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# Exploring Risk Factors Affecting Sustainable Outcomes of Global Public–Private Partnership (PPP) Projects: A Stakeholder Perspective

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**Abstract:** As a model for delivering infrastructure initiatives, public–private partnerships (PPPs) have gained significant popularity in recent years. The globalization of PPP has exposed them to elevated risks emanating from the international real economy and financial market, which can ultimately result in project cancellations or distress. This study analyzes risk factors affecting the sustainable outcomes of global PPP projects from a stakeholder perspective. After identifying the interests of key stakeholders and examining how various risks influence stakeholders' interests, a two-step binomial probit model is used to investigate domestic and international risk factors in PPP arrangements based on the World Bank PPI database. The empirical results indicate that inflation has a substantially positive effect on project failure, while factors such as PPP experience, central government involvement, exchange rate fluctuations, etc., significantly contribute to PPP success. In addition, the study demonstrates that trade openness and net foreign direct investment (FDI) inflow are crucial for the transmission of global risks. The study also provides policy implications and recommendations from a risk allocation–stakeholder relationship perspective to enhance the resilience of PPP initiatives based on these findings.

**Keywords:** public–private partnership (PPP); risk factors; sustainable outcomes; stakeholder relationship



**Citation:** Li, Z.; Wang, H. Exploring Risk Factors Affecting Sustainable Outcomes of Global Public–Private Partnership (PPP) Projects: A Stakeholder Perspective. *Buildings* **2023**, *13*, 2140. https://doi.org/10.3390/buildings13092140

Academic Editor: Patrick S.W. Fong

Received: 26 July 2023
Revised: 16 August 2023
Accepted: 21 August 2023
Published: 23 August 2023



## 1. Introduction

Over the last two decades, the public–private partnership (PPP) model has been widely implemented in over 134 countries to deliver infrastructure, with the market growing to USD 1049 billion, contributing 15–20% of total global infrastructure investment [1]. With the widespread adoption of the PPP model, the economic and financial sustainability of PPP projects has emerged as a crucial concern in both the practical and academic spheres. PPP aims to combine the benefits of competitive bidding and flexible negotiation and to allocate risk between the public and private sectors on an agreed-upon basis [2,3]. As a prominent method for achieving performance, reducing transaction costs [4], fostering innovation and competition, and transferring procurement risks [5], the PPP form of procurement is theoretically recognized as an efficient means of delivering value-for-money infrastructure and public services [6]. However, the outcomes of these projects often fall short of expectations due to various internal and external risk factors that persist throughout the project's lifecycle. These factors pose significant obstacles to the sustainable development of PPP projects [7–9].Evidence from the industry indicates that some infrastructure projects have failed at the country or project level, with some critical determinants linked to global risk factors.

The notion of project resilience and sustainability gained prominence in the late 1980s [10], and emerged as a pivotal global concern in the industry, particularly within the realm of project management and infrastructure investment [11]. In the past decade, along with the introduction of the Sustainable Development Goals (SDGs) by the United

Nations [12], the concepts of project resilience and sustainability have increasingly gained significant attention and popularity [9,13]. This surge in interest coincided with the construction industry's pioneering efforts in addressing environmental, economic, and social factors in the whole life cycle management of buildings and infrastructure [10], where resilience is commonly associated with responding to extreme events [14].

More recently, the concept of infrastructure project resilience has expanded its scope beyond construction, engineering, and ecological resilience in the face of enduring challenges and unprecedented incidents to encompass essential project management facets, including financial robustness, economic viability, and long-term socio-economic benefits [10,11]. Public–private partnership (PPP) concessions typically span 8 to 30 years [7] and involve diverse stakeholder interests [15–20]. PPP's foundational premise lies in its theoretical capability to judiciously allocate risks among participants, harmonize stakeholder interests, and thereby bolster the project's long-term financial and operational resilience. The overarching goal of PPP lies in its potential to achieve sustainable outcomes aligned with the principles of resilient infrastructure [10].

Globalization is another trend that is reshaping the conventional landscape of infrastructure delivery. Globalization has accelerated at an unprecedented rate through increased trade and investment, cross-border migration and mobility, economic and security interdependence, and the worldwide involvement of multinational enterprises (MNEs) and financial institutions that have diversified their global assets. In the last two decades, the involvement of foreign investors, contractors, and multilateral organizations has become a key feature of global infrastructure development. Institutional investors from various countries have invested in a range of infrastructure projects [1]. Furthermore, the rise of international contractors is changing the infrastructure and PPP arena. The top 250 international contractors in the construction industry have a combined contracting revenue of USD 522 billion from projects outside their home countries. Research indicates that the involvement of multinational enterprises (MNEs) and multilateral development banks (MDBs) in PPP projects may have a detrimental impact on project survival [21].

Although there is a heated discussion on the winners and losers of globalization, it is undeniable that globalization has brought shared prosperity and shared risks. In a globalized world, countries and projects are interconnected through investment and trade, resulting in the international transmission of financial stress and economic shocks, which can transfer risk from one specific country or group of countries to the entire global economy. During the Eurozone sovereign debt crisis, sovereign rating downgrades and rising costs of debt led to the bankruptcy of many PPP projects. Considering the various stakeholders involved in a PPP arrangement, the channels of risk transmission that affect project outcomes are complex, and the channels themselves can be highly interconnected.

This paper aims to examine the factors that contribute to the success of PPP, with a particular focus on the impact of risks that transcend national borders. To achieve this goal, the study draws on a global database and a quantitative approach to validate existing literature on the key determinants of PPP outcomes. The empirical findings underscore a significant positive correlation between inflation and project failure. Conversely, attributes such as PPP experience, central government engagement, and exchange rate fluctuations exert notable influences, collectively contributing to the success of PPP ventures. Furthermore, the study underscores the critical significance of trade openness and the inflow of net foreign direct investment (FDI) in facilitating the transmission of global risks. Within this context, the government emerges as a central stakeholder, assuming a pivotal role in effectively managing international risks. Equipped with an array of financial and monetary policies, the government stands poised to address and mitigate these multifaceted challenges. Drawing from these insights, this study contributes to the body of knowledge in two ways: (1) it offers a fresh perspective in the context of today's interconnected world, highlighting the links between global economic cycles, cross-border risk, foreign investment, and PPP outcomes; and (2) it enriches the stream of research on project success/failure by linking stakeholder analysis to project survival and revealing the potential justification for government and

multilateral development bank (MDB) support for PPP projects in the face of global risk and economic fluctuations, which help to increase the resilience and sustainable outcomes of PPP projects.

## 2. Overview of World Bank PPI Database

The World Bank Private Participation in Infrastructure (PPI) database is a comprehensive resource that documents PPP/PFI projects across approximately 130 emerging economies, which includes a total of 16,330 project records. After removing duplicate entries, the dataset comprises 7286 projects, of which 383 are classified as failed projects. This gives an overall failure rate of 5.26%. The PPI database is widely used in the literature and provides valuable insights into the performance of PPP/PFI projects in emerging economies.

Analysis of the PPI database reveals an uneven distribution of PPP development in emerging countries, with East Asia and Latin America leading in the number of projects while Africa and the Middle East lag behind. Furthermore, the data highlights a positive correlation between economic development and the number of PPP projects, with upper-middle-income countries accounting for the majority of projects. In terms of sectoral distribution, Energy projects exceeded the number of Transport projects by more than twofold and more than triple the number of Water and Sewerage projects. In contrast, ICT projects were the least common (See Figure 1).

