.*, 2006; Hammami, *et al.*, 2006; Sharma, 2012). Most of the above factors, particularly macroeconomic conditions and institutional factors, influence the PPP arrangements positively. However, factors such as government budget constraints and government effectiveness may have negative influences on the PPP arrangements.

Specifically, PPP arrangements are commonly adopted by governments that have infrastructure gaps but are constrained by limited internal and external resources (Reside & Mendoza, 2010). This is often cited as the main argument for making PPP arrangements to finance public infrastructure (Grimsey & Lewis, 2007). While there are many indicators for government resources, in the context of developing countries the government revenues are usually associated with income from natural resources such as oil, gold and other mining activities. It has been found that countries with large amounts of natural resources tend to have fewer PPP projects and investments since their governments are able to use money from the natural resources to finance infrastructure provision (Hammami, *et al.*, 2006). Additionally, to reduce the financing gap, such countries tend to have a high amount of aid and external debt (Sharma, 2012). Thus, when governments have budget constraints reflected in large deficits and heavy debt burdens, they are more likely to adopt PPP arrangements to accelerate public infrastructure financing in their countries. However, when they have soft budget constraints as more revenues are generated from sources such as fuel exports, they are less likely to participate in PPP projects.

Another economic factor critically related to private participation in infrastructure financing is macroeconomic conditions. Theoretically,

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stable macroeconomic conditions indicated by low inflation, stable money circulation and a high amount of international (currency) reserves may reduce the commercial risk associated with PPP, which in turn will increase the private sector's prospects of gaining profits. This is very important for the private sector because PPP projects usually have high advance costs and often require a considerable amount of time to generate revenues and profits (Hammami, *et al.*, 2006). Thus, it is generally suggested that PPP arrangements are more common in countries with credible, predictable and stable macroeconomic conditions (Banerjee, *et al.*, 2006; Reside & Mendoza, 2010; Sharma, 2012).

Market condition is another factor strongly associated with the number and amounts of PPP investments implemented in developing countries. Intuitively, demand for public infrastructure such as roads, bridges, water, electricity, telecommunications and other public goods will be high in countries with large populations. The demand will be even higher when the population have higher incomes and more purchasing power, as the public will be concerned not only about the quantity but also about the quality of the infrastructure (Hammami, *et al.*, 2006). Thus, it can be predicted that countries with favourable market conditions and large market size indicated by high levels of income and large populations will tend to have more PPP projects and investments.

More recently, infrastructure financing has been linked with non-economic and institutional factors which directly influence the country risk. By definition, PPP arrangements are contractual arrangements. As such, their sustainability depends critically on the regulatory environment, which in turn is determined by the quality of institutions such as government and political institutions. This is the case because weak institutions create uncertainties about the quality of regulations and therefore increase country risk. As the country risk increases, incentives for the investors to participate in PPP arrangements decrease. Thus, effective political, regulatory (legal) and government institutions are important for securing PPP arrangements (Hammami, *et al.*, 2006; Pistor, *et al.*, 2000). Despite having poor institutions, it is notable that in some cases governments tend to avoid private participation in public infrastructure financing and prefer to finance the infrastructure provisions from their own sources (Sharma, 2012). Additionally, it is found that, in some circumstances, the private sector tends to invest

more in countries with relatively unstable political conditions provided that they are able to 'cooperate' with the regime and gain substantial profits from their investments (Banerjee, *et al.*, 2006). As such, government effectiveness and political environment may influence the extent of PPP arrangements in either positive or negative directions.

To conclude, the literature suggests a number of variables with the potential to determine and influence the extent of PPP implementations in a positive direction. The factors include, among others, stable macroeconomic conditions, favourable market conditions and good institutions (particularly in terms of the quality of regulation and stable political institutions). Conversely, heavy government budget constraints and, to some extent, ineffective government may reduce the number and value of PPP investments in developing countries.

4. Research Methods

To investigate the determinants of PPP implementation in financing public infrastructure in Muslim developing countries, this study proposes two models. The first model analyses the factors associated with the number of PPP projects in the region, while the second model examines the variables determining the amount of PPP investments in the countries. These approaches are expected to explain the determinants and capture the implementations of PPP arrangements in the Muslim countries.

