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DETERMINANTS OF PUBLIC-PRIVATE PARTNERSHIP IMPLEMENTATION IN OIC COUNTRIES

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ABSTRACT

This study examines the Private-Public Partnership (PPP) implementation for financing public infrastructure and its determinants for the case of OIC countries during the period 2015–2019. Using the fixed-effects panel model and considering public resource constraints and market, macroeconomic, institutional and cultural variables as potential factors, it documents that the regulatory quality, political stability, Islamicity Index and inflation variables positively influence the implementation of PPP for financing public infrastructure in the OIC region. Meanwhile, aid is found to negatively affect the PPP implementation. These findings suggest that PPP implementation tends to be higher in countries with good institutions, stable macroeconomic conditions, low public resources, low levels of aid and strong adherence to Islamic values. The results are expected to provide insights for policymakers and private sectors involved in the implementation of PPP in OIC countries.

Keywords: Infrastructure financing, Public-private partnership (PPP), OIC countries, Islamic finance, Islamic economics.
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I. INTRODUCTION

1.1. Background

It is well acknowledged that public infrastructure is a key determinant of economic development (Brueckner, 2021). Good transportation and logistics infrastructure, for example, will facilitate efficient distribution of goods and services (Wang, Kim, & Kim, 2021). Furthermore, infrastructure development projects could also increase labor demand, reduce unemployment and benefit the economy in the long run (Kasri & Wibowo, 2015; Ndubuisi, Otioma, & Tetteh, 2021). From a broader perspective, various studies have also identified a positive relationship between the availability of infrastructure and economic growth (Brueckner, 2021; Lau & Sin, 1997; Pradhan & Bagchi, 2013).

The building of resilient infrastructure is also an important part of the United Nations' Sustainable Development Goals (SDGs) (Adshead, Thacker, Fuldauer, & Hall, 2019). Since 2016, the G20 countries have endorsed and advocated resilient and sustainable infrastructure as part of the G20 Principles for Quality Infrastructure Investment (Phillips, 2020). The aim is to increase the amount of existing infrastructure while improving the quality of global infrastructure development in supporting economic activities. Emphasis is also placed on the need for high infrastructure financing to be followed by increased innovation in alternative infrastructure financing products to ensure the sustainability of the infrastructure development. Many developing countries, including Muslim countries, have prioritized infrastructure development in their national development agenda (Kasri & Wibowo, 2015).

It is estimated that the cost of meeting global infrastructure investment needs will reach $94 trillion between 2016 and 2040. This implies an average of $3.7 trillion per year (Global Infrastructure Initiative, 2017). According to United Nations Conference on Trade and Development (UNCTAD) estimation, in the developing world alone, the annual financing requirement, which includes investment needs, ranges from $3.3 trillion to $4.5 trillion for basic infrastructure (roads, rail and ports; power stations; water and sanitation), food security (agriculture and rural development), climate change mitigation and adaptation, health and education (SESRIC, 2019a). In Asia alone, the Asian Development Bank (ADB) forecasts that $1.7 trillion will be needed annually up to 2030, or $26 trillion in total, to bridge the infrastructure funding gap (Refinitiv, 2020). Moreover, according to the OIC Economic Outlook 2020, developing countries including Organization of Islamic Cooperation (OIC) member countries, are experiencing severe infrastructure needs as around 1.1 billion people live without safe water, 1.6 billion people live without electricity and 2.4 billion people live without sanitation. Furthermore, while current levels of investment in sectors relevant to the SDGs are estimated at $1.4 trillion, developing countries, including OIC countries, face an annual gap of $2.5 trillion (SESRIC, 2020).

Specific to OIC member countries, global studies have suggested that they suffer not only from a lack of basic infrastructure but also from high inequality in terms of the provision of infrastructure amongst the different countries (SESRIC, 2020; World Bank, 2017). In relation to infrastructure quality, based on the World Bank's

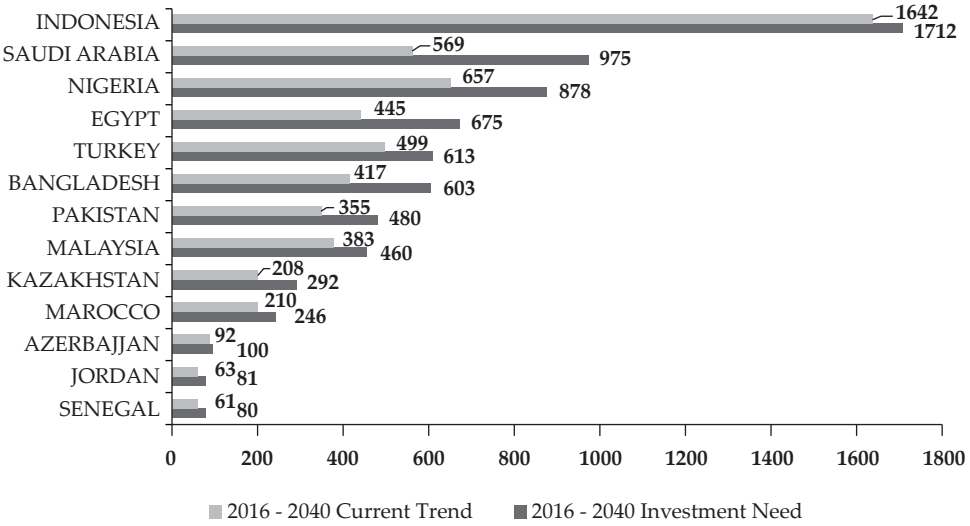
latest report on global competitiveness (Table 1), data show that OIC countries have a global average ranking of 88 for overall infrastructure, which is below the global average of 81 for non-OIC developing countries (World Bank, 2017). OIC member countries are also ranked last in other areas of global infrastructure, including road construction, ports, electricity supply and telecommunications. Furthermore, for the OIC countries, a fairly wide interval is evident between the highest and lowest rankings across almost all of the assessment indicators, thus indicating inequality in infrastructure development in those countries (World Bank, 2017).

Table 1.
Comparison of Global Infrastructure Rankings in 2016

Indicators	Developing Countries (Non-OIC)				Developing Countries (OIC)			
	Highest Rank	Lowest Rank	Average Rank	Median Rank	Highest Rank	Lowest Rank	Average Rank	Median Rank
Overall Infrastructure	26	139	82	81	2	140	84	88
Roads	19	139	81	84	1	140	83	86
Railroad Infrastructure	16	108	64	63	13	107	69	70
Port Infrastructure	7	139	83	85	3	140	80	81
Air Transport Infrastructure	6	140	82	83	1	139	84	86
Available Airline Seats (km/week)	2	140	82	85	5	136	77	72
Electricity Supply	17	138	79	79	10	140	90	103
Mobile Telephone Subscriptions / 100 population	8	140	74	78	2	136	73	85
Fixed Telephone Lines / 100 population	7	137	76	74	22	140	95	98
Global Competitiveness Index	14	122	70	71	14	140	88	97

Source: *World Economic Forum & Global Competitiveness Report* 2017, World Bank
Note: 1 = highest rank; 140 = lowest rank

The gap between the amount of investment required and the current trend in infrastructure spending in the OIC region (see Figure 1) is also identified. The total investment required for the period 2016–2040 stands at around US$7,200 billion, while the current trend shows total infrastructure spending of US$1,599 billion. Saudi Arabia and Egypt have the largest gaps between actual and required spending on infrastructure, at US$406 billion and US$230 billion, respectively. By contrast, Azerbaijan has the smallest gap of around $8 billion.



Source: *GIH and Oxford Economics (2018), Global Infrastructure Outlook, Infrastructure investment needs 50 countries, 7 sectors to 2040. COMCEC OIC*

Figure 1.
Cumulative Infrastructure Spending Needs 2016–2040 in Selected OIC Countries (USD billion, 2015 prices and exchange rates)

1.2. Research Gap and Objective

From the existing conditions and literature, two research gaps can be identified. First, from a practical perspective, there is evidence of a persistent shortage and decline in the quality of infrastructure development in Muslim countries. As such, questions arise regarding the effectiveness of the infrastructure financing models implemented in those countries, notably the public-private partnership (PPP) financing model, and the factors that have influenced the model's implementation in the region. Furthermore, from the PPP data, it appears that the infrastructure policies and practices currently in place in OIC countries do not include adequate provision for the private sector to participate. However, this presumption needs to be empirically tested. Second, from a theoretical perspective, previous studies have shown that several factors significantly influence the implementation of PPP in a country, namely market size, macroeconomic conditions and the institutional quality of a country or region (see, for example, Banerjee, Oetzel, & Ranganathan, 2006; Hammami, Ruhashyankiko, & Yehoue, 2006; Hyun, Park, & Tian, 2018; Kasri & Wibowo, 2015; Sharma, 2012). In general, the factors that positively affect private sector investment in PPP projects are the market or GDP size (Kasri & Wibowo, 2015; Ouattara, 2004), population size (Kasri & Wibowo, 2015), macroeconomic stability (Hammami et al., 2006) and a high quality of public sector institutions and supporting regulations (Amović, Maksimović, & Bunčić, 2020; Kasri & Wibowo, 2015; Kwak, Chih, & Ibbs, 2009). Meanwhile, variables that negatively influence PPP implementation are macroeconomic and political instability (Kinda, 2008) and the business risk factors inherent in each PPP transaction (Kasri & Wibowo, 2015).