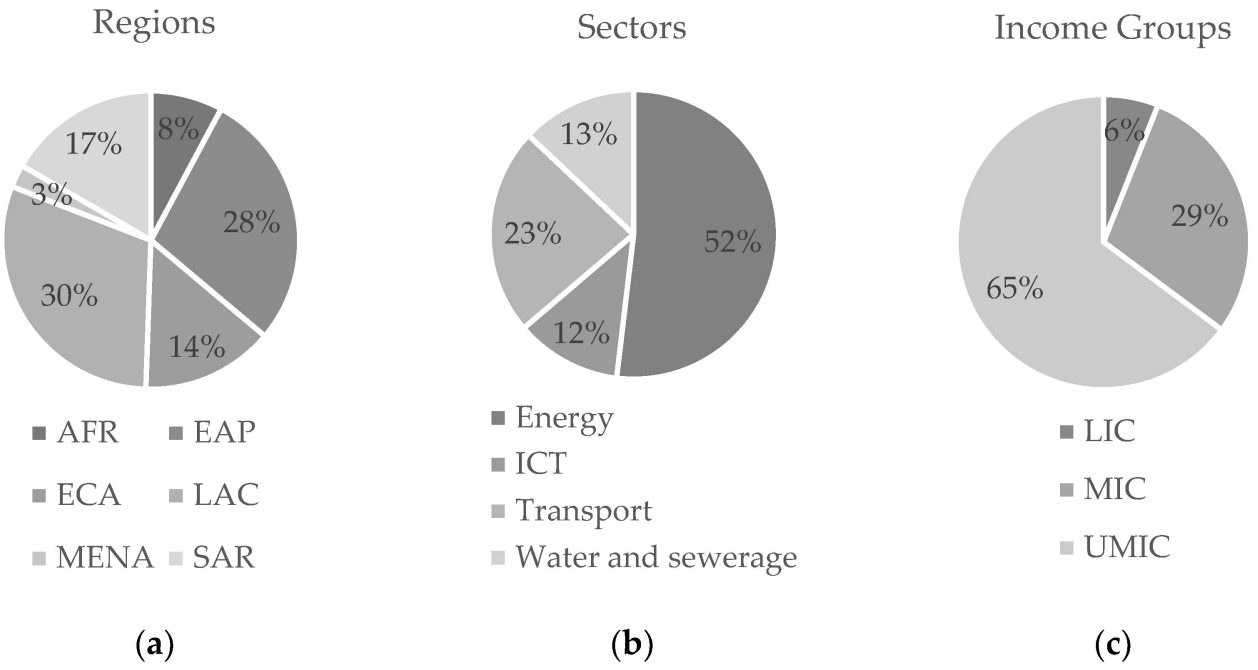



**Figure 1.** Devision of the database by (**a**) regions, (**b**) sectors, and (**c**) income groups.

Figure 2 provides a visual representation of the number of new and failed projects between 1990 and 2015. The solid line shows the number of new projects that reached financial closure each year, while the dotted line represents the number of projects that failed during the same period. It is worth noting that both trends show a similar pattern, with a correlation coefficient of 0.41 (Figure 3).

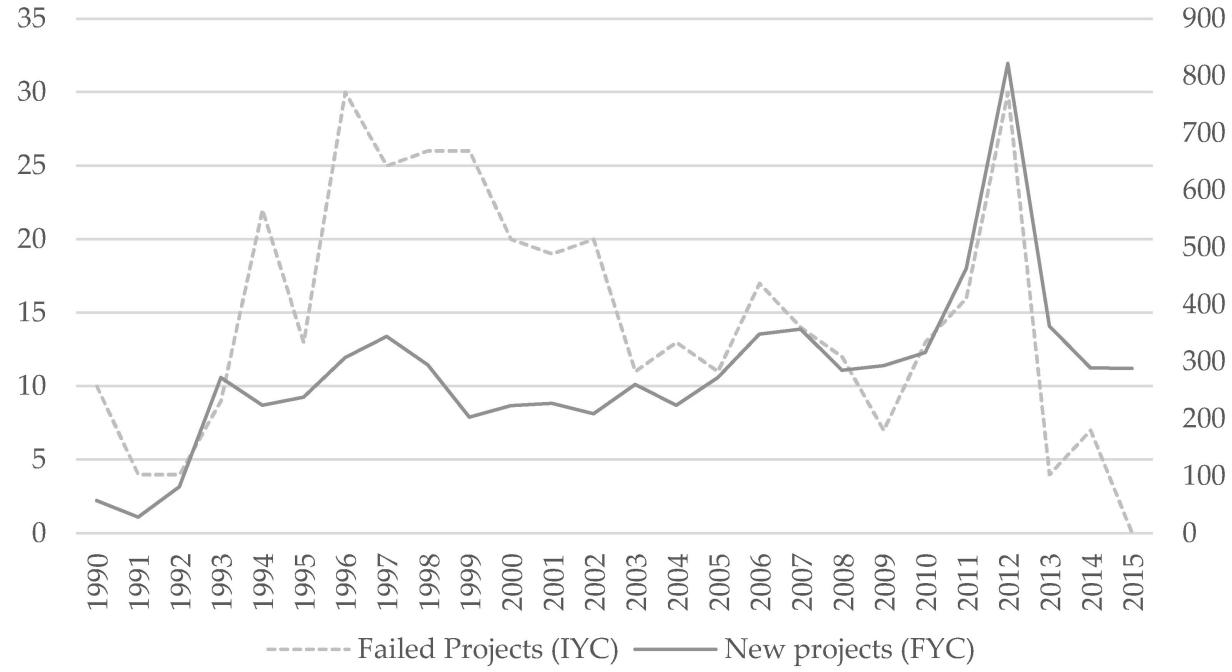



**Figure 2.** Global trend in failed projects and new projects.

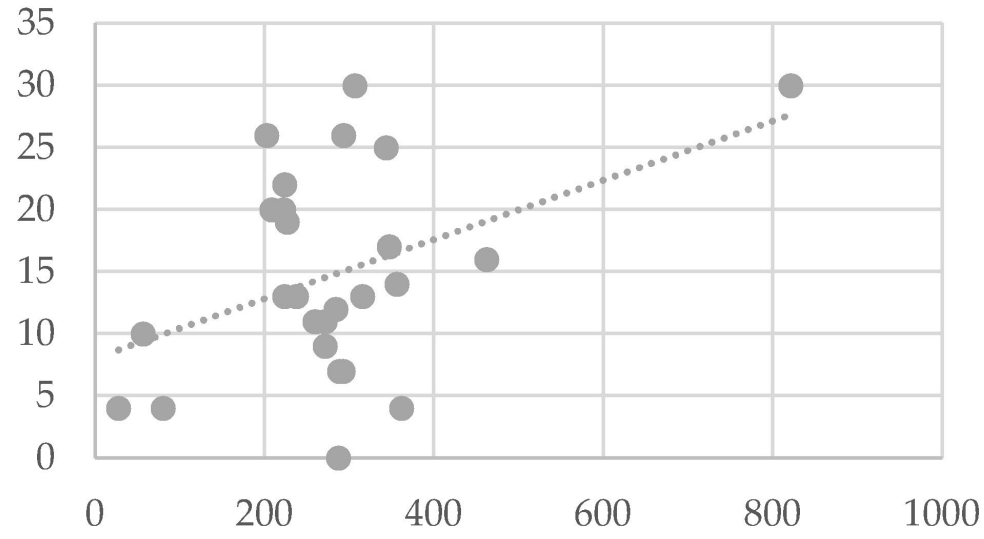
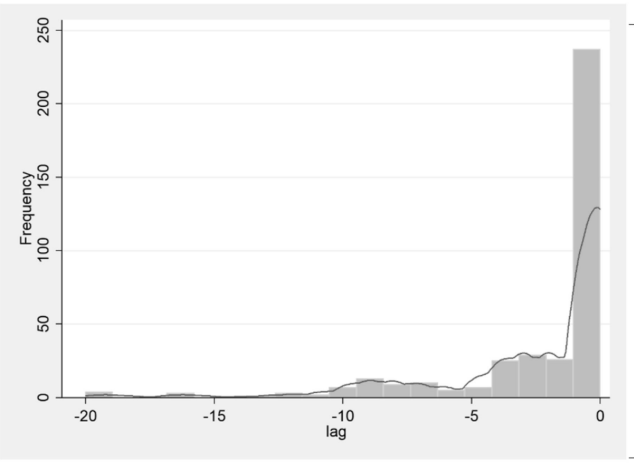



**Figure 3.** Correlation between failed projects and new projects.

There are two anomalous surges in project activity that occurred between 2006 and 2007 and between 2011 and 2012, which deviated from the global downward trend observed since 1997/98. Notably, the first surge was followed by the global financial crisis of 2007–2008, while the second surge coincided with the sovereign debt crisis. It is noteworthy that a one-year temporal lag was observed between the first surge and the onset of the financial crisis, whereas the second surge occurred one year after the onset of the sovereign debt crisis. This finding aligns with Chudik and Fratzscher's analysis [22], which highlights the differing impacts of these two crises on global economies. The present study's findings lend support to the notion that international factors, such as macroeconomic conditions, can have a profound impact on PPP resilience, and should be given due consideration when assessing risk in such ventures.

With respect to failed projects, our analysis reveals that the period between financial closure and the year in which a project is classified as "Cancelled" or in "Distress" is

typically less than ten years. In the majority of cases, failed projects exhibit a swift decline in performance immediately following financial closure. Specifically, a large proportion of failed projects are classified as being in distress within the first year after achieving financial closure. These findings underscore the importance of carefully assessing project viability and risk prior to financial closure and suggest that early indicators of project distress should be closely monitored and acted upon to minimize the risk of project failure (Figure 4).




| lag | Freq. |
|---|---|
| -20 | 1 |
| -19 | 3 |
| -17 | 1 |
| -16 | 3 |
| -14 | 1 |
| -13 | 1 |
| -12 | 3 |
| -11 | 2 |
| -10 | 7 |
| -9 | 13 |
| -8 | 9 |
| -7 | 10 |
| -6 | 5 |
| -5 | 7 |
| -4 | 25 |
| -3 | 29 |
| -2 | 26 |
| -1 | 29 |
| 0 | 208 |

**Figure 4.** Time lag between financial closure and project failure.

Figure 5 illustrates the number of new projects that achieved financial closure each year (represented by the solid line), as well as the number of projects that failed during the same period (represented by the dotted line). By breaking down the global trend into regional trends, the analysis reveals how region-specific economic phenomena can impact the outcomes of PPP projects. For example, the steep increase observed in the East Asia region between 1995 and 1998 can be attributed to the Asian Financial Crisis of 1997–1998, which was largely driven by currency risks. Similarly, the impact of the Latin American Economic Liberalization movement of the 1990s is evident in the graph, which shows a sharp rise in both failed and new projects between 1990 and 1999, followed by a gradual decline. These findings provide compelling evidence that the determinants of PPP project outcomes go beyond individual countries and are influenced by global and regional economic trends. As such, it is crucial to consider such factors when assessing the risks associated with PPP projects and developing effective risk mitigation strategies [23].