Following recent literature and discussion in the previous sections, the four critical factors influencing the numbers and amounts of PPP investments in developing countries included in this study are government resource constraints, macroeconomic conditions, market conditions, and institutional factors. Each factor is proxied by a number of indicators obtained from the Private Participation in Infrastructure (PPI), World Development Indicators (WDI) and Worldwide Governance Indicators (WGI) databases of the World Bank (World Bank, 2013a, 2013b, 2013c). These databases are considered the most comprehensive sources of PPP data to date (Hammami, *et al.*, 2006; Kaufmann, *et al.*, 2010). The variables used, data sources, and the direction of the relationships are summarised in Table 2.

Table 2: Data Descriptions

Variables		Definition	Unit	Data Source	Relationship
Dependent Variables					
PPP Project	Nppp	Number of PPP projects	Count number, annual	PPI	
PPP Investment	Ippp	Amounts of PPP investments	USD million	PPI	
Independent Variables					
Government resource constraint	Aid	Aid	% of GNI	WDI	Negative
	Exdebt	External debt	% of GNI	WDI	Negative
	Fuel export	Fuel export	% of merchandise export	WDI	Negative
Macroeconomic conditions	Inf	Inflation	Annual %	WDI	Positive
	M2	Money and quasi-money	M2, as % of GDP	WDI	Positive
	Res	Total currency reserve	Months of import	WDI	Positive
Market conditions	Lypc	GDP per capita	PPP constant 2005, USD, logged	WDI	Positive
	Lpop	Population	Count number, logged	WDI	Positive
Institutional factors	Goveff	Government effectiveness ⁸	Index number (-2.5 < I < 2.5)	WGI	Positive/negative
	Regqual	Regulation quality ⁹	Index number (-2.5 < I < 2.5)	WGI	Positive
	Pol	Stable political environment ¹⁰	Index number (-2.5 < I < 2.5)	WGI	Positive/negative

Given the data above, the first model investigating the determinants of the number of PPP projects is formulated in Equation 1. Due to the nature of the dependent variable (i.e. count data), the relevant models commonly used in previous studies are the Random-Poisson regression model, the Binomial regression model and the Zero-Inflated Poisson

⁸ The index reflects perceptions of the quality of public services, the quality of the civil service and its degree of independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies (Kaufmann *et al.*, 2010).

⁹ The index reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development (Kaufmann *et al.*, 2010).

¹⁰ The index reflects perceptions of the likelihood that the government will be destabilised or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism (Kaufmann *et al.*, 2010).

regression models (Enders, 2008; Hammami, *et al.*, 2006). However, the most common model used is the Random-Poisson model (Hammami, *et al.*, 2006; Sharma, 2012). Therefore, this model is utilised in this study.

$$N_{ppp} = f(\text{Aid, Exdebt, FuelEx, Inf, M2, Res, LYPC, LPOP, Goveff, Regqual, Pol}) \quad (1)$$

Furthermore, in line with most of the previous studies (see, among others, Hammami, *et al.*, 2006; Sharma, 2012), this study utilises the Generalised Least Square (GLS) model to estimate the determinants of PPP investment. However, depending on the nature of their data/variables, it is notable that some studies also use the Ordinary Least Square (OLS) and Tobit Regression Model (Banerjee, *et al.*, 2006). In this study, the determinants of PPP investment are modelled below and estimated using the GLS regression model.

$$I_{ppp} = f(\text{Aid, Exdebt, FuelEx, Inf, M2, Res, LYPC, LPOP, Goveff, Regqual, Pol}) \quad (2)$$

It is also worth noting that this empirical study covers 48 Muslim developing countries registered as members of the Islamic Development Bank (IDB) and Organisation of Islamic Conference (OIC). Importantly, the countries are also listed in the World Bank's PPI, WDI and WGI databases.¹¹ Some Muslim countries that are not listed in the databases are therefore omitted from the analysis.¹² Other than that, no exclusion criteria are applied in the selection of countries, although some countries have very few projects and very small amounts of PPP investment. The time period covered in this study is 2002-2011, representing an adequate timeframe for observations with a complete dataset while providing the most updated data from the World Bank's databases.

¹¹ The list is provided in Appendix 1.