Nevertheless, it appears that almost none of the extant literature has not considered variables that reflect the similarities among Muslim countries, such as cultural and religious factors. Such characteristics may affect PPP implementation in Muslim countries, as culture (including religion) is commonly seen as a crucial factor that positively affects a country's economic growth (Di Tella & MacCulloch, 2014). In this respect, Rehman & Askari (2010) has developed the Islamicity Index as an instrument for measuring the quality of institutions in the socio-political environment in Muslim countries. Following this, there is a need to examine the cultural context of PPP implementation in Muslim countries.

Given the research gap identified above, the main objective of this study is to analyze the determinants of PPP implementation for financing public infrastructure in 57 OIC Muslim countries during the period 2015–2019. In conducting the analysis, the variables examined in the study include not only the variables traditionally considered to influence PPP implementation (i.e. public resource constraints, market, macroeconomic, institutions) but also a cultural/ Islamicity variable reflecting the unique characteristics of the region.

The study and its findings are expected to make at least three contributions. First, it is hoped that the study will provide practical insights for the policymakers and private sectors involved in implementing PPP in OIC Muslim countries. Second, it is hoped that the study to produce an early assessment of the impact of cultural factors in PPP implementation in OIC Muslim countries. Finally, it is hoped that the study will enrich the contemporary academic literature on Islamic finance in general and the implementation of PPP in Muslim countries in particular.

To this end, the paper is organized as follows. Section 2 provides background and reviews previous studies while Section 3 elaborates on the research method. Section 4 discusses the findings and analysis. The final section presents the conclusions and recommendations of the study.

II. BACKGROUND AND PREVIOUS STUDIES

2.1. Background

2.1.1. Emergence, Definition and Current Status of PPP Implementation

Prior to the 1980s, public sector management was often associated with low levels of efficiency and effectiveness. Therefore, in the 1980s, a fresh perspective, termed New Public Management (NPM), emerged with the aim of reforming the bureaucracy and managerial processes run by the public sector. Conceptually, NPM seeks to increase the productivity of public services by transitioning traditional public bureaucratic models towards private business models and market developments (Hood, 1995). In addition, this new paradigm was expected to lead to a decentralization of policy-making as the public sector began to collaborate with the private sector to increase efficiency and productivity (Kettl, 2000).

In terms of the development of financing infrastructure, one of the products of the NPM paradigm was the PPP. By definition, a PPP is a long-term contract established between private and public entities for the provision of a public asset or service. In this respect, the private partner assumes significant management risk and responsibility and is paid on a performance-related basis (Yescombe,

2007). Another definition of PPP emphasizes the sharing of costs, risks and results between the two entities in the model (Klijn & Teisman, 2003). The entities entering into partnerships with the public sector could be industry players, civil organizations or any other institution that is a good match for the needs and can support the priorities of the public sector. Furthermore, from the perspective of the economic policy reform agenda, the PPP concept can be seen as a government-led modernization strategy as it concerns an effort by the public sector to overcome existing gaps in service quality, speed and efficiency (Sharma, 2007).

It is also notable that the partnership model based on cooperation between the government and private sector depends on the project requirements. The partnership model can also be implemented through a range of cooperation programs across a wider spectrum. Thus, according to Sharma (2007), the types of common partnership models implemented in PPP programs in the infrastructure sector include build-own-operate (BOO), build-operate-transfer (BOT) and build-own-operate-transfer (BOOT) schemes. In practice, the choice of model depends on the nature of the project and other supporting factors. However, whichever model is chosen, the basic objective of combining public sector accountability with private sector efficiency remains the same and must be achieved (Sharma, 2007).

Furthermore, theoretically, there are two arguments as to why the majority of the public sector integrates PPP into the infrastructure development scheme in their country. The first argument suggests that private sector involvement in infrastructure development could help to protect the government budget and reduce the 'dependence' on financing infrastructure from public debt (Grimsey & Lewis, 2007). The PPP model can also reduce the burden on the government of financing the initial capital of an infrastructure project. Thus, the public sector can divert this amount to fund more urgent fiscal needs (Kwak et al., 2009; Yescombe, 2007). Meanwhile, the second argument states that PPP can increase the value of money. This type of efficiency occurs primarily because the private sector is better at managing risks than the public sector (Grimsey & Lewis, 2007). However, it is notable that some more recent studies have highlighted a lack of evidence that PPP increases value for money. Indeed, according to Parker (2012), PPPs may be an 'expensive option' for the public sector in the long run because of the continuity of the financial burden that the next generations have to bear.

Despite the debate, in practice, PPPs have been widely used for financing public infrastructure primarily in developed countries such as the United States, the United Kingdom, Australia, Hong Kong and Canada (Cheung, Chan, & Kajewski, 2009; Grimsey & Lewis, 2007). Some developing countries, such as China, India and Indonesia, have also implemented PPP schemes when financing public infrastructure in their countries (Kasri & Wibowo, 2015; Ke, Jefferies, Shrestha, & Jin, 2014; Kirikkaleli & Adebayo, 2021).

2.1.2. Islamic Perspectives on PPP Schemes

In general, the PPP concept appears to be in line with Islamic teaching as well as Islamic economic principles and practices. In the Islamic concept, the economy plays an important role in achieving the ultimate goal of mankind, namely the achievement of *falah* (the victory of the world and the hereafter). Economics is

intended to provide instruments and mechanisms that support humans to fulfil their nature as the most perfect creation of Allah SWT. Islam also seeks to guide people to direct individual action and responsible participation in economic affairs in a way that binds them to community solidarity and cooperation, resulting in a dynamic and thriving economy (Askari, Iqbal, & Mirakhor, 2014).

Cooperation and justice are the main principles of Islamic economics embedded in the PPP concept. More specifically, the concept of cooperation is clearly explained in QS Al-Maidah verse 2: *'… And you should cooperate in (doing) righteousness and piety, and do not help in sin and enmity.'* The principle of cooperation is inherent in the PPP concept, reflecting a sense of partnership between the public and private sectors. The integration of roles between public entities and private parties thus demonstrates that the value of cooperation is strongly embedded within the implementation of this type of program. Justice, as another important principle in Islamic economics, is primarily reflected in transaction schemes based on profit and loss sharing. This principle is consistent with the context of PPP implementation. There is a clear division of responsibilities and risks between the two entities that work together, as emphasised in Klijn & Teisman (2003).

In relation to financial contracts, from an Islamic economics perspective, every financing contract must fulfil aspects of *shari'ah* such as avoiding *riba* (usury), *gharar* (speculation) and *maysir* (gambling). Alongside these prohibitions, the chosen financing contract must also pay attention to economic efficiency (Ebrahim, 1999). The concept of financing in Islam must also be developed and pursued to support economic growth in ways that follow the legal corridors in Islam. As such, innovation in the development of financing models for public projects is important so that all resources owned can be utilised optimally to increase economic growth for Muslim countries (Anwar, 1995).

In contemporary economies, Kahf (2002) suggests that the development of financing schemes in Islam should no longer rely solely on the public sector but also encompass involvement from the private sector. Moreover, Iqbal & Khan (2004) emphasize that private sector involvement in infrastructure development cooperation projects is expected to prevent Muslim countries from entering into debt-based public loan schemes that rely on the practice of usury.

In practice, Islamic partnership contracts that resemble the PPP concept in financing public infrastructure can be traced back to the Middle Ages (Ebrahim, 1999). Çizakça (1996) corroborates this finding by explaining how maritime projects at the height of the Ottoman dynasty were financed by profit sharing or *mudharabah* contracts. Meanwhile, in contemporary Muslim countries, Islamic contracts and PPP schemes have also been used in various Muslim countries, including OIC countries (Kasri & Wibowo, 2015).