**Figure 5.** Trends of new and failed projects in (**a**) East Asia and (**b**) Latin America.

By analyzing the data on a sectoral basis, it is noteworthy that the Energy sector experienced a significant increase in the number of new projects (represented by the solid line) from 2011 to 2013. This trend may be attributed to the high level of oil prices during the period from 2011H1 to 2014H1, as depicted in Figures 6 and 7.

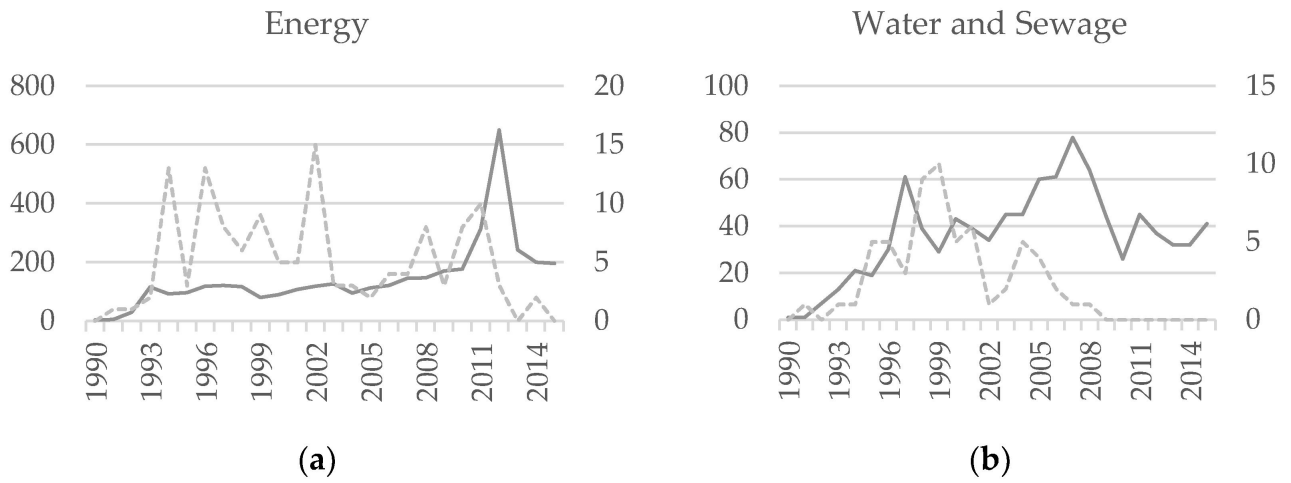



**Figure 6.** Trends of new projects (represented by the solid line) and failed projects (represented by the dotted line) in (**a**) Energy and (**b**) Water and Sewerage sector.

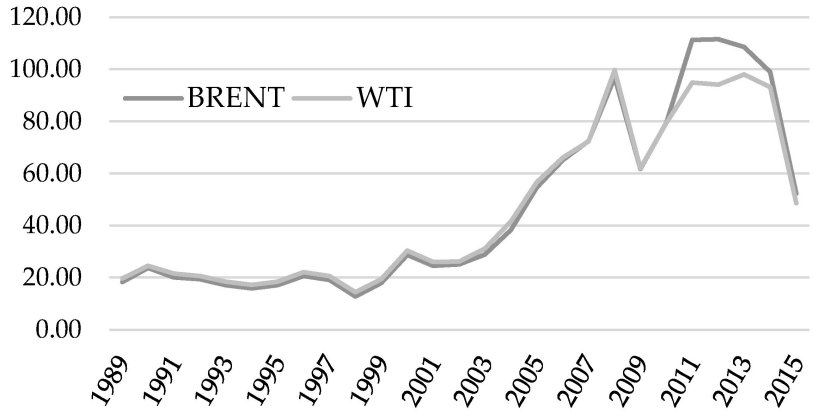



**Figure 7.** BRENT and WTI oil prices (1989–2015).

## 3. Literature Review

A notable feature of PPP projects is the involvement of multiple stakeholders with diverse interests, making it challenging to identify the risk factors that contribute to the sustainable outcomes or failure of projects [15,16]. Stakeholder theory was selected as the most appropriate framework for the research question [2,15–17], while other theories such as incomplete contract theory [24], agency theory [5], transaction cost theory [4,25,26], the perspective of critical success factors (CSF) [27–29], or collaboration, network, and governance perspectives [15,30–32] were not employed. For instance, agency theory was not pursued as it focuses on the principal–agent relationship (public sector and the SPV) [5,17] and does not delve into the interrelationships among various stakeholder groups as explored in this study. Furthermore, the exploration of network and governance perspectives was omitted due to the intricate nature of such analyses, which would necessitate in-depth case-by-case analysis to uncover nuanced factors such as trust, entrepreneurship, and resource allocation capabilities [15,30,31].

### *3.1. Risk Allocation and Stakeholders in a PPP Project*

This paper will focus on stakeholder theory in the specific context of PPP and its unique features [2,17,18,33]. Despite the fact that PPP lacks a common definition, the definition widely used by the practitioners may be structured as follows: "A cooperative venture between the public and private sectors, built on the expertise of each partner that best meets clearly defined public needs through the appropriate allocation of resources, risks, and rewards" [11]. According to stakeholder theory, stakeholders are defined by Freeman as any group or individual who can affect or is affected by the achievement of the organization's objectives [34]. El-Gohary et al. [19] further define stakeholders in a PPP arrangement as any person or organization that has a legitimate interest in a project. The approach to stakeholder analysis involves three levels of stakeholder analysis: rational, process, and transactional. The rational level addresses stakeholder identification and perceived stakes, while the process level involves classifying stakeholders based on their interests, stakes, and power [34,35]. The transactional level focuses on managing stakeholder relations, trade-offs, and understanding stakeholder legitimacy. Clarkson also distinguishes between primary stakeholders, who significantly impact the organization's survival, and secondary stakeholders, who influence or are influenced by the transaction but are not directly involved in transactions with it [36].

Infrastructure projects, especially in the context of PPP, require the careful consideration of stakeholders throughout the project life cycle. Stakeholders may possess different relationship traits or attributes, including power, legitimacy, and interests [37]. The primary concern is identifying stakeholders with a significant potential influence on the project's success and allocation of responsibilities and accountability. Figure 8 depicts the intricate network of stakeholder relationships between those parties in a typical PPP arrangement with international participants, and most projects in the World Bank PPI Database may fall into this category. Below we will illustrate the role, function, power, and interests of each party in more detail.

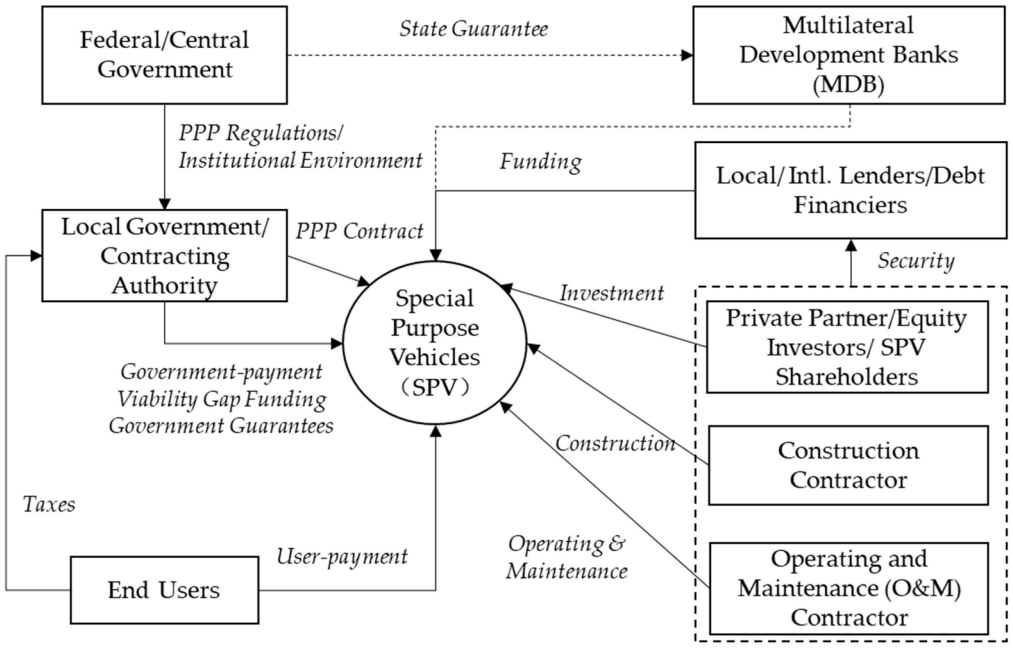



**Figure 8.** Stakeholder relationships in a typical international PPP project (drawn by authors).

The government's power and interests are four-fold: firstly, as the project sponsor, local governments are responsible for ensuring that the project aligns with the central government's policies, long-term objectives, and public interests when negotiating with other local governments [38]; secondly, as the contract-awarding party, tendering party,