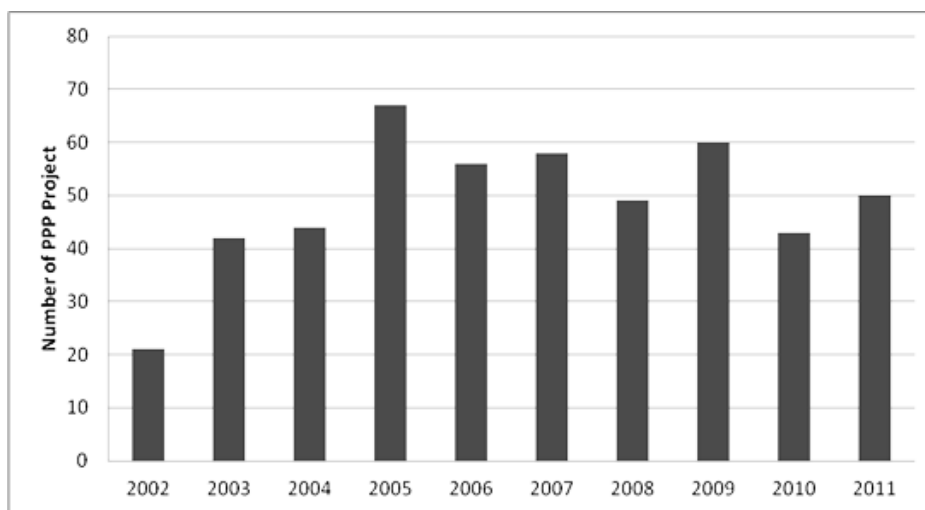
¹² The data are not available for Bahrain, Brunei, Kuwait, Libya, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. The database also does not cover developed countries.

5. Results

5.1 Descriptive Statistics

Figure 2 illustrates the development of PPP projects in the Muslim developing countries investigated in this study. It is shown that the number of PPP projects increased between 2002 and 2005 and steadily decreased thereafter. The highest number of PPP projects in the countries was 67 in 2005, yet in 2011 the number had dropped to only 50 projects, a decline of around 25.37%. Consistent negative growth was also identified for the number of PPP projects implemented during the period 2006-2011, resulting in an average negative growth rate of 3%. However, on average, one PPP project was implemented in each of the 48 countries during the period 2002-2011.

Figure 2: Trend in the Number of PPP Projects in Muslim Developing Countries, 2002-2011



Relatively the same trend appears for the amounts of PPP investments implemented across the developing countries (Figure 3). From 2002 to 2005, the amounts of PPP investments increased gradually and reached a total investment of around 35.6 billion USD in 2005. This is equal to an average growth rate of 77.84% during the period. From 2005 to 2006, the average amount slightly decreased before increasing again, eventually reaching a peak in 2007 with total investments of around 37.3

billion USD. However, after that, amounts of PPP investments decreased gradually. Indeed, in 2011, the total investment value was only around 28 billion USD, which is close to the 2004 figure for PPP investment values. On average, the amount of PPP investments during the period 2002-2011 was approximately 561.85 million USD annually.

Figure 3: Trend in the Amount of PPP Investments in Muslim Developing Countries, 2002-2011

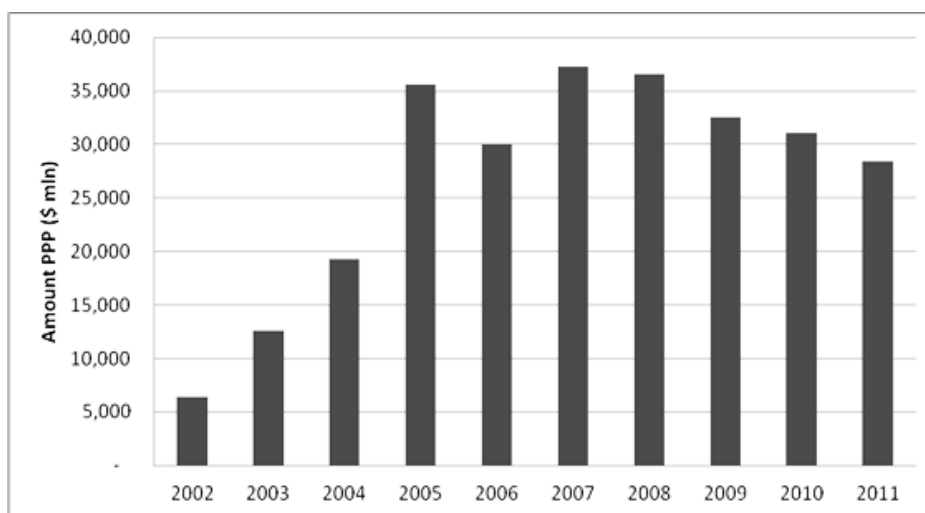


Table 3 summarises the descriptive statistics of the factors potentially influencing the number and amounts of PPP investments in the Muslim developing countries during the period 2002-2011. It is shown that an average of 52.77% and 7.73% of the overall GNI was allocated to external debt and foreign aid respectively; meanwhile, fuel exports, which provide revenues for the countries, only accounts for an average 28.99% of the merchandise exports. Macroeconomic conditions seem to be relatively stable, as suggested by the low level of average inflation and modest level of average international reserves. Overall, these indicators suggest that the developing countries seem to have budget constraints amidst relatively sound macroeconomic conditions.