2.1.3. Current Status of PPP Implementation in OIC Countries

As the concept of PPP has become embedded in Islamic finance, various standard Islamic financial instruments such as partnership financing (*musharakah*), profit and loss-sharing contracts (*mudarabah*), lease contracts (*ijarah*) and agency contracts (*wakalah*) have been adopted to meet the financing needs of infrastructure PPP projects (see Table 2). These Islamic finance contracts are commonly used

for project financing and can be selected based on the nature of the business in question. The instruments are used, either in isolation or in combination with multiple instruments, to tailor bespoke financing solutions for PPP projects.

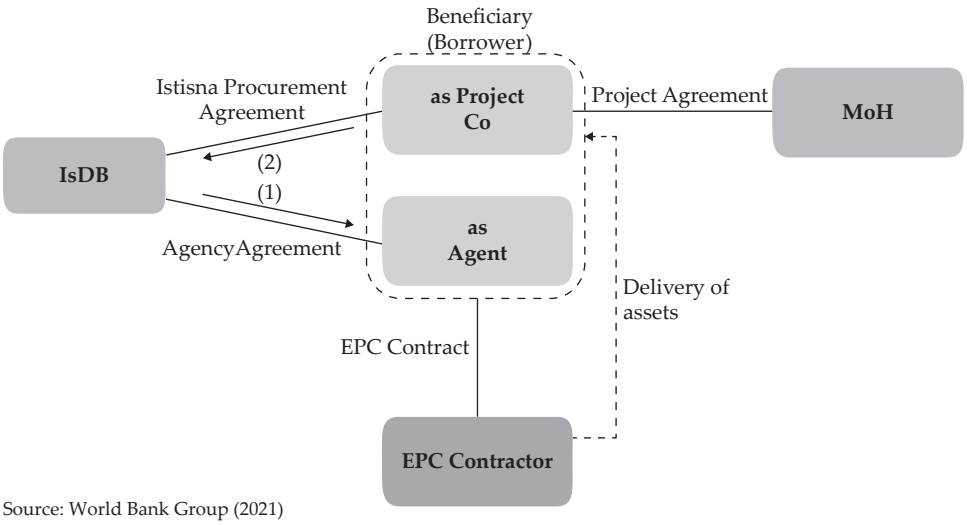
Table 2.
Islamic Finance Contracts for Project Financing

Type of Islamic Finance Contract	Description
Musharakah	Partnership financing method in which all parties jointly contribute and bear losses
Mudarabah	Profit and loss-sharing contract
Istisna'	Used when manufacturing or building assets based on terms specified by the buyer, at an agreed price, within a certain time
Ijara	A lease for a specific rent for a specific period
Wakala	An agency contract whereby a principal appoints an agent to perform an act on their behalf

Source: Summarised from COMCEC (2019)

One example is the Konya Integrated Hospital PPP project in Turkey. As illustrated in Figure 2, the Ministry of Health (MoH) of the Government of Turkey has collaborated with the Islamic Development Bank (IsDB) and an engineering, procurement and construction (EPC) contractor to deliver the project. In short, the scheme comprises two main activities. First, IsDB makes stage payments to the borrower (as the agent) during the construction phase in consideration for the agent ensuring the construction and delivery of the procurement assets to the borrower to fulfil IsDB's obligations under the Procurement Agreement. Then, the borrower makes deferred consideration payments to IsDB in return for IsDB fulfilling its obligations to obtain the procurement assets (World Bank Group, 2021).

Table 3 shows the number of PPP projects in selected OIC countries. Based on World Bank data, it is evident that there is great variation in the number of PPP projects amongst the different countries. This implies an unequal implementation of PPPs in Muslim countries and their infrastructure sectors over the past 10 years. It is also notable that the energy sector has tended to see a greater concentration of PPP projects compared to other sectors. By region, Asia-Pacific accounts for the largest proportion of these projects.



Source: World Bank Group (2021)

Figure 2.
Istisna' Structure for Konya Integrated Hospital PPP Project, Turkey

Table 3.
Total PPP Projects in Selected Muslim Countries 2011–2020

Country	Energy Sector	ICT Sector	Transportation	Sanitation
South Asia Average	39	0.5	2.5	1
Bangladesh	30	1	4	2
Pakistan	48	0	1	0
Central Asia Average	68	0	10.5	0
Azerbaijan	0	0	0	0
Kyrgyz Republic	1	0	0	0
Turkey	135	0	21	0
Middle East & North Africa (MENA) Average	8.67	0.33	0.44	0.78
Algeria	1	0	0	2
Egypt, Arab Rep.	28	0	2	1
Iran, Islamic Rep.	4	0	1	0
Jordan	29	0	1	2
Lebanon	1	0	0	0
Morocco	13	0	0	2
Syrian Arab Republic	0	2	0	0
Tunisia	2	0	0	0

Table 3.
Total PPP Projects in Selected Muslim Countries 2011–2020 (Continued)

Country	Energy Sector	ICT Sector	Transportation	Sanitation
Yemen Rep.	0	1	0	0
Sub-Saharan Africa Average	3.11	0.56	1.22	0.11
Benin	0	0	0	0
Cameroon	3	1	1	0
Cote d'Ivore	3	1	1	0
Gabon	3	1	2	0
Gambia, The	0	1	0	0
Mozambique	5	0	0	0
Nigeria	3	0	3	0
Senegal	11	1	3	1
Sudan	0	0	1	0
Pacific Average	30.5	1.5	4.5	3
Indonesia	39	3	8	6
Malaysia	22	0	1	0

Source: Private Participation in Infrastructure (PPI) Database & World Bank, 2011–2020.

2.2. Previous Studies

Several previous studies have discussed the determinants of PPP implementation in a regional and global context. The literature generally identifies four determinants of PPP implementation in financing infrastructure provision, namely public resource constraints (Hammami et al. 2006), market size (Hammami et al., 2006; Kasri & Wibowo, 2015), macroeconomic stability (Kasri & Wibowo, 2015; Sharma, 2012) and institutional factors (Hammami et al. 2006; Kasri & Wibowo, 2015; Sharma, 2012).

Hammami, Ruhashyankiko, & Yehoue (2006) analyze the determinants of PPP implementation globally. Their study uses samples of global infrastructure projects obtained from World Bank data for the period 1990–2003. It also uses a quantitative research design with the Zero-inflated Poisson method and Tobit regression model to examine the determinants of PPP implementation. The results show that PPPs tend to be more common in countries where governments have a heavy debt burden and there is large aggregate demand and a sizeable market. In other words, public resource constraints act as the main determinant of PPP implementation globally. The study also highlights the importance of macroeconomic stability and institutional quality, noting that less corruption and the effective rule of law are associated with more PPP projects. PPPs are also found to be more prevalent in countries with previous PPP experience.

Sharma (2012) conducted a similar study with a sample of developing countries worldwide from 1990 to 2008. The study employs a panel data estimation with

Generalised Least Squares (GLS) models. While the sample of countries examined differs from Hammami et al. (2006), the findings are generally similar. Market coverage (country GDP and population) and the quality of a country's regulations are identified as the positive determinants of PPP implementation in developing countries. However, it is also notable that high inflation has a negative, disruptive effect on the country's macroeconomic stability.

Kasri & Wibowo (2015) conduct a more specific study on developing countries, specifically examining the determinants of PPP implementation in Muslim developing countries, motivated by the persistent gap between the demand for and supply of public infrastructure in most Muslim developing countries. The study employs advanced panel estimators using a sample of 48 Muslim developing countries for the period 2002–2011. The findings suggest that market conditions, institutional quality and country risks are the most crucial factors in determining private involvement in the financing of infrastructure in Muslim countries.

Amović, Maksimović, & Bunčić (2020) also report similar findings in their investigation of the success factors influencing the establishment of a sustainable PPP in transition conditions. The study examines 650 samples containing practitioners and policymakers in the public institution arena linked to infrastructure in several federations in Bosnia Herzegovina from January to April 2020. The results point to a set of common factors that can enhance the implementation of PPPs in developing countries, namely the establishment of a compatible legal/regulatory framework, the development of national PPP policies and strategies, and standardization and transparency of the process.