and party which proactively selects its private partner for the special purpose vehicle (SPV), the government is responsible for ensuring the private partner's qualifications and the effectiveness of the contract, the output specifications being clearly outlined, the decision-making process and the tendering process being competitive and transparent, and avoiding allocating too much risk to investors or lacking accurate predictions of demand. Thirdly, the government is normally responsible for the following during the project planning and construction phase: (1) the delivery of the land and site; (2) coordinating and facilitating all dealings with the appropriate government authorities; (3) obtaining, in a timely manner, and thereafter maintaining the approvals required for construction [11]; fourthly, for long-term project resilience, particularly government-pay projects, government payments, viability-gap funding [18], or some form of government guarantee [39–41] or credit enhancement [42] will be required. Unrealistic or unreasonable guarantees and assurances made by local governments lead to high costs to fulfill contracts, resulting in unfavorable outcomes such as renegotiation or project failure [43].

Private partners/equity investors in international public–private partnerships (PPPs) typically include MNEs, pension funds, insurance companies, and sovereign wealth funds, collectively known as "financial sponsors," who seek long-term stable returns [44]. In recent years, there has been a rise in infrastructure mergers and acquisitions, leading to the emergence of "strategic sponsors" who are willing to take on higher risks for potential returns in the early stages of project development. Some of these sponsors are specialized infrastructure funds [45]. Private investors are primarily concerned with the creditworthiness risk of local governments, and they must assess the liability of government officials' decisions. Consequently, it is imperative that the private sector seek the government's cooperation and assistance; however, the institutional quality of some local governments may considerably increase the cost of such cooperation and assistance [46]. Especially for foreign investors, the nature and quality of host country institutions affect FDI in a variety of ways [47]. The commitment of private partners to longer-term investment and operation is essential to the resilience of a project. Infrastructure is not typically considered a financial asset, but it does exhibit certain characteristics that are common to financial assets, such as longer-term maturity with lower liquidity, predictable and often inflation-linked cash flows, and low correlation with other asset classes [1]. The private partners place a premium on long-term returns and performance relative to global equity investments.

Lenders/debt financiers are a key source of infrastructure financing, particularly for projects in emerging markets, and they often rely on bank lending from advanced economies, particularly international financial institutions [1]. These loans are typically indexed to the London Interbank Offered Rate (LIBOR) with a margin added to it. However, since the 2008 financial crisis, new regulations such as Basel III have placed significant constraints on the long-term financing capacity of commercial banks. This has particularly affected infrastructure assets with longer contract periods, which may struggle to secure long-term financing at affordable rates [48]. Since the majority of PPP ventures are structured with project financing, SPV normally lacks sufficient collateral to cover the loans. The lenders rely on government guarantees, collaterals from private partners, or other credit enhancement measures to compensate for the risks associated with the project [49]. Banks also execute "Direct agreements" with the SPV to guarantee the bank's ability to intervene directly in crisis circumstances to take direct control over the borrower's contracts with the government or the contractors [50]. Lenders are susceptible to credit risk and liquidity dry-ups, but they are generally committed to the long-term viability of projects, as the majority of project loans are long-term loans that will mature after the construction period.

Contractors are generally categorized in two ways: construction contractors or operation and maintenance contractors which intervene at different phases of the projects. The two types of contractors normally have certain ways of collaborating to ensure a smooth takeover from construction to operation. As the project moves from the design/construction to the operation/maintenance stage, the risk/return profile changes, and risks are shifted/reallocated to the party best able to manage it. In the past, PPP

practitioners have always viewed the risks associated with the construction stage to be more prominent. However, as project management techniques improve over the years, such as the EPC/turnkey methods of delivery that have already made risk management and cost control, i.e., cost overrun, inflation of the price of the raw materials, considerably less risky [51]. In the meantime, the resilience of O&M operators is becoming more of a question, considering the supply and demand of the provided services tend to become increasingly less sustainable, especially in the case of high inflation in user-payment projects and government payment default in government-payment projects, O&M operators often struggle to meet the financial requirements and standards as predicted at the project planning stage [21,29,50].

As for the end users, based on the principle of public goods, the PPP's foundation is publicness and the pursuit of public interests, and its main purpose is to address public needs by providing public services [51]. On the contrary, a 'white elephant' has been defined as an investment project that results in negative social outcomes and inefficient redistribution of wealth. To avoid the "white elephant" in infrastructure [52], users should be at the center of the entire PPP process (design, delivery, and outcome evaluation). If the project poses no significant demand risk for the private party, there will be incentives for the government to promote any form of project, some of which may become white elephants.

In summary, public–private partnerships (PPPs) highlight the intricate nature of the process and the diverse range of stakeholders involved, setting them apart from other infrastructure delivery models. The dynamic relationships among these stakeholders, constantly evolving within the PPP framework, presents a substantial challenge in effective project management [17,20]. De Schepper [20] underscores a noticeable research gap, with limited research (covered by 22 research articles) directed towards stakeholder management within PPPs, and even fewer studies centering on project success. Wegrzyn and Wegrzyn [16] propose that the success of PPP projects hinges upon the knowledge of stakeholders, their capacity to influence the project, their motivation, the urgency of project implementation, and their adeptness in fostering relationships with other stakeholders, etc. Jiang et al. [26] examined the bargaining process in PPP projects between multinational investors and contractors (MNEs) and the host government, emphasizing the significance of the governance and ownership structure of the Special Purpose Vehicle (SPV). While current stakeholder analysis guidelines offer a foundational framework, they omit crucial intricacies surrounding the actual engagement or the process of influence [16,20]. Given this backdrop, the examination of risk factors influencing the outcome of PPP projects from a stakeholder perspective adds a compelling dimension to this study.

### *3.2. Risk Determinants in Global Risk Transmission*

Our attention now turns to the global risk transmission mechanism, which proposes that risks originating in one country or the global economy can affect PPP projects and create risks in other countries. This study aims to identify the channels through which global risks impact PPP projects, either by directly affecting them financially or by indirectly affecting the real economy of the country and subsequently impacting PPP projects. In contemporary international economics, the perception of international trade and finance as distinct domains has been a prevailing perspective [53,54]. However, a pivotal aspect of grasping this interconnection lies in comprehending the intricate relationship between interest rates, exchange rates, and inflation rates. The interactions between these factors significantly shape trade dynamics and investment patterns [55]. Another noteworthy contemporary development pertains to the shift in focus. Initially, the analysis centered on a country-wide perspective, drawing insights from national trade and foreign direct investment (FDI) statistics. Subsequently, attention is redirected toward the behaviors of multinational enterprises (MNEs). Rather than solely observing the entirety of a country, the emphasis evolved to scrutinize individual stakeholders. This involved delving into specific dynamics, such as the intricate relationship between governments and MNEs [56]. Remarkably, this aligns with the stakeholder perspective central to our study's framework.

On a global scale, Chudik and Fratzscher [22] investigated the transmission of shocks to risk and liquidity across 28 economies, including 10 advanced and 18 emerging economies. They focused on two specific periods of global risk outburst: the 2007–2008 financial crisis and the 2010–2011 sovereign debt crisis. The research found that the perception of risk transmission varied across countries and was influenced by portfolio choice decisions by investors, the strength of countries' fundamentals (such as sovereign rating and quality of institutions), and their financial exposure to the U.S. Furthermore, the geographic flight-to-safety phenomenon observed during the 2007–2008 crisis became less compelling during the 2010–2011 crisis. Notably, the authors found that the signs of emerging market elasticities during the crisis were always opposed to those of advanced economies, suggesting a differentiated effect of U.S. variables on the rest of the world.