Table 3: Descriptive Statistics for the Determinants of PPP, 2002-2011

Variable	N	Mean	Std. Dev.	Min	Max
Aid (% of GNI)	414	7.73	10.04	0.00	78.84
External Debt (% of GNI)	423	52.77	42.89	2.03	501.83
Fuel Export (% of merchandise export)	320	28.99	34.63	0.00	99.74
Inflation (% annual)	457	8.58	9.85	-30.14	95.85
M2 (% of GDP)	425	48.66	40.70	7.03	247.82
Reserves (months of imports)	357	5.62	4.84	0.27	36.69
Ln GDP/Cap (PPP 2005)	457	7.05	1.04	5.00	9.34
Ln Population (number)	480	16.23	1.50	12.55	19.31
Government (index number)	480	-0.72	0.59	-2.45	1.24
Regulation Quality (index number)	480	-0.69	0.61	-2.67	0.74
Political Environment (index number)	480	-0.81	0.92	-3.32	1.01

In terms of market conditions, the average amounts of annual income and the mean size of population were USD 2033/capita and 30 million people respectively during the period 2002-2011. It is notable, however, that around 70% of the countries' people have an average annual income below the mean income of developing countries of approximately USD 6597.¹³ Furthermore, the population distribution was relatively uneven. Some of the Muslim developing countries, such as Indonesia and Pakistan, have relatively large populations of more than 200 million people. In contrast, other countries such as the Maldives and Suriname were inhabited by only around 300,000 to 500,000 people in 2011.

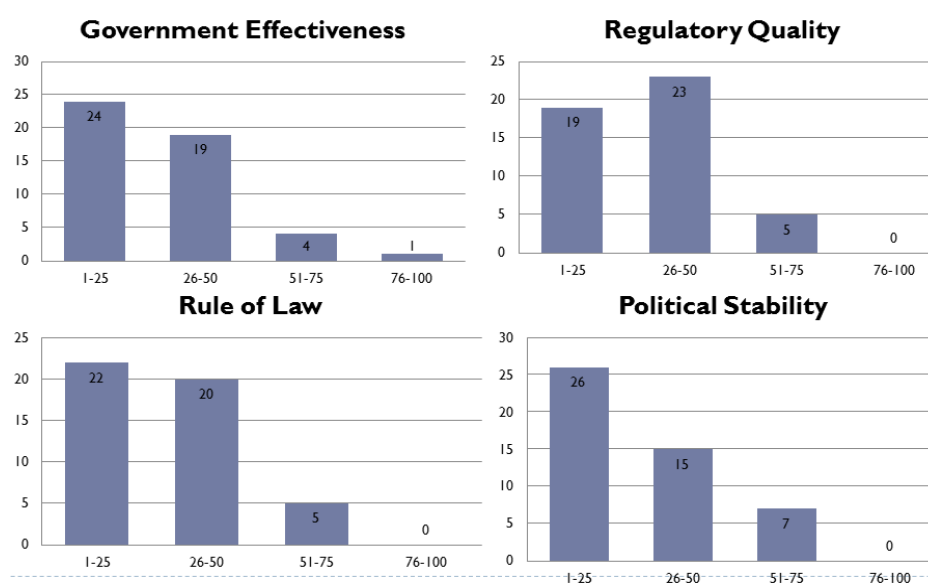
In relation to the institutional factors, it is evident from the Table that the average values of the index numbers have negative signs, thus implying that the quality of institutions in the region is not really favourable during the time period. Nevertheless, further observations suggest, at least in recent years, that not all of the Muslim countries have poor institutions. Decomposition and ranking of the index in 2011,¹⁴ as shown in Figure 4, reveal that a few of the countries have relatively

¹³ Indeed, by the end of 2011, only two Muslim developing countries maintained incomes per capita above USD 15000, namely Malaysia (USD 15,579) and Lebanon (USD 15,597), while Turkey stood slightly below it (USD 14,616) (World Bank, 2013b).