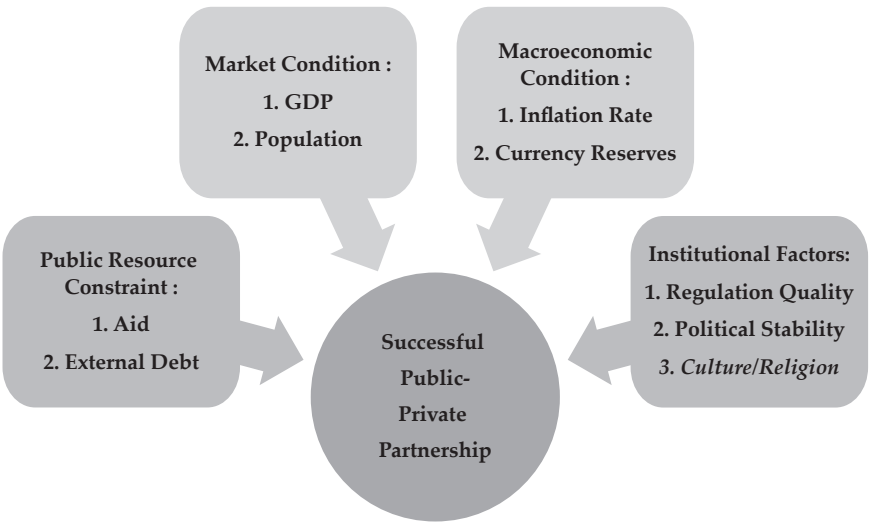
Hyun, Park, & Tian (2018) also discuss the determinants of PPP implementation in infrastructure projects. Their research uses a sample of 12 low-middle income countries (LMIC) in Asia from 1995 to 2015. The main findings reveal that a determinant of private sector investment in PPP projects is the dominance of government bonds in a country's financial market. Thus, a country must create a good investment climate in its financial sector to attract private sector involvement in PPP implementation.

COMCEC (2019) additionally examines some of the commonly used factors to determine the infrastructure financing ecosystem in Muslim countries. It use variables such as policy framework, legal and regulatory quality, and the procurement process and cover six samples – Indonesia, Malaysia, Nigeria, Sudan, Saudi Arabia and the United Kingdom. The research concludes that the infrastructure financing ecosystem in OIC countries is relatively underdeveloped and requires huge investment. In addition, it suggests the important role of private sector participation in the development of infrastructure projects. Therefore, the industry can participate as an alternative source of funds to develop public infrastructure in the future.

Chowdhury et al. (2022) look at institutional quality in OIC countries using OIC country data for a three-year average period from 1991 to 2016 to identify any correlation between aid and institutional quality within a Muslim country. Their study find that aid in its general form reduces institutional quality in Muslim countries. It also emphasizes the importance of the institutional quality variable, which has been a consistent feature in previous studies.

Khan & Rehman (2022) use a dataset of 141 countries spanning the period 2004 to 2015 to detect the relationship between macroeconomic fundamentals and institutional quality, and the shadow economy. They use GDP, political stability and regulation quality as variables and their results demonstrate the significance of macroeconomic variables such as GDP and population in determining the success of PPP projects.

Based on the previous studies, it appears that very few have attempted to link variables that reflect the similar characteristics of Muslim countries, such as cultural and religious factors, in their analyses. However, these characteristics may affect the implementation of PPPs in Muslim countries, as culture (including religion) is commonly seen as a crucial factor that positively affects a country's economic growth (Di Tella & MacCulloch, 2014). Furthermore, recently there exists an index that measures the extent to which Islamic aspects have been upheld in relation to the four main pillars of socio-economic development, namely aspects of Islamic economics, law and governance, human rights, and international relations (Rehman & Askari, 2010).



Source: Authors

Figure 3.
Theoretical Framework on the Determinants of PPP Implementation

To conclude, previous studies have suggested that PPPs generally tend to be implemented in countries or regions that have resource constraints, a large market, stable macroeconomic conditions and high-quality public institutions (Banerjee et al., 2006; Hammami et al., 2006; Hyun et al., 2018; Kasri & Wibowo, 2015; Sharma, 2012). However, the data used might need to be updated to reflect the current situation. Furthermore, studies have also suggested the potential impact of cultural/religious factors for countries that have similar cultures, such as the OIC member countries. Nevertheless, as an area of study, this has scarcely been examined by the existing literature. Thus, as shown in Figure 3, which illustrates

the theoretical framework of this study, it is reasonable to incorporate cultural/religious factors when assessing the success of PPP implementation, particularly in the more recent and cultural context of the Muslim countries.

III. METHODOLOGY

3.1. Data and Sample

This study uses secondary data to analyze the determinants of PPP implementation for financing public infrastructure in OIC countries. The data comprise the amount of PPP investment (as a proxy for PPP implementation) and are obtained from the World Bank's Private Participation in Infrastructure database, which are the only global data on PPP presently available; indeed, most previous studies (see, among others, Hammami et al., 2006; Kasri & Wibowo, 2015; Sharma, 2012) have also used this data set.

Furthermore, the variables used to explain the determinants of PPP implementation include aid and external debts (public resources), inflation and currency (macroeconomic condition), GDP/capita and population (market size), regulation quality, political stability (institutional quality), and the Islamicity Index to represent Islamic culture. They are also used in previous studies (see, among others, Hammami et al., 2006; Kasri & Wibowo, 2015; Sharma, 2012). The data were obtained from publicly accessible sources, namely the World Development Indicators (WDI), World Governance Indicator (WGI) and Islamicity Index data from the Islamicity Foundation.

In this empirical study, Muslim countries are represented by the 57 member countries of the OIC. In geographical terms, the majority of OIC member countries (54) are in Africa and Asia. The remaining three countries comprise Suriname and Guyana in Latin America and Albania in Europe. It should also be noted that, due to the availability of data, particularly Islamicity Index data, this study covers the period 2015–2019. The year 2020 is not included to avoid the bias effect of the Covid-19 pandemic.

3.2. Model Development

In developing the model, the study draws on and mostly refers to existing studies such as Hammami et al. (2006), Sharma (2012) and Kasri & Wibowo (2015). The dependent variable is the amount of PPP investment as a proxy for PPP implementation (Hammami et al., 2006; Kasri & Wibowo, 2015; Sharma, 2012). Meanwhile, the independent variables include aid (Hammami et al., 2006; Kasri & Wibowo, 2015; Sharma, 2012), external debts (Hammami et al., 2006; Hyun et al., 2018; Kasri & Wibowo, 2015; Sharma, 2012), inflation and currency (Hammami et al., 2006; Kasri & Wibowo, 2015; Sharma, 2012), GDP and population (Hammami et al., 2006; Kasri & Wibowo, 2015; Sharma, 2012), regulation quality (Amović et al., 2020; Hammami et al., 2006; Kasri & Wibowo, 2015; Sharma, 2012) and political stability (Hammami et al., 2006; Kasri & Wibowo, 2015; Sharma, 2012). Furthermore, as some theoretical studies have highlighted the potential impact of cultural factors in the implementation of PPPs, this study includes the Islamicity Index (Rehman & Askari, 2010) to represent Islamic culture. Therefore, we propose the empirical model as follows:

$$LIPPP_{it} = \alpha + \beta_1 AID_{it} + \beta_2 EXDEBT_{it} + \beta_3 INF_{it} + \beta_4 RES_{it} + \beta_5 LGDP_{it} + \beta_6 LPOP_{it} + \beta_7 REGQUAL_{it} + \beta_8 POLSTAB_{it} + \beta_9 ISLI_{it} + \varepsilon \quad (1)$$

This study also employs an alternative model for robustness. This alternative model uses the number of PPP projects (NPPP) as its dependent variable, in line with several previous studies, including Sharma (2012) and Kasri & Wibowo (2015), the data for which are from the WDI. The model is:

$$NPPP_{it} = \alpha + \beta_1 AID_{it} + \beta_2 EXDEBT_{it} + \beta_3 INF_{it} + \beta_4 RES_{it} + \beta_5 LGDP_{it} + \beta_6 LPOP_{it} + \beta_7 REGQUAL_{it} + \beta_8 POLSTAB_{it} + \beta_9 ISLI_{it} + \varepsilon \quad (2)$$

Based on the models developed above, Table 4 summarizes the variables used as well as the data definition and data sources for this study.