Dovern and van Roye [57] extended the time horizon from 1970 to 2012 and found that the correlation of financial stress across countries had increased considerably over the four decades, peaking during the 2007–2008 financial crisis. They used five risk indicators, i.e., stock market volatility, exchange rate volatility, stock market returns, government bond volatility, and banking sector volatility, and demonstrated that the correlation of financial stress was stronger with increased financial openness/exposure. The research emphasized the negative impact of financial stress on economic activity and the significant role of the United States in the global transmission of financial stress. Furthermore, the authors identified industrial production as a good indicator for capturing global shocks. In a similar approach to Chudik and Fratzscher [22], Cashin et al. [58] investigated two significant scenarios of global risk transmission: China's economic slowdown and the surge in global financial market volatility. The study comprised 33 economies, representing more than 90% of the world's GDP. The authors found that China's slowdown had a significant impact on less-diversified commodity exporters and ASEAN countries, with evidence of a fall in global inflation and short-term interest rates, which negatively affected global equity and oil prices in the short run, and impacted interest rates in the long term.

It is crucial to recognize that international risks do not have a uniform impact, and their effects on each country and its projects can vary significantly. As an illustration, the International Monetary Fund estimates that China's economic slowdown will predominantly impact the economies of the Association of Southeast Asian Nations (ASEAN), with the exception of the Philippines, owing to their significant trade exposure to China [22].

## 4. Risk Determinants of Project Outcome

Many studies have identified the factors that contribute to the success or failure of PPP projects [27–29,59,60], while our objective here is to establish quantitative relationships between the risk factors and the project outcomes [26,61]. Through an extensive review of the literature, this study has identified several key risk factors influencing PPP development. Notably Hammami et al. [62] identified seven key channels affecting PPP development, including government constraints, the political environment, market conditions, macroeconomic stability, institutional quality, the legal system, and past experiences with PPP. Their research confirmed that heavy government fiscal burdens, good market conditions, low inflation, good institutional quality, and previous experiences with PPP contribute to PPP development; Reside [63] and Reside and Mendoza [64] found that factors such as exchange rate fluctuations, government guarantees, debt ratios, and project support influence PPP failure rates. Further research conducted by Jimenez et al. has a pronounced regional focus, linking country risk to the outcomes of PPP projects in Eastern Europe [65] and Latin America [66]. We will provide a more detailed elaboration on these risk factors and the previous research supporting the inclusion of these factors.

To aid in this process, risks have been classified into various categories for presentation purposes, although it is important to note that these categories are not necessarily independent of one another. For example, Reside and Mendoza [64] have shown that political risk often arises from macroeconomic risk, while Dailami and Klein [67] have highlighted the connection between market risk and credit risk, particularly in emerging

markets. Similarly, fluctuations in commodity prices—a sectoral risk—can sometimes lead to government intervention and the realization of political risk [63]. Another constraint stems from the unique attributes of each project. The list of risks presented below may not encompass all the potential risks associated with the project. This constraint can be more pronounced when we take into account that risks can be reduced, increased, or transferred during different phases of the project development [7]. For example, the risk associated with construction may be eliminated as the project transitions from the construction phase to the operation phase. This article adopts a holistic and result-oriented view by focusing on the project outcome rather than the process, in order to explore the overall effect of risk on project resilience.

### *4.1. Domestic Risk Determinants*

#### 4.1.1. Market Risk

Market risk, also known as commercial risk or revenue risk, is associated with the ability to purchase infrastructure services at market prices. Market risk is highly sensitive to changes in both prices and demand, and fluctuations in inflation rates can potentially harm project success [68]. Market/revenue risk is particularly important if the project's primary revenue source is market-based, where short-term revenue shortfalls could undermine the project's long-term viability [69].

Considering the extensive involvement of various emerging and developing economies in the database, another category of indicators pertains to trade. Many emerging economies significantly depend on trade to sustain their domestic economies [70], as the average trade-to-GDP ratio is 58% for the economies in our project database. Empirical investigations [2,24,58] have shown that risk transmission is amplified in the presence of heightened trade exposure, while the dependence on tariffs as a source of fiscal income incentivizes governments to expand their trade exposure [71].

Another indicator of market risk is inflation. High inflation may cause a significant decrease in end users' affordability and an increase in labor and material costs, resulting in a rise in project construction and operation costs, which will impact the contractors' financial performance [28,62]. Table 1 details the market risk indicators and their impact on primary stakeholders.

**Table 1.** Market risk indicators.

| Indicators | Indicator Description | Impact on Primary Stakeholders |
| --- | --- | --- |
| GDP per capita | Average per capita GDP growth, indicating the level of affordability in a consecutive period (Source: World Bank) | End users |
| Openness (Trade Exposure) | 1. Openness/Trade exposure: Average ratio of total exports and imports divided by GDP<br>2. Average ratio of fuel and industrial exports to total exports<br>(Source: World Bank) | Government |
| Inflation | Average inflation rate (Source: World Bank) | End users/Contractors |

#### 4.1.2. Fiscal Risk

The fiscal position of the government indicates the constraints and ability of the government to fulfill its obligations. Several governments worldwide, including Brazil, Canada, Chile, China, Colombia, Spain, and the United Kingdom, have implemented measures such as the provision of a minimum revenue guarantee (MRG) [72], viability gap funding [18], or government subsidies [73]. However, such government support can also

pose a significant fiscal risk, especially if the project is backed by a government guarantee. Falling government revenues and shrinking domestic financing, such as government treasury funds, can exacerbate this problem and create long-term budgetary and debt-related consequences for the government [74]. Table 2 details the fiscal risk indicator.

**Table 2.** Fiscal risk indicators.

| Indicators | Indicator Description | Impact on Primary Stakeholders |
|---|---|---|
| Fiscal position | Average net lending in terms of either surplus or deficit (Source: World Bank) | Government |

#### 4.1.3. Country Risk

The concept of country risk brings to the fore the distinct characteristics of each country's natural and economic endowment [75], political and regulatory systems [65,66], political stability [26,76], fiscal and monetary stability, as well as their previous experiences with public–private partnerships (PPPs), i.e., whether the central government has implemented the PPP model before and whether the country has the corresponding expertise in risk management [77,78]. Jimenez et al. [75] further classified country risks into endogenous and exogenous country risks through whether the risk is endogenous or exogenous to the PPP projects.

Given that PPPs rely heavily on contractual arrangements, the quality of the legal and contractual environment is critical to their success [79]. Within an institutional environment marked by an absence of the rule of law and accountability, policy makers wield the authority to unilaterally alter the terms and conditions stipulated in concession agreements, and in more severe instances, opportunistically expropriate a private partner's profits or assets [76,80]. If the contract is awarded directly by the central government, such projects are generally viewed as more attractive due to state guarantees [11], and such projects typically involve MDB support. The MDBs are not necessarily the project's stakeholders, but their presence implies that the external institutional environment and the internal governance of the project are somewhat guaranteed or sufficient enough for PPP [21]. Table 3 details the country risk indicators.

**Table 3.** Country risk indicators.

| Indicators | Indicator Description | Impact on Primary Stakeholders |
|---|---|---|
| PPP experience | Discrete variable—1 if the country has implemented a PPP initiative before the underlying PPP project, 0 if otherwise (Source: World Bank's PPI database) | Government/Private Partner |
| Federal or local government granted the contract | Discrete variable—1 if the project was contracted with the federal government, 0 if otherwise (Source: World Bank's PPI database) | Government/Private Partner |
| Support from multilateral institutions (MLS) | Discrete variable—1 if the project received a political risk guarantee from MFIs, 0 if otherwise (Source: World Bank's PPI database) | Government |

#### 4.1.4. Currency Risk

Infrastructure projects in developing countries typically rely on significant amounts of foreign capital in the form of equity investment or loans to finance PPP. Financial exposure is a critical component to transmit global risks [22,57]. The degree of financial exposure can be measured through the indicator of Foreign Direct Investment (FDI) [81]. The government has a strong motivation to encourage foreign direct investment (FDI), highlighting the importance for the government of maintaining a stable currency [82].

Unlike debt repayments and payments to contractors, which are normally denominated in foreign currency, dividends from private partners' investments, which stem from

project cash flows, typically accrue in the local currency. In many emerging countries with underdeveloped financial markets, hedging instruments (such as exchange rate swaps) for currency risks are scarce. Unexpected devaluations can significantly impact project profitability [83]. If strong fluctuations impact the revenue repatriation for a consecutive period, the project's financial viability will be in dispute. This was particularly evident in the 1990s when several public–private partnerships (PPPs) in Latin America [66] and Southeast Asia experienced financial challenges due to unexpected currency fluctuations [62]. Table 4 details the currency risk indicators.

**Table 4.** Currency risk indicators.

| Indicators | Indicator Description | Impact on Primary Stakeholders |
|---|---|---|
| FDI (Financial Exposure) | Average change in FDI net inflows (Source: World Bank) | Government |
| Exchange rate | Standard deviation in the real exchange rate (Source: World Bank) | Private Partners |

#### 4.1.5. Credit Risk and Liquidity Risk

Credit risk refers to the increase in financing costs that can result in higher debt service payments and elevated project costs, rendering previously feasible projects no longer bankable [83]. Lenders/debt financiers carefully analyze the cash flows associated with a project to ensure that the profits are sufficient and that the creditworthiness of the project is strong enough to enable loan repayment [84]. The ratio of short-term foreign debt to exports serves as an indicator of the creditworthiness of the sovereignty [85].