¹⁴ Percentile rank among all countries (ranging from 0 or lowest rank to 100 or highest rank).

good institutions. Indeed, three countries (Malaysia, Turkey and Jordan) consistently rank above average in all of the institutional factors. Despite that, around half of the countries (i.e. between 40%-54%) have relatively poor institutions, particularly with respect to political stability. This may explain the tendency towards a negative index shown in the region.

Figure 4: Institutional Factors in Muslim Developing Countries



5.2 Determinants of PPP Projects

Table 4 reports the estimation results for the determinants of the number of PPP projects in the selected Muslim developing countries. The main findings suggest that the number of PPP projects in the region is positively and strongly affected by favourable market conditions (high income and large market size) and good institutions (high government effectiveness and quality regulations). Positive and strong relationships are also found with respect to macroeconomic conditions (international currency reserves). Meanwhile, negative associations with the number of PPP projects are revealed in relation to political stability and money supply.

Table 4: Determinants of the Numbers of PPP Projects in Muslim Developing Countries, 2002-2011

Dependent Variable: Number of PPP Project (nppp); Model: Random-Poisson		
Variable	Coefficients	St. Error
Aid	0.0367*	0.014
Exdebt	-0.0002	0.003
Fuelex	-0.0016	0.003
Inf	-0.0019	0.008
M2	-0.0076***	0.002
Res	0.0360***	0.011
Lypc	0.3862***	0.103
Lpop	0.3607***	0.074
Goveff	0.7911***	0.262
Regqual	0.6506**	0.312
Pol	-0.7746***	0.116
Constant	-8.7574***	1.574
Chi-square	322.32	
Prob > Chi-square	0.0000	
Observations	257	

Note: *,** and *** denote significance levels of 10%, 5% and 1% respectively.

In particular, results from the model show that the number of PPP projects is positively related to market conditions. Indeed, the empirical findings suggest that a 10% increase in income (GDP/capita) is likely to increase the number of PPP projects by 3.86 units. Similarly, it is found that a 10% increase in the population size will increase the number of PPP projects by around 3.60 units.

The estimation results also found evidence of a positive relationship between the number of PPP projects and institutional factors. A 10-point increase in the government effectiveness and regulation quality is associated with an increase in the number of PPP projects of around 7.9 units and 6.51 units respectively. Additionally, it is shown that political environment affects the number of projects negatively. Thus, political instability is associated with fewer infrastructure projects in the developing countries.

The number of PPP projects is also significantly related to country (currency) risk, where a 10-month increase in the international (currency) reserves for imports is associated with an increase in the number of PPP projects of around 0.36 units. It is also suggested that money supply (M2) significantly affects the number of PPP projects although the impact is negative and negligible (i.e. close to zero). Inflation, however, is not statistically significant according to the estimation result.

The study also found that government budget constraint in the form of foreign aid is positively related with the number of PPP projects. Although the impact is negligible and statistically weak¹⁵, the result somewhat indicates that private investors tend to have more projects in countries with large amounts of foreign aid. Meanwhile, other proxies of government budget constraint (i.e. external debt and fuel exports) are not statistically significant during the period 2002-2011.

5.3 Determinants of PPP investments

Table 5 summarises the factors that critically influence the amounts of PPP investment in the Muslim developing countries. The factors include market conditions (income and size of population), the institutional factor in terms of regulation quality, and macroeconomic conditions, particularly in relation to money supply. The findings generally suggest that higher incomes, larger populations, better regulation quality and better monetary policy are all related to higher amounts of PPP investment.

The estimation results suggest that the impacts of market size and conditions on the amounts of PPP investment are very high and significant. It is found that a 1% increase in GDP/capita is associated with an increase in PPP investments of approximately 758.49 million USD. Similarly, it is revealed that a 1% increase in the population size is positively associated with an increase in PPP investments of around 662.32 million USD. As such, these factors are clearly important for any private sector actors wishing to participate in PPP arrangements in the countries.

¹⁵ It is significant at 10%.