Table 4.
Data and Operational Variables

No	Variable	Code/ Symbol	Definition	Unit of Data	Source of Data
			Dependent Variable		
1	PPP Investment (for main model and alternative model)	LIPP	Amount of PPP investment; logged	Million US$	PPI World Bank, 2015-2019
		NPPP	Number of PPP projects	Units	PPI World Bank, 2015-2019
			Independent Variables		
2	Public Resources	AID	Grants	% of GNI	WDI, 2015-2019
		EXDEBT	External debt	% of GNI	WDI, 2015-2019
3	Macroeconomic Condition	INF	Inflation	Percentages, annually	WDI, 2015-2019
		RES	Total currency reserves	Months of import	WDI, 2015-2019
4	Market Size	LGDP	GDP per capita; logged	PPP constant 2011, US$	WDI, 2015-2019
		LPOP	Population; logged	Nominal	WDI, 2015-2019
5	Institutional Quality	REGQUAL	Regulation quality	Index, (-2.5<I<2.5)	WGI, 2015-2019
		POLSTAB	Political stability	Index, (-2.5<I<2.5)	WGI, 2015-2019
6	Cultural Aspect	ISLI	Islamicity Index	Index, (I=0-10)	Islamicity Index, 2015-2019

Source: Authors

3.3. Method

To determine the most appropriate model, this study followed Gujarati & Porter (2012) and Wooldridge, Wadud, & Lye (2016) in using the Hausman and Chow tests to determine the most appropriate models and choose between fixed and random effects. If the Chow test is rejected, the fixed-effects model yields a better result than the Pooled OLS model. The Hausman test is then conducted to determine the better model between the fixed-effects and random-effects models. Table 5 reports the test results and suggests that the most appropriate model is the fixed-effects model.

Table 5.
Results of Model Specification Tests

Test	Probability Value	Significance	Results	Implication
Chow Test	Prob>F (Fixed-effects Model) = 0.0009	0.05	Reject Null Hypothesis	Fixed-Effects Model is chosen
Hausman Test	P-Value = 0.000	0.05	Reject Ho	Fixed-Effects Model is Chosen

Source: Authors

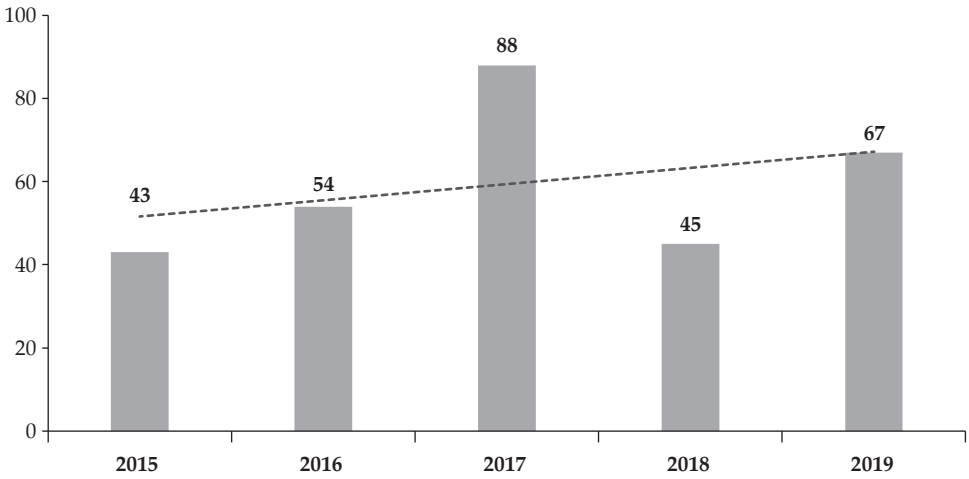
For robustness, this study also uses the random Poisson model (Hammami et al., 2006; Kasri & Wibowo, 2015; Sharma, 2012). It is chosen based on the fact that NPPP is a discrete count data type.

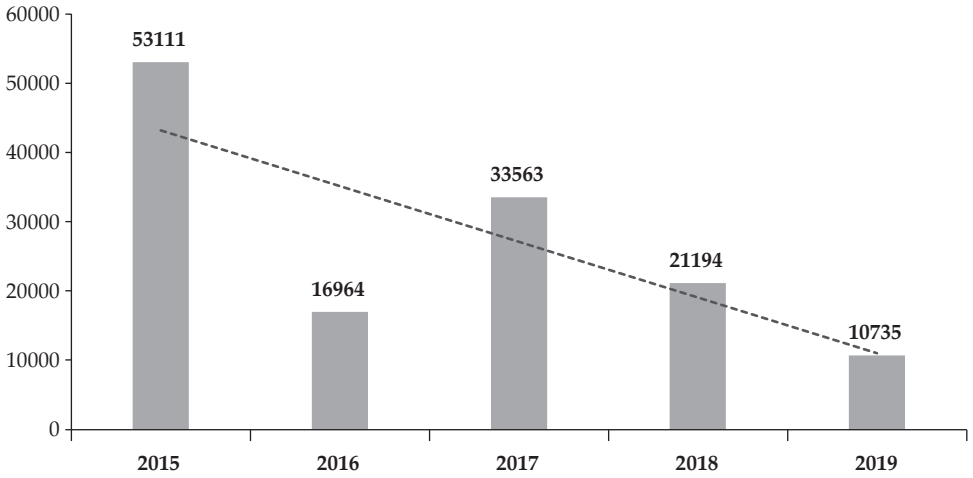
IV. RESULTS AND ANALYSIS

4.1. Results

4.1.1. Descriptive Statistics

Figure 4 shows the development of investment and NPPP in the OIC member countries during the 2015–2019 period. The NPPP fluctuates during the period, with a peak recorded in 2017. Interestingly, the data also show a decreasing trend for the amount of PPP investment over the three most recent years.

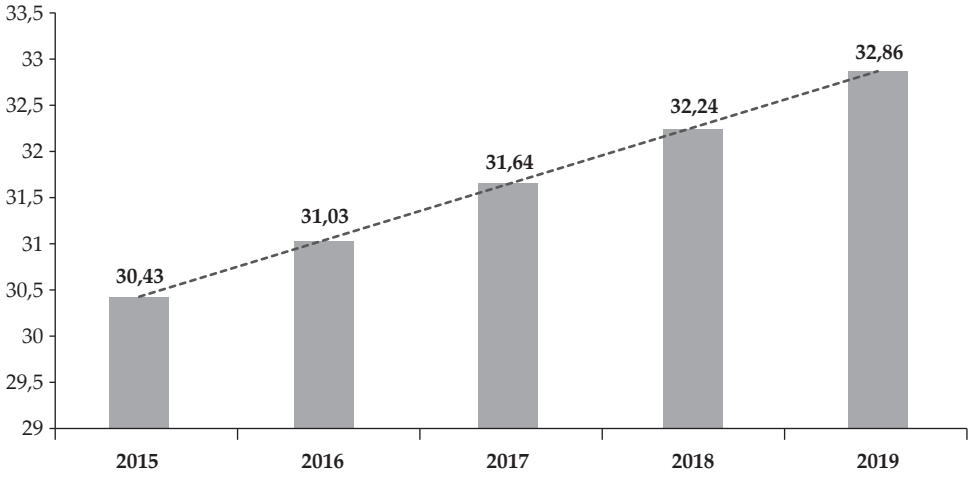


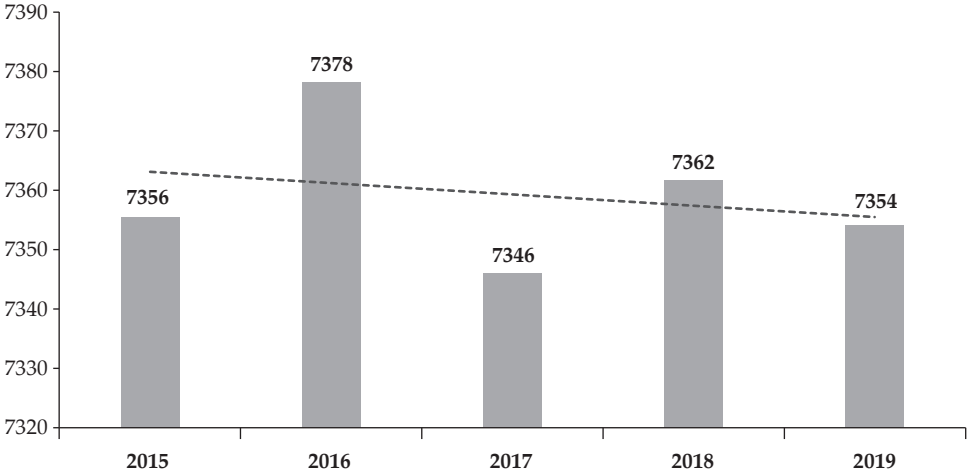


Source: PPI Database (2021), processed by the authors

Figure 4.
Number of PPP Projects and Amount of PPP Investment, 2015–2019

Next, Figure 5 shows the trends for the variables representing the market, macroeconomic and public resources conditions. A positive trend can be seen for the population of the OIC countries, while the mean GDP fluctuates during the period. The inflation rate has increased gradually, while the currency reserves drops after 2016. The data also show that while dependence on external debt has increased, aid has decreased over time.