In some cases, credit risk leads to liquidity risk, which involves the unavailability of shorter-term financing. The interest rate indicates the risk-free cost of capital in the economy. Interest rate hikes either raise project financing costs or dry up liquidity, which will force lenders to meet redemption calls, significantly restricting the capital available for PPP projects [22]. Burger et al. [74] examined the impact of the 2007–2008 financial crisis on PPP and concluded that the increased financing costs and limited financial liquidity significantly affected PPP projects. Table 5 details the credit and liquidity risk indicators.

**Table 5.** Credit risk and liquidity risk indicators.

| Indicators | Indicator Description | Impact on Primary Stakeholders |
|---|---|---|
| Interest rate | Average change in real interest rate (Source: World Bank) | Lenders |
| Short-term debt | Average ratio of short-term debt to exports (Source: World Bank) | Lenders |

#### 4.1.6. Construction Risk

Infrastructure projects typically entail high upfront costs and may require a lengthy period before generating revenue, making greenfield projects riskier than brownfield projects. Greenfield contractors must ensure that all necessary administrative work, including obtaining business permits and licenses, complying with environmental regulations, and securing land handover, is completed and approved, otherwise construction risks may lead to costly delays and significant losses for the project [69].

#### 4.1.7. Sectoral-Specific Risk

It is worth noting that each infrastructure sector exhibits unique risks and characteristics [86]. For example, the energy sector is intricately linked to energy prices and is consequently exposed to price fluctuations. Conversely, macroeconomic conditions exert a significant influence on the information and communication technology (ICT) and transport

sectors [87]. In contrast, the demand for water and sewerage services tends to be relatively inelastic, rendering this sector less vulnerable to external factors [88].

### *4.2. International Risk Determinants*

#### 4.2.1. Risks Transmitted through the Global Real Economy

Widely recognized as the most potent indicator of global economic activity, GDP serves as an indispensable metric for analyzing both demand and supply side factors. Under the impact of the global economic downturn, changes in raw material prices, and reduced global demand, market and financial risks are likely to intensify. The impact on GDP growth affects various stakeholders universally, albeit to varying degrees, and influences their decision-making in diverse ways [89].

This study also examines the possibility of a single country exerting significant influence over global risk transmission. Chudik and Fratzscher [22] and Cashin et al. [58] have both posited the United States' dominance in global risk transmission. Cashin et al. [58] and Cesa-Bianchi et al. [45] have further highlighted the increasing significance of the Chinese economy in this regard. Given these factors, the economic growth of both China and the United States has been incorporated into the model. Table 6 details the indicators for risks transmitted through the global real economy.

**Table 6.** International risk indicators (real economy).

| Indicators | Indicator Description | Impact on Primary Stakeholders |
|---|---|---|
| External GDP growth (U.S./China) | GDP Growth (Source: World Bank) | All stakeholders |

#### 4.2.2. Risk Transmitted through the Global Financial Market

Several risks are directly linked to the global financial market. Credit risk, for instance, can be gauged by fluctuations in the London Interbank Offered Rate (LIBOR) [22]. To measure stock market fluctuations, the NASDAQ Composite Index has been widely utilized as the variable [22,58]. Previous studies [22,58,90–92] have demonstrated the connection between commodity prices/oil prices and global risk transmission. Contractors will face significant challenges in managing project costs due to the drastic increase in commodity prices, with cost overruns posing a significant threat to project resilience [7]. Table 7 details the indicators for risks transmitted through the global financial market.

**Table 7.** International risk indicators (financial market).

| Indicators | Indicator Description | Impact on Primary Stakeholders |
|---|---|---|
| LIBOR fluctuations | Standard deviation of LIBOR (Source: Federal Reserve Economic Data) | Lenders |
| Stock market fluctuations | NASDAQ Composite Index (Source: Federal Reserve Economic Data) | Private Partners |
| Oil price fluctuations | BRENT Crude Oil Price (Source: Federal Reserve Economic Data) | Contractors |

## 5. Materials and Methods

### *5.1. Data Description*

The World Bank's Private Participation in Infrastructure (PPI) database is the primary data source for this study (available at https://ppi.worldbank.org/ (accessed on 31 July 2022)). The World Bank PPI database is widely used by many researchers to investigate diverse forms of PPP. [26,32,62–65,75]. The PPI database is cross-sectional and each project is considered independent. The dependent variable in this study is project status, which is binary. A value of 1 indicates a distressed or canceled project, while a value of 0 indicates an ongoing or successfully completed project [26,75].

The economic data used in this study were obtained from World Bank Open Data (available at https://data.worldbank.org/ (accessed on 1 August 2022)). Financial indicators were sourced from Federal Reserve Economic Data (available at https://fred.stlouisfed.org/ (accessed on 1 August 2022)). For a complete list of independent variables and data descriptions, please see Appendix A. Independent variables were adjusted based on either the year in which the project reached financial closure (Financial Closure Year) for the exogenous ones or the most recent year in which the project was updated in the database (Year before the Outcome) for the endogenous ones. However, it is worth noting that the variable for institutional governance, represented by World Governance Indicators (WGI) (available at http://data.worldbank.org/data-catalog/worldwide-governance-indicators (accessed on 8 August 2022)), was held constant throughout the 25-year period. Table 8 presents the descriptive statistics of the dependent and independent variables:

**Table 8.** Data Description (Dependent Variable and Independent Exogenous Variables).

| No. | Indicators | No. of Obs. | Average | St. D. | Min. | Max. |
|---|---|---|---|---|---|---|
| 1 | Project Status | 7286 | 0.0525666 | 0.2231819 | 0 | 0.58 |
| 2 | GDP per capita growth | 7266 | 0.0412766 | 0.0394792 | −0.2143894 | 0.1793668 |
| 3 | Inflation | 7242 | 34.63687 | 202.1898 | −12.59891 | 9630.281 |
| 4 | Fiscal Position | 6923 | −2756.323 | 14649.38 | −245670.3 | 9630.281 |
| 5 | Openness | 7266 | 58.33845 | 32.37531 | 0 | 215.8228 |
| 6 | PPP experience | 7286 | 0.9669229 | 0.1788503 | 0 | 1 |
| 7 | MLS | 7286 | 0.8734559 | 0.3324843 | 0 | 1 |
| 8 | Central Gov. | 7286 | 0.4360417 | 0.4959265 | 0 | 1 |
| 9 | Net FDI inflow (ac.) | 7266 | 0.041736 | 0.6104446 | −13.06869 | 6.226839 |
| 10 | Real exchange rate (std.) | 4301 | 2.593689 | 2.688933 | 0 | 87.86307 |
| 11 | Real interest rate | 7266 | 0.0846632 | 5.035214 | −40.7934 | 46.72787 |
| 12 | Short debt to exports (av.) | 6731 | 22.65931 | 16.96856 | 0 | 299.8865 |
| 13 | Ratio ind. exports (av.) | 7266 | 18.6997 | 17.07576 | 0 | 98.10608 |
| 14 | China GDP Growth | 6364 | 9.479046 | 2.067778 | 3.907114 | 14.23139 |
| 15 | U.S. GDP Growth | 6364 | 2.230547 | 1.528975 | −2.77553 | 4.6852 |
| 16 | LIBOR (std.) | 7286 | 0.2240708 | 0.2528473 | 0.005359 | 1.202141 |
| 17 | BRENT (ac.) | 7286 | 1.441581 | 17.67275 | −46.65 | 31.65 |
| 18 | Nasdaq (std.) | 7286 | 182.1118 | 107.9594 | 27.7693 | 581.6638 |

The correlation matrix for the independent exogenous variables is shown in Table 9. As Table 9 demonstrates, none of the variables exhibit any significant pairwise correlation.