Table 5: Determinants of PPP Investment in Muslim Developing Countries, 2002-2011

Dependent Variable: Amount of PPP Investment (pppinv); Model: Random-GLS		
Variable	Coefficients	St. Error
Aid	13.8830	19.271
Exdebt	2.2953	2.899
Fuelex	-5.0341	4.087
Inf	-16.4538	10.765
M2	-8.9140***	3.167
Res	-7.2119	20.924
Lypc	758.4058***	172.537
Lpop	662.3218***	103.691
Goveff	-316.3809	357.379
Regqual	1205.6970***	402.585
Pol	-196.4959	155.360
Constant	-14811.4300***	2513.659
R-square	0.4966	
Observations	257	

Note: *,** and *** denote significance levels of 10%, 5% and 1% respectively.

Regulation quality is also considered an important determinant of PPP investments in the region. The estimation result suggests that a 1-point increase in the regulation quality index number is associated with an increase in the amounts of PPP investment of around 1205.70 million USD. Furthermore, it is notable that M2 has a negative and significant relationship with the amounts of PPP investment. However, other institutional and macroeconomic factors do not significantly affect the amounts of private investment in public infrastructure financing during the period. Similar results are found with respect to government resources/budget constraints indicators.

6. Discussions

The results of the study highlight a number of interesting findings and implications in relation to the determinants of PPP in the Muslim developing countries. First, favourable market conditions are found to be the main determinant of private sector involvement in PPP arrangements

in the developing countries. These results are quite intuitive and consistent with the earlier findings suggesting that higher incomes and larger populations generally demand more public infrastructure (Banerjee, *et al.*, 2006; Hammami, *et al.*, 2006; Sharma, 2012). Furthermore, considering that the countries have gradually been enjoying higher incomes and experiencing relatively high population growth rates compared to the global average¹⁶, it is natural for them to demand more and better-quality public infrastructure. The demand will be particularly high with respect to public infrastructures which are still undersupplied in the region, such as electricity and water. Thus, these factors are clearly important for any private sectors wishing to participate in the PPP arrangements in the countries.

From a policy perspective, policies related to market sizes are probably not easy to change and are strongly related to country-specific conditions. Highly populated countries such as Indonesia and Pakistan may want to reduce their population growth, while small countries may prefer the opposite (Mauldin, 1978). However, a new study has found that the mortality rates in South East and South Asia - where most Muslim developing countries are located - tend to be higher overtime than in other regions of the world (Dartanto, 2013) and therefore any policies related to population will have big challenges to be implemented. Despite that, it is generally agreed that higher per capita incomes and greater purchasing power will contribute positively to improving the quality of people's lives, which is directly related to greater demand for public infrastructure, including through PPP arrangements (SESRIC, 2013a).

Second, good institutions in terms of effective government and good regulations are critical for attracting private financing for infrastructure development. Effective government reflected in, among other things, high-quality public/civil services that are committed to implementing public policies are undoubtedly necessary for securing policies such as PPP and ensuring that they are well implemented. Furthermore, regulation quality which enables the government to formulate and implement sound policies/regulations that promote private sector development is also crucial for developing the infrastructure. In a more general sense, strong institutions may also reduce uncertainties about the

¹⁶ See the results presented in Table 3.

quality of regulations and country risk, which in turn provides more incentives for investors to participate in PPP arrangements. Meanwhile, quite intuitively, political instability has reduced the number of PPP projects in the regions. Overall, these findings are generally in line with the conclusions of existing studies which suggest that institutional factors are highly important in private sector decisions on involvement in PPP financing for public infrastructure (Banerjee, *et al.*, 2006; Hammami, *et al.*, 2006; Kaufmann, *et al.*, 2010; Reside & Mendoza, 2010; Sharma, 2012).

Improving government effectiveness and regulation quality, however, are no ordinary tasks (Garvey, 1993), especially for the Muslim developing countries which have relatively poor institutions (see Figure 4). In relation to PPP policies, it is notable that PPP is an arrangement in which a government as the owner of a project makes an agreement to share the risks and returns with a private partner in developing public infrastructure. The workability of the arrangement is therefore highly dependent on the government's credibility (Grimsey & Lewis, 2007). Credibility can be established by, among other things, ensuring that the regulatory system is in place and enforceable since a functioning regulatory system provides protection for the private sector's rights in securing their assets and claiming their share of the returns (Wankuan, *et al.*, 2010). In selecting private partners for the bidding/procurement provision process, a government might also demonstrate its credibility by developing transparent and accountable procedures in order that selection based on cronyism and corruption, as found in some Muslim countries, might be avoided (Beh, 2010). Furthermore, in a wider perspective, credibility might be increased by enhancing the government's capacity to formulate and implement sound PPP policies as well as maintaining stable political environments in the countries (ADB, 2008). These should be the primary concerns for the governments of contemporary Muslim developing countries.