7390
7380
7370
7360
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7340
7330
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7356
7378
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7362
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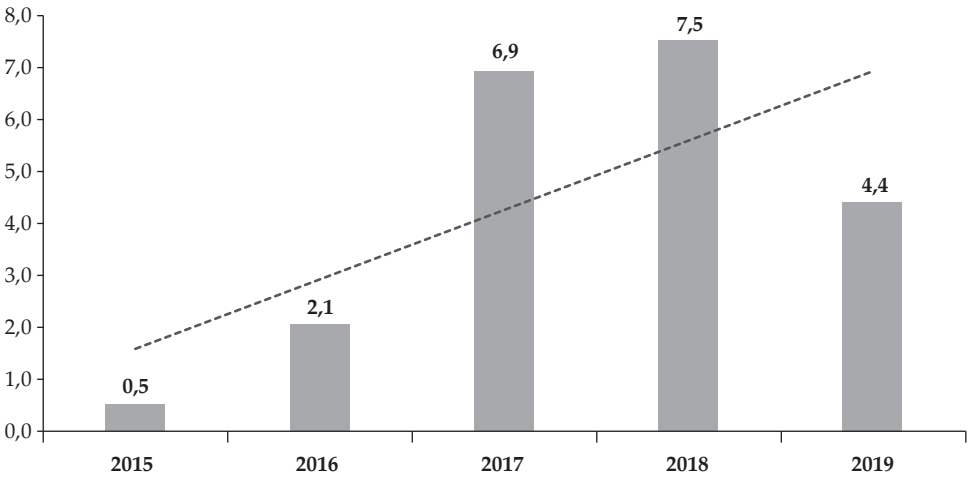
2015
2016
2017
2018
2019


8,0
7,0
6,0
5,0
4,0
3,0
2,0
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6,9
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2015
2016
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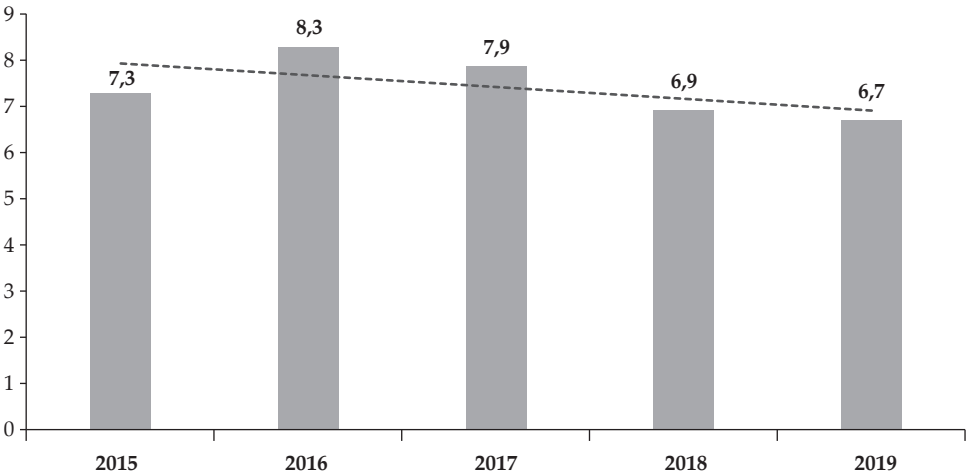
9
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2015
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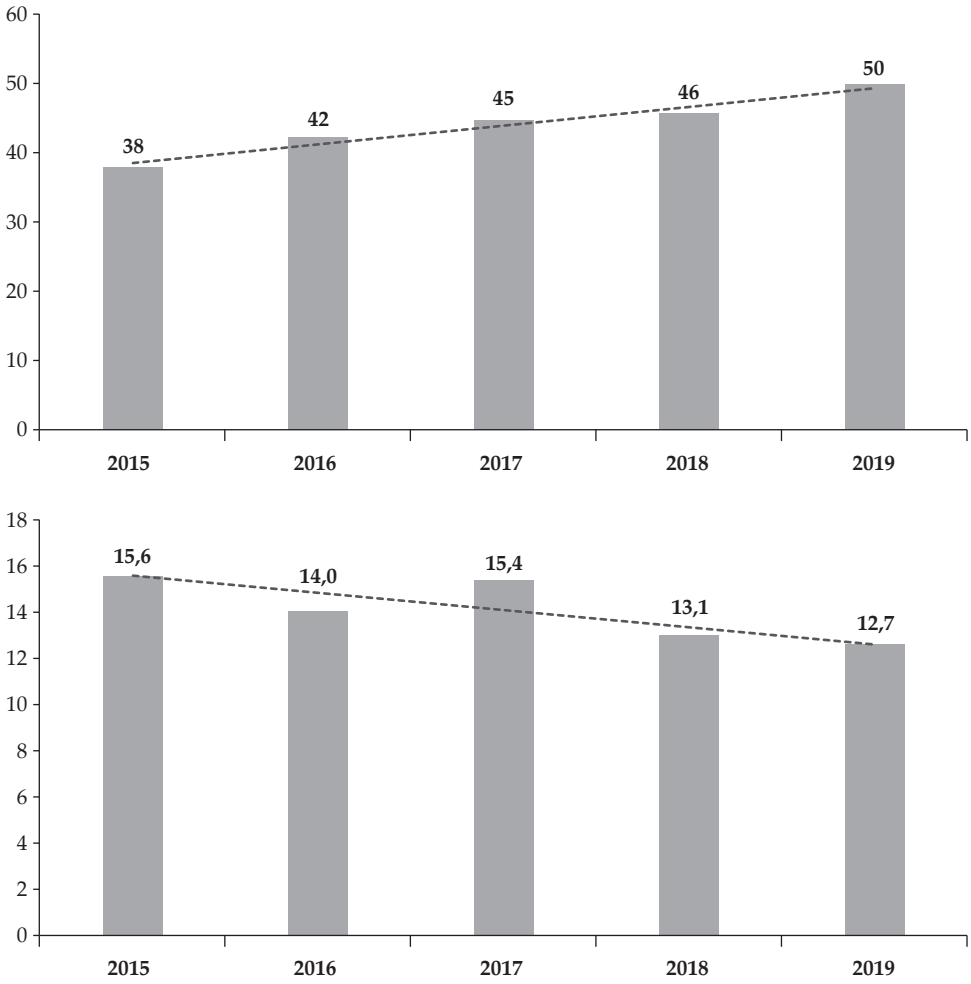
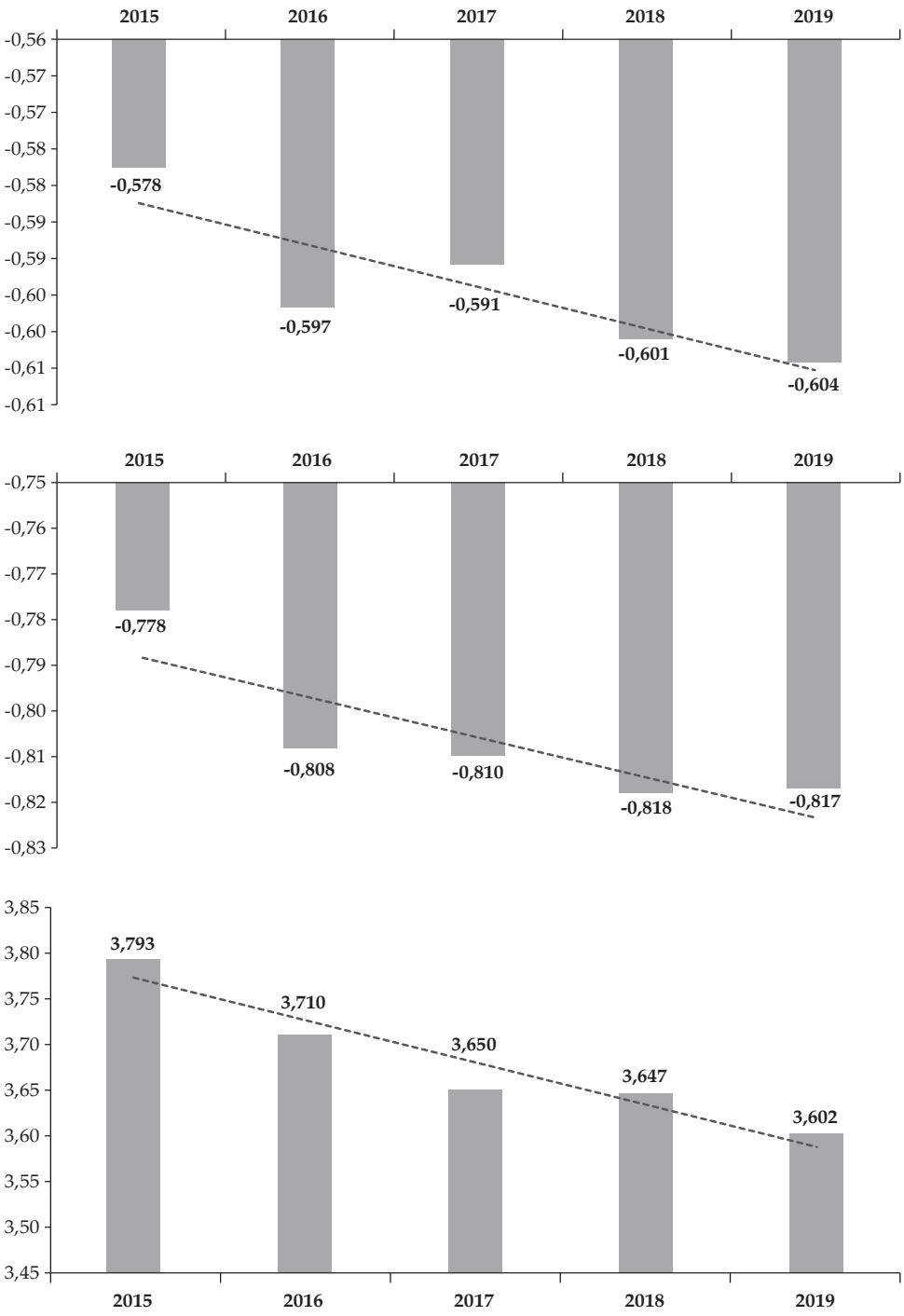
2019