**Table 9.** Correlation Matrix (Independent Exogenous Variables).

| Correlation Matrix | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. PPP experience | 1.00 | | | | | | | | | |
| 2. MLS | 0.07 | 1.00 | | | | | | | | |
| 3. Central Gov. | 0.04 | −0.09 | 1.00 | | | | | | | |
| 4. Real interest rate | −0.01 | 0.00 | −0.04 | 1.00 | | | | | | |
| 5. Short debt to exports (av.) | −0.04 | −0.03 | −0.09 | 0.10 | 1.00 | | | | | |
| 6.Ratio ind. exports (av.) | −0.06 | −0.16 | 0.17 | 0.00 | 0.25 | 1.00 | | | | |
| 7. GDP per capita growth | 0.13 | 0.10 | −0.17 | −0.04 | −0.14 | −0.26 | 1.00 | | | |
| 8. Inflation | −0.20 | 0.04 | −0.09 | 0.03 | 0.19 | −0.01 | −0.35 | 1.00 | | |
| 9. Fiscal Position | −0.03 | −0.02 | −0.06 | −0.04 | 0.08 | 0.00 | −0.01 | 0.00 | 1.00 | |
| 10. Openness | −0.05 | −0.06 | 0.15 | −0.01 | −0.09 | −0.09 | −0.03 | −0.04 | −0.15 | 1.00 |
| 11. Net FDI inflow (ac.) | −0.01 | −0.01 | −0.08 | 0.05 | −0.13 | 0.09 | 0.08 | 0.02 | −0.02 | −0.13 |
| 12. Real exchange rate (std.) | −0.07 | 0.00 | −0.02 | 0.00 | 0.08 | 0.04 | −0.13 | 0.20 | −0.14 | −0.17 |
| 13. China GDP Growth | 0.11 | 0.00 | −0.15 | −0.10 | −0.11 | −0.15 | 0.15 | 0.13 | 0.09 | 0.00 |
| 14. U.S. GDP Growth | −0.02 | 0.00 | −0.18 | 0.03 | 0.15 | 0.07 | −0.06 | 0.06 | 0.02 | −0.03 |
| 15. LIBOR (std.) | 0.02 | 0.01 | −0.15 | −0.10 | −0.05 | −0.02 | 0.11 | 0.01 | 0.09 | −0.04 |
| 16. BRENT (ac.) | 0.04 | 0.03 | −0.03 | −0.20 | −0.06 | −0.07 | 0.17 | −0.01 | 0.02 | 0.01 |
| 17. Nasdaq (std.) | 0.05 | −0.03 | −0.03 | −0.09 | −0.03 | 0.04 | −0.04 | −0.16 | 0.02 | −0.03 |

**Table 9.** *Cont.*

| Correlation Matrix (Cont'd) | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|
| 11. Net FDI inflow (ac.) | 1.00 | | | | | | |
| 12. Real exchange rate (std.) | 0.08 | 1.00 | | | | | |
| 13. China GDP Growth | 0.16 | −0.09 | 1.00 | | | | |
| 14. U.S. GDP Growth | 0.08 | 0.12 | 0.05 | 1.00 | | | |
| 15. LIBOR (std.) | 0.11 | 0.05 | 0.25 | −0.18 | 1.00 | | |
| 16. BRENT (ac.) | 0.06 | −0.18 | 0.37 | 0.20 | 0.12 | 1.00 | |
| 17. Nasdaq (std.) | 0.00 | −0.01 | −0.38 | −0.24 | 0.17 | −0.08 | 1.00 |

### *5.2. Model Specification*

Given the characteristics of the datasets, we have opted for the two-step binomial probit model with endogenous factors. For instance, consider a project that fails in 2016. The GDP per capita growth in 2016 may impact project outcomes due to the lack of purchasing power. However, the GDP per capita growth in 2008, the year of project design, may impact the project outcome due to wrong decisions made at the planning stage, and also distinctly impacts the GDP per capita growth in 2016 due to continuity. GDP per capita growth in 2008 is therefore an endogenous factor to GDP per capita growth in 2016. To address this intricacy, the two-step binomial model is employed, which conducts two sequential regression steps to mitigate the influence of these factors. This approach has been developed and refined by prominent econometricians such as McFadden [93], Newey [94], and Rivers and Vuong [95]. The theoretical foundations of the probit model and econometrics, which underpin our analysis, are drawn from works by Stock and Watson [96], Cameron and Trivedi [97], and Baum [98]. The STATA® command that we have employed to implement this model is specified as follows and the model specification for models 1–9 is illustrated in Table 10.

```
ivprobit depvar varlist1 (varlist2 = varlist_iv), first twostep
```

**Table 10.** Model Specification (Model 1–9).

| Model No. | Exogenous Variables | Endogenous Variables | Supporting Literature |
|---|---|---|---|
| Model 1 | • GDP per capita growth *2 years before the outcome*<br>• Inflation *2 years before the outcome*<br>• Net fiscal position *2 years before the outcome*<br>• Openness *2 years before the outcome* | • GDP per capita growth *2 years before the financial closure*<br>• Net fiscal position *2 years before the financial closure*<br>• Openness *2 years before the financial closure*<br>• Institutional quality:<br>- Rule of Law<br>- Control of corruption<br>- Voice and accountability | [2,18,22,24,58,62–64,66,68–74] |
| Model 2 | Model 1+<br>• PPP experience<br>• MFI support<br>• Federal or local government guarantee the contract | Same as Model 1 | [11,21,26,62–67,76–79,99] |
| Model 3 | Model 2+<br>• Exchange rates *1 year before the outcome*<br>• FDI *1 year before the outcome* | Model 1+<br>• Exchange rates *1 year before financial closure*<br>• FDI *1 year before financial closure* | [22,57,62–64,81–83] |

**Table 10.** *Cont.*

| Model No. | Exogenous Variables | Endogenous Variables | Supporting Literature |
|---|---|---|---|
| Model 4 | Model 3+<br>• Interest rates *2 years before the outcome* | Same as Model 3 | [22,74] |
| Model 5 | Model 4+<br>• Short-term debt to exports ratio *2 years before the outcome*<br>• Industrial raw exports *2 years before the outcome* | Same as Model 3 | [2,24,58,62–64,70,71,83–85] |
| Model 6 | Model 5<br>• China/U.S. GDP growth *1 year before the outcome*<br>• U.S. GDP growth 1 year before the outcome | Same as Model 3 | [22,45,57,58,89] |
| Model 7 | Model 5+<br>• LIBOR fluctuations *in the year of the outcome* | Same as Model 3 | [22] |
| Model 8 | Model 5+<br>• Oil price *fluctuations in the year of the outcome* | Same as Model 3 | [22,57,58] |
| Model 9 | Model 5+<br>• Stock market fluctuations *in the year of the outcome* | Same as Model 3 | [22,57,58,90–92] |

Regarding the time lag of the exogenous and endogenous factors, previous empirical research studies using similar variables suggested a country-specific time lag of risk transmission, which is 2 for domestic variables and 1 for foreign variables [58,81]. The inherent shifts in financial market indicators, such as LIBOR, BRENT, and NASDAQ, occur without any inherent time lags [57,58]. The research relies on a Wald chi-square test as the model selection criterion, as noted by Campos et al. [100]. Specifically, adding each new variable should increase the Wald chi (2) statistic while ensuring that the variables in the basic model remain significant and exhibit consistent coefficient signs [101].

## 6. Results and Discussion

### *6.1. Model Effectiveness*

As shown in Table 11, the effectiveness of the new models was demonstrated through the increasing Wald chi (2) test statistics resulting from the inclusion of new variables. The results indicate that upon the addition of international variables to the models, the Wald chi (2) test statistics of the two most significant models, Model 6 and Model 7, which used different metrics to quantify international economic growth, reached 112.14 and 129.58, respectively. Please note that the factors that cause success are indicated by negative signs, whereas the factors that cause failure are indicated by positive signs.

**Table 11.** Model results.

| Model | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| GDP p.c. growth | −0.0717 | 0.322 | −0.538 | −0.670 | −1.742 | −1.355 | −1.585 | −1.413 | −1.334 |
| Inflation | 0.0725 ** | 0.0786 ** | 0.0712 ** | 0.0702 ** | 0.0533 ** | 0.0554 ** | 0.0544 ** | 0.0579 ** | 0.0539 ** |
| Fiscal position | $8.2 \times 10^{-6}$ ** | $8.36 \times 10^{-6}$ ** | $-3.49 \times 10^{-5}$ * | $-3.55 \times 10^{-5}$ | $-3.49 \times 10^{-5}$ | $-1.59 \times 10^{-5}$ | $-3.93 \times 10^{-5}$ | $-3.45 \times 10^{-5}$ | $-3.47 \times 10^{-5}$ |
| Openness | 0.00293 ** | 0.00318 ** | 0.00648 ** | 0.00641 ** | 0.00653 ** | 0.00642 ** | 0.00638 ** | 0.00656 ** | 0.00663 ** |
| PPP exp. | | 0.374 | 0.183 | 0.166 | −0.558 ** | −0.675 ** | −0.635 ** | −0.529 ** | −0.604 ** |
| MLS | | −0.0758 | −0.0371 | −0.0355 | 0.0237 | 0 | 0.026 | 0.0232 | 0.0268 |
| Central Gov. | | −0.0404 | −0.204 ** | −0.217 ** | −0.279 ** | −0.185 * | −0.224 ** | −0.281 ** | −0.260 ** |
| FDI inflow | | | 0.260 ** | 0.268 ** | 0.338 ** | 0.341 ** | 0.310 ** | 0.336 ** | 0.344 ** |
| Exchange rate | | | −0.100 | −0.103 | −0.104 * | −0.133 ** | −0.0983 * | −0.116 * | −0.105 * |
| Interest rate | | | | −0.0133 * | −0.0104 | −0.0151 ** | −0.00566 | −0.0137 * | −0.00884 |
| Debt to exports | | | | | −0.00151 | −0.00386 | −0.00169 | −0.00138 | −0.00133 |
| Indl. Exports | | | | | 0.00384 | 0.00408 | 0.00478 * | 0.00380 | 0.00397 |
| China GDP | | | | | | 0.0170 | | | |
| U.S. GDP | | | | | | 0.103 ** | | | |
| LIBOR | | | | | | | 0.595 ** | | |
| BRENT | | | | | | | | −0.00231 | |
| NASDAQ | | | | | | | | | 0.000615 * |
| _cons | −2.379 ** | −2.745 ** | −2.500 ** | −2.456 ** | −1.614 ** | −1.622 ** | −1.768 ** | −1.665 ** | −1.726 ** |
| | (−11.48) | (−5.49) | (−4.25) | (−4.20) | (−4.53) | (−4.65) | (−5.03) | (−4.58) | (−4.49) |
| *N* Wald chi (2) | 6658 | 6658 | 4059 | 4059 | 3784 | 3381 | 3784 | 3784 | 3784 |
| test statistic | 44.17 ** | 69.26 ** | 97.19 ** | 97.86 ** | 107.80 ** | 112.14 ** | 129.58 * | 107.86 ** | 108.30 ** |