Third, PPP implementation is also generally influenced by stable macroeconomic conditions although the impacts are not as great as those found in other regions cited by other studies (Banerjee, *et al.*, 2006; Reside & Mendoza, 2010; Sharma, 2012). In particular, controlled money supply has a negative association with PPP investment while international reserves have a positive relationship with the number of PPP projects. Intuitively, higher international reserves and a less

controlled money supply may reduce the country risks, in turn creating higher certainties for investors interested in pursuing PPP projects in the regions. However, inflation did not seem to influence PPP implementations in the developing countries. This is probably related to the fact that there were large gaps in inflation levels in some of the countries¹⁷; hence, at a regional level, it did not become a main concern for the investors. As such, the government should increase its efforts to formulate and implement sound macroeconomic policies, which are more attractive for investors and contribute more positively towards the provision of public infrastructure in the regions.

Fourth, the study found that government budget constraint is not considered the main reason for the Muslim countries' involvement in PPP schemes. This result implies that, regardless of budget constraints, the countries still invest in PPP projects. In other words, there are other reasons for becoming involved in PPP-type arrangements apart from aid, external debt and resources constraints. This is in contrast to the common belief that PPP-type arrangements are preferred due to government budget constraints in financing public infrastructure (Grimsey & Lewis, 2007; Hammami, *et al.*, 2006; Iqbal & Khan, 2004; Kahf, 2002; Reside & Mendoza, 2010).

A possible explanation for this interesting result is that the Muslim developing countries have adopted PPP schemes because they are considered a trend and a 'global fashion', a term often used in institutional change (Abrahamson, 1996; Røvik, 1996) among developing countries. This trend is arguably related to 'progressive' advice, mostly based on the experience of developed countries, recommended by international agencies despite wide acknowledgment that the international bodies tend to advocate relatively the same 'grand policies' for resolving problems faced by the member nations (Easterly, 2003).¹⁸ It is also possible that these countries adopt PPP because it is believed to deliver better value for money. As argued earlier, value for money may be obtained from its more efficient allocation of risks

¹⁷ There were some countries with low inflation in 2011 such as Morocco (1.5%), Chad (2%) and Benin (2.8%). However, there were also many more countries with double-digit inflation figures at that time, such as Sudan (20%), Pakistan (13.9%) and Nigeria (10.60%) (World Bank, 2013b).

¹⁸ This is probably influenced by the fact that, as shown in Figure 1, there was a tendency amongst the countries to invest in telecommunications infrastructure instead of the most basic necessities such as water and sewerage infrastructure.

provided that the risks are managed better by the private sector than by the public sector (Grimsey & Lewis, 2007). Therefore, the developing countries have adopted PPP arrangements although some of them may not have budget constraints in financing public infrastructure.

Fifth, in a wider perspective, the study found additional evidence that the Muslim developing countries are generally deficient and undersupplied in the provision of critical public infrastructure such as water and electricity. This may potentially jeopardise economic growth and long-term development in the region. Accordingly, it is important that the government invest in and build more public infrastructure such as electricity (particularly in Bangladesh, Yemen, Cameroon and Indonesia), water (especially in countries such as Azerbaijan, Kyrgyz Republic, Yemen, Mozambique, and Nigeria) and telecommunications (most notably in Bangladesh, Kyrgyz Republic, Egypt, Syria, and Sudan). This might be done not only through an efficient and effective PPP implementation but also through more initiatives and cooperation in the region.

In this respect, international Muslim organisations such as IDB and OIC might potentially play important roles. To promote private financing in the provision of public infrastructure, it is essential that the governments of Muslim developing countries extend their concern to the improvement of institutional capacities and macroeconomic stability in addition to focusing on the acceleration of Islamic banking growth and efficiency, and the advancement of financial/banking structures and financial deepening suggested by many policy studies (see, for instance, Bello, 2014; Hassan, *et al.*, 2012; Hutapea & Kasri, 2010; Kasri & Kassim, 2009; Kermani & Afandi, 2014). Considering their strategic position in the Muslim world, this is something that can be facilitated by the international organisations as individual countries may not have necessary guidance or capabilities to improve their institutional qualities. In addition to that, IDB or OIC might act as a standard-setter and ‘controller’ to ensure that the institutional quality is improved over time. Such attempts would contribute positively to enhancing the quality of institutions in IDB and OIC member countries, which indirectly attract private financing, particularly for providing public infrastructure in the Muslim developing countries.