Source: Authors

Figure 5.
Market, Macroeconomic and Public Resources Conditions

Furthermore, Figure 6 shows the development of the institutional and cultural factors, with the values of all variables showing a tendency to fluctuate. The Regulation Quality Index fell from 2016 onwards, with a similar trend for the Islamicity Index. Regarding the political stability index, the value fell sharply after 2015 but remained relatively steady from 2018 to 2019.



Source: Authors

Figure 6.
Institutional and Cultural Factors

Next, Table 6 summarizes the descriptive statistics of the variables used in the study and they generally confirm the trends depicted in the figures above. However, it should be noted that the data observations for the amount of PPP as well as certain other variables (such as external debt and currency reserves) are below the ideal number for balanced panel data due to the limited data availability (World Bank, 2017).[1] Furthermore, in relation to the ISLI variable (scale 0–10), it is notable that the values range from 0.97 to 6.53, with an average of 3.68. These results imply that the current socio-economic conditions in the OIC countries, which are reflected in the Islamicity Index, are significantly below the optimal level.

Table 6.
Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
IPPP	285	475,676	2.965,7	0	44.999,27
NPPP	285	1,042	2,733	0	25
AID	284	14,166	23,251	0	96,52
EXDEBT	213	44,226	31,875	1,089	145,86
INF	274	4,277	9,866	-26,1	58,64
RES	189	7,483	9,258	0,184	69,983
GDP	269	7.359,159	11.850	441.138	67.443,05
POP	285	3,16E+07	5.29e+07	414.907	2.71e+08
REGQUAL	285	-0,594	0,708	-2,347	1,111
POLSTAB	285	-0,791	0,923	-2,5	1,248
ISLI	242	3,681	1,235	0,97	6,530

Source: processed by the authors

4.1.2. Estimation Results

Table 7 contains the estimation results of the study. These results suggest that five variables significantly influence the implementation of PPPs for financing infrastructure projects in the OIC member countries: regulatory quality, political stability, Islamicity Index, inflation and aid. All of the variables, except aid, have a positive influence on PPP implementation. Furthermore, it is notable that regulation quality and political stability appear to be the most important determinants of PPP implementation for financing public infrastructure in the OIC region.

[1] For countries with no data on several variables, the criterion is that they are generally experiencing internal conflicts or wars in their regions, e.g. Afghanistan, Somalia, West Bank and Gaza, and Yemen (World Bank, 2017).

Table 7.
Estimation Results – Main Model

VARIABLES	(1)
	LIPP
AID	-0.0883***
	(0.0190)
EXDEBT	-0.114
	(0.0705)
INF	0.288***
	(0.0571)
RES	-0.489
	(0.297)
LGDP	-1.143
	(3.382)
LPOP	-8.724
	(5.125)
REGQUAL	7.576***
	(2.189)
POLSTAB	4.558**
	(1.952)
ISLI	2.197***
	(0.445)
CONSTANT	179.0*
	(91.95)
Observations	52
Number of Code	20
Adjusted R-squared	0.482
R-squared	0.574

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

***, ** and * denote significance at the 1%, 5% and 10% confidence levels.

4.2. Robustness Test

As explained earlier, a robustness test was also conducted using the random Poisson model, the estimation result for which is shown in Table 8. The estimation result confirms the significance of the findings, except for the GDP and Islamicity Index variables. To a certain extent, however, these results may indicate that the results for the two variables, as estimated and reported in Table 7, are not strong

Table 8.
Estimation Results – Robustness Model

VARIABLES	NPPP
AID	-0.0202**
	(0.00934)
EXDEBT	-0.00154
	(0.00370)
INF	0.107***
	(0.0170)
RES	0.0461
	(0.0317)
LGDP	-0.489***
	(0.161)
LPOP	0.678***
	(0.0834)
REGQUAL	2.915***
	(0.451)
POLSTAB	-0.386**
	(0.158)
ISLI	0.217
	(0.212)
Constant	-8.058***
	(1.830)
Observations	117
R-squared	
Pseudo-R2	0.504
Number of Kode	

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

***, ** and * denote significance at the 1%, 5% and 10% confidence levels.

enough during the period of observation.

4.3. Analysis

It is possible to highlight several interesting findings from the descriptive statistics. First, there is a large gap in PPP implementation amongst the OIC member countries, as suggested by the standard deviation values of PPP investment and NPPP. This confirms the findings of the World Bank survey as reported earlier in Table 1. Second, the average inflation rate in the OIC countries is around 4%, which is usually considered to be mild. Third, the market size in the region appears to

be quite large, which could give rise to high demand for infrastructure. Fourth, there are relatively low averages for both the political stability index and quality of regulation. The negative (below 0) average values indicate the poor institutional quality of the public sector in Muslim countries. Finally, for the cultural factors proxied by the Islamicity Index, the mean value is 3.8, while the highest value is 6.5 (on a scale of 1–10). This somewhat indicates that the OIC member countries have not fully implemented the optimal Islamic values in their regions. Indeed, Askari (2019) suggests that the results of these indices show the failure of most Muslim countries and the urgent need for sustained reform.

The estimation results suggest that four variables positively influence PPP implementation: regulatory quality, political stability, Islamicity Index and inflation. At the same time, aid negatively affects PPP implementation. These findings imply that PPPs tend to be more prevalent in countries with good institutional quality, as reflected in their good regulatory and stable political conditions, relatively stable macroeconomic conditions, low public resources and a high degree of conformity to Islamic teaching. Therefore, the study confirms the findings of earlier studies regarding the importance of institutions, public resource constraints and macroeconomic conditions in the implementation of PPPs in the OIC countries (particularly Hammami et al., 2006; Kasri & Wibowo, 2015; Sharma, 2012). However, the study finds no evidence for the importance of market size in the OIC countries during the 2015–2019 period, as has been reported by some earlier studies (Hammami et al., 2006; Kasri & Wibowo, 2015). Additionally, as the Islamicity Index is found to be significant in the main model, this study provides evidence regarding the important role of Islamic institutions in influencing PPP implementation for financing public infrastructure in Muslim countries.

The positive impact of regulatory and political stability is fairly rational and consistent with the findings of previous studies (Hammami et al., 2006; Kasri & Wibowo, 2015; Khan & Rehman, 2022; Sharma, 2012). The positive relationship between institutional factors and PPP investment is also in line with the aforementioned descriptive statistics results, which show that political stability and regulatory quality in the OIC countries declined during the 2015–2019 period. Amović et al. (2020) emphasize the utmost importance of regulation in attracting private investors to enter into PPP projects in a country. Meanwhile, Kasri & Wibowo (2015), who also study OIC countries, highlight that the private sector closely monitors political stability variables before proceeding with investments in developing Muslim countries.