In a more practical perspective, the study suggests that a PPP scheme combined with Islamic financing instruments such as *sukuk* and *murabahah/mudharabah* should be increasingly utilised as an alternative arrangement to the commonly used conventional scheme for financing infrastructure development in Muslim developing countries. Such an alternative, which is characterised by greater emphasis on profit/risk-sharing features and socio-economic functions, may potentially insulate the projects from speculative activities, which are partly to blame for previous financial crises (Ahmed, 2010a; Solé, 2008). Such a combination might also reduce financial instability and support more sustainable development (Dogorawa, 2012). More recently, provision of basic infrastructure such as education, healthcare and social care suggested through revitalisation of the cash-*waqf* instrument (Mohsin, 2013) might also be operationalised through the PPP scheme in order that more people receive the benefits of the public infrastructure provision.

Overall, it might be suggested that the governments of developing Muslim countries design and implement policies that improve market conditions, enhance institutional qualities and reduce country risks to attract more private involvement in infrastructure financing. The policies should be implemented by various means; however, the use of Islamic financial instruments such as *sukuk* and cash-*waqf* are strongly recommended. Cooperation between Islamic countries should also be extended and facilitated by international Islamic organisations such as IDB and OIC. Ultimately, these strategies are expected to contribute not only to meeting the infrastructure demand but also to accelerating economic growth and development in the Muslim regions.

7. Concluding Remarks

This study investigates the determinants of private financing in 48 Muslim developing countries using the PPI World Bank database covering the period 2002-2011. The study is motivated by the fact that, even though private financing (PPP) is conceptually encouraged in Islamic finance discourse, the implementation of such financing to provide public infrastructure which might potentially accelerate economic growth and increase living standards in Muslim developing countries is still relatively low.

The study found empirical evidence that private financing in infrastructure projects in Muslim countries is primarily determined by market conditions and institutional quality. Thus, it can be concluded that private sectors are more attracted to countries that have huge demands for infrastructure and provide better protection for their income and assets through sound regulations. It might also be emphasised from the findings that institutional quality is important for attracting private investments in infrastructure and hence deserves more attention by the Muslim developing countries that intend to encourage private participation in the development of their public infrastructure.

Finally, the authors acknowledge that the study has many limitations, particularly in terms of data and model specifications.¹⁹ Nevertheless, it is believed that the findings and analysis of this study might provide important insights into the importance of institutional factors in public infrastructure discourse and have also contributed to and enriched the discussion on public and private infrastructure financing in the Muslim developing countries.

¹⁹ The study includes only a limited number of variables and countries. Therefore, investigations incorporating more variables and different model specifications (for example by incorporating dummy variables for global crises, and decomposing the analysis into specific regions of the Muslim developing countries (i.e. Asia, Africa, MENA, etc.) or specific sectors of infrastructure (technology, energy, transportation, communication, etc.)), might be undertaken to sharpen the analysis of such study.

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Appendix 1: List of Sample Muslim Developing Countries

No	Country	No	Country	No	Country	No	Country
1.	Afghanistan	13.	Egypt, Arab Rep	25.	Malaysia	37.	Somalia
2.	Albania	14.	Gabon	26.	Maldives	38.	Sudan
3.	Algeria	15.	Gambia	27.	Mali	39.	Suriname
4.	Azerbaijan	16.	Guinea	28.	Mauritania	40.	Syrian Arab Republic
5.	Bangladesh	17.	Guinea-Bissau	29.	Morocco	41.	Tajikistan
6.	Benin	18.	Indonesia	30.	Mozambique	42.	Togo
7.	Burkina Faso	19.	Iran, Islamic Rep.	31.	Niger	43.	Tunisia
8.	Cameroon	20.	Iraq	32.	Nigeria	44.	Turkey
9.	Chad	21.	Jordan	33.	Pakistan	45.	Turkmenistan
10.	Comoros	22.	Kazakhstan	34.	Palestine	46.	Uganda
11.	Cote d'Ivoire	23.	Kyrgyz	35.	Senegal	47.	Uzbekistan
12.	Djibouti	24.	Lebanon	36.	Sierra Leone	48.	Yemen, Rep.