In recent decades, the OIC countries have consistently experienced poor regulation and political instability, which has had a devastating impact on infrastructure provision and economic development. Countries such as Afghanistan, Iraq, Libya, Syria and Yemen have seen regular conflicts. Cordesman (2019) further states that the governments of such countries face complex political problems. Not only do they have very poor governance and high levels of corruption, but they are also under intense pressure from factors such as population increase, urbanization and social change that far outpace their current rates of development. Moreover, in 2019, the OIC released the report 'Achieving Peace and Security in a World of Turmoil: An Arduous Challenge for the OIC'. It highlights that more than half of the world's conflicts take place in OIC countries, creating a devastating impact

on economic and social development (SESRIC, 2019a).[2] It is reasonable to assume that these conditions discourage private-sector players from cooperating with the governments of these developing Muslim countries in offering PPP investment.

Inflation is the other factor that positively affects PPP investment. This generally implies that PPP implementation tends to be higher in countries with higher inflation rates and stable macroeconomic conditions. While this result differs from Sharma's (2012) finding that inflation negatively influenced PPP implementation for developing countries during the period 1990–2008, which see a relatively low and stable rate of inflation of around 4%, it could be explained from the context of the OIC countries during the 2015–2019 period. During this period, the OIC countries experienced relatively stable rates of inflation, averaging 4%. This could be considered mild inflation that would not usually pose a threat to economic growth, especially in the short term. At this relatively low rate, studies have suggested that inflation can actually encourage production and consumption, simultaneously increasing a country's GDP (Ross, 2021). This argument is empirically supported by Datta & Kumar (2011), who demonstrate a significant short-term but not long-term relationship between inflation and economic growth. Therefore, it could be concluded that higher prices act as an 'incentive' for PPP implementation.

The Islamicity Index is the next factor found to positively and significantly influence the implementation of PPP financing in the OIC countries. Although not as great in magnitude as the other factors, i.e. only 0.217, this finding indicates that the private sector is more likely to make PPP investments in countries where social and economic life is closely aligned with Islamic teachings. As explained earlier, an important aspect of the Islamicity Index is the implementation of Islamic finance, in which values such as cooperation and fairness/justice, as well as avoidance of debt, are strongly encouraged in economic (*muamalah)* transactions. This is reflected, among others, in many OIC countries' adoption of an Islamic banking system. The Islamic banking principles also encourage profit and loss-sharing transactions, which reflect the value of justice and cooperation inherent in the PPP model. Furthermore, countries such as Pakistan and Iran have transitioned to an Islamic financial system (El-Ashker & Wilson, 2006). As greater cooperation and justice may be expected from such a system, it is likely that partnership models such as the PPP will also be well received in these countries. Taken together, this finding highlights the importance of the cultural/Islamic aspect as well as the adoption of Islamic economics in determining the implementation of PPPs in Muslim countries.

Interestingly, the study also finds that PPP implementation is negatively influenced by aid, implying that PPPs tend to be less prevalent in countries with higher levels of government aid. It could be argued that aid is perceived as a cheaper 'substitute' for PPP investment, as its costs are usually low compared to those of implementing PPP projects. Indeed, some PPP schemes can be very expensive

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[2] The report states, '… *currently more than 60% of all conflict in the world occur in OIC countries, of which the overall majority are internal conflicts. The consequences of the raging violence in OIC countries have been devastating… More than 80% of global conflict fatalities have taken place in OIC countries...*'. It also notes: *'The economic consequences of conflicts in OIC countries are running in the hundreds of billions of dollars; money that could have been well spent on economic and social development'* (SESRIC, 2019a, p.78).

due to their high-risk and intergenerational burden. Furthermore, Sharma (2012) suggests that the negative relationship might also indicate the existence of a fiscal deficit in the country, thereby reducing private-sector interest in making PPP investments. While previous studies have not confirmed the significance of aid (Kasri & Wibowo, 2015; Sharma, 2012), from a wider perspective, it has been found to reduce the institutional quality in Muslim countries (Chowdhury et al., 2022).

In addition to the result above, it is worth noting that the study does not confirm the importance of market conditions as a determinant of PPP implementation in the OIC countries. While this result contradicts the view emphasizing the importance of market conditions in PPP investment decisions, as well as the findings of several previous studies (e.g. Hammami et al., 2006; Kasri & Wibowo, 2015), it may be affected by decreased average GDP during the 2015–2019 period, as shown in the descriptive statistics. It is also possible that other factors, particularly regulation quality and political stability, offset the significance of market size, as suggested by the OIC Report (COMCEC, 2019). In this way, even a large market size would be insufficient to attract private investment in PPP implementation.

V. CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

5.1. Conclusions

This study examines the determinants of PPP implementation in 57 OIC Muslim countries during the period 2015–2019. It employs a panel data method with a fixed-effects estimation model as well as the random Poisson regression for robustness. The variables examined include public resource constraints, market size, macroeconomic conditions, regulation quality, political stability and the Islamicity Index.

The study finds that regulatory quality, political stability, Islamicity Index and inflation positively influence the implementation of PPPs for financing public infrastructure in the OIC region during the 2015–2019 period. Meanwhile, aid is found to have a negative effect on PPP implementation. These findings imply that PPP implementation tends to be higher in countries with good regulation and political institutions, mild inflation and relatively stable macroeconomic conditions, low public resources and strong adherence to Islamic values. However, there is a tendency for aid to harm PPP implementation in the OIC region.

Overall, the results highlight the importance of maintaining institutional quality and macroeconomic stability to strengthen the implementation of PPPs for public infrastructure financing. The study also highlights the important role of the cultural/Islamic aspect, particularly the implementation of an Islamic economic system, in enhancing PPP implementation in the region.

5.2. Implications and Recommendations

Based on the findings and analysis of this study, several implications and recommendations can be highlighted. First, the OIC countries urgently need to strengthen the quality of their regulations and improve political stability. To make PPPs work, governments in OIC countries must maintain a regulatory regime capable of ensuring that PPP contract obligations on the public side are

obeyed, and the rights of the private sector are respected. This can be achieved, for example, by implementing policies designed to strengthen the regulatory quality of member countries and improve cooperation to maintain security and peace in the region. It may be necessary for the OIC and its member countries to review the existing regulations and make the necessary adjustments, including supporting the private-sector investment climate in implementing PPPs. In addition, governments should continue to uphold credibility, accountability, and transparency in their operations to maintain political stability. Existing public policies must also maintain a government agenda free from elements of corruption, collusion, and nepotism that can disrupt existing political stability.

Second, the OIC countries need to maintain lower inflation and improve macroeconomic stability by adopting appropriate macroprudential policies. Private-sector players in PPPs face many challenging risks, and stable macroeconomic conditions will significantly boost their confidence and willingness to invest. For example, in addition to standard macroprudential policies such as inflation targeting and other monetary policies, OIC countries could develop more attractive PPP projects and implement more Islamic PPP projects.

Third, OIC countries must continue to improve the management of their public resources and reduce their dependence on aid and, perhaps, external debts. In this respect, along with appropriate fiscal policies and effective fiscal management, the efficient and effective implementation of PPP schemes for public infrastructure financing could be a good alternative. Compared to schemes driven by foreign aid, the PPP may be a more innovative, collaborative, and empowering arrangement.

Fourth, OIC countries should seek to better leverage their shared identity. Institutions such as the OIC and IsDB can provide more significant support to their members to develop pipelines of PPP projects, particularly in building the capacity of governments to initiate such projects. Likewise, to further support PPPs, those bodies could also encourage member countries to develop Islamic financial institutions such as Islamic banking and Islamic capital markets. They should also encourage member countries to collaborate and implement more Islamic economic aspects across the regions. They could help launch new initiatives, such as a Common Halal Market supported by Islamic PPP projects, to increase cooperation and the prosperity of people in the region.

Finally, academia can improve and enrich the current study results in many respects. For example, the model specification could be improved by adding variables that potentially influence PPP implementation in the region. Future studies could also extend the analysis to cover inter-regional characteristics or conduct a more country-specific case study related to the topic. Moreover, it may be necessary to examine the impact of an event such as the COVID-19 pandemic on implementing PPPs. These future directions would undoubtedly enrich the analysis of PPP implementation and provide helpful insight for policymakers, private sectors, and academics.

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