Notes: T-statistics in parentheses * $p < 0.10$, ** $p < 0.05$.

In the context of a multivariate regression model, multicollinearity arises when strong correlations exist among multiple independent variables. To assess the presence of multicollinearity, this study employed the variance inflation factor (VIF) to quantify the extent to which variance in the regression coefficients has been amplified. The results, as presented in Table 12, reveal VIF values for the exogenous independent variables, with a mean VIF of 1.37 which is far below the recommended threshold of 10 [102]. This value signifies the absence of observed multicollinearity.

**Table 12.** Test for Multicollinearity of the Exogenous Independent Variables.

| Variables | GDP p.c. Growth | Inflation | Fiscal Position | Openness | PPP exp. | Central Gov. | FDI Inflow | Exchange Rate |
|---|---|---|---|---|---|---|---|---|
| VIF | 1.85 | 1.06 | 1.09 | 1.22 | 1.05 | 1.48 | 1.37 | 1.26 |
| 1/VIF | 0.541 | 0.943 | 0.917 | 0.820 | 0.952 | 0.676 | 0.730 | 0.794 |
| **Variables** | **Interest rate** | **Debt to exports** | **Indl. Exports** | **China GDP** | **U.S. GDP** | **LIBOR** | **BRENT** | **NASDAQ** |
| VIF | 1.2 | 1.28 | 1.57 | 1.86 | 1.36 | 1.27 | 1.5 | 1.46 |
| 1/VIF | 0.833 | 0.781 | 0.637 | 0.538 | 0.735 | 0.787 | 0.667 | 0.685 |
| Mean VIF | | | | 1.37 | | | | |

### *6.2. Analysis of the Empirical Results*

Model 1–5 only exhibit the risk effect of domestic risk factors. This study finds that average GDP per capita growth does not have a significant impact on project failure. However, inflation is identified as a critical variable contributing to project failure, consistent with previous research [62]. Trade exposure, as measured by openness, consistently contributes to project failure. The analysis also found that factors such as support from multilateral development banks are not statistically significant in determining project sustainable outcomes. With regard to financial exposure, the study found that an increase in FDI net flow significantly raises the probability of project failures, highlighting the potential risks associated with foreign investment.

The study found that the involvement of the federal government in granting the contract and past PPP experiences can reduce the likelihood of project failure, possibly due to the central government's ability to manage national-level projects. MLS, indicating whether the project receives a MDB's support in the form of a political risk guarantee, also proves to be insignificant. When faced with a PPP project that is exposed to international risk, the central government has additional issues to consider, such as managing the exchange rate, interest rates, and inflation, and may need to consider infrastructure development goals, imports of raw materials, exports, and the effort required to maintain the free flow of capital when employing fiscal and monetary policy.

This study revealed that the real interest rate's influence is considerable, although not consistently evident in all models. Surprisingly, fluctuations in the exchange rate positively impact project success, challenging the common belief that a stable currency is crucial for sustaining foreign direct investments (FDIs). This phenomenon is likely because long-term investments like equity investments in PPP are less influenced by short-term exchange rate fluctuations. As much of the revenue repatriation for private partners and contractors is denominated in foreign currencies, the negative effect of currency fluctuations is relatively insignificant. Moreover, the project's resilience is enhanced by maintaining open and liquid capital markets that allow free capital flow, indicating strong institutional quality and less reliance on a single export source.

Models 6 was used to examine the relationship between global economic growth and PPP project success, using GDP growth to operationalize global real economy dynamics. While China's growth did not show a significant relationship to project outcomes, U.S. economic growth was found to be a significant factor contributing to project failure. The divergence may be attributed to the fact that China has consistently demonstrated greater resilience and independence in its fiscal and monetary policies. China's economic perfor-

mance maintains a notable degree of independence from both global and U.S. economic growth, with correlation coefficients of 0.08 and 0.07, respectively. Conversely, the U.S. economy exhibits a robust correlation with overall global economic health, reflecting a correlation factor of 0.73. Figure 9 portrays the trajectories of world GDP growth (depicted by the solid line), while the economic growth of the U.S. (represented by the dotted line) aligns closely with the global trend. In contrast, China's economic growth (indicated by the dashed line) appears largely disconnected from these trends.

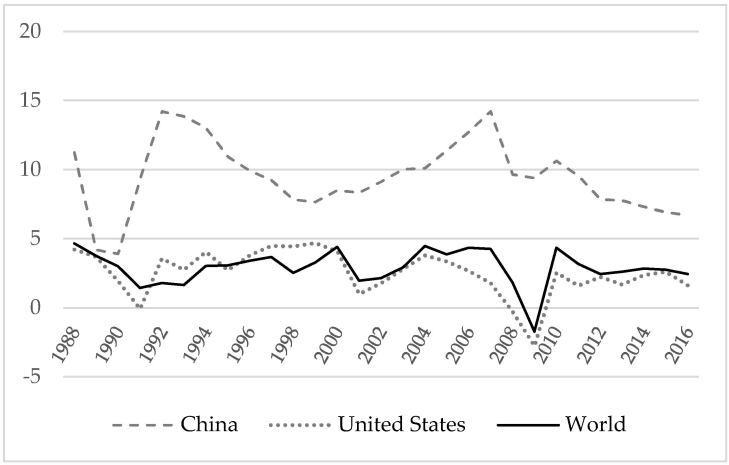



**Figure 9.** Trends of GDP growth in China, the U.S., and the world average.

Many investors perceive Chinese assets as a viable alternative and a safe haven during times of U.S. crises, favoring them as a means of risk evasion. The result reaffirms that the U.S. wields a dominant influence over the global real economy and financial markets. When the U.S. economy performs well, it leads to an increase in the value of U.S. assets, thereby diminishing the appeal of investing in emerging market infrastructure projects.

In Models 7–9, three financial indicators were added: standard deviations in LIBOR, average change in BRENT crude oil price, and standard deviation in the Nasdaq Composite Index. Of these indicators, only the standard deviation in LIBOR was found to have a highly significant impact, highlighting the importance of credit risk transmission in the infrastructure market. This finding may also be attributed to the fact that the infrastructure market is not as interconnected and liquid as the global financial market, suggesting that infrastructure assets have a low correlation with other asset classes. Overall, these findings suggest that financial indicators may have limited predictive power in assessing the resilience of PPP projects.

### *6.3. Sectoral and Regional and Project Type Differences*

Infrastructure assets exhibit significant heterogeneity [103], and our database breakdown revealed distinct characteristics across various infrastructure assets. To further investigate this diversity, we conducted an empirical analysis by utilizing five sets of dummy variables: income groups, regions, sectors, revenue sources, and project types. By employing these variables, we aim to capture the varied impact of infrastructure investments on different socio-economic segments and understand the nuanced implications of such investments. Please see Appendix B for the full results.

As shown in Table 13, our findings indicate that out of the three income groups, only the low-income group exhibits a significant vulnerability to project failure. Additionally, our analysis of region-specific dummy variables has revealed that projects in Africa and East Asia are more prone to failure, whereas those in South Asia are more likely to succeed [104]. While the energy sector was the only sectoral dummy variable that proved significant, both indicators for oil price fluctuations remained insignificant. The study also found that contract periods and fiscal support from the government were not significant predictors of project success.

**Table 13.** Results of models with dummies.

| Models with Dummies | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| LIC | 0.574 ** | | | | | | | | |
| MIC | | −0.0310 | | | | | | | |
| UMIC | | | −0.0801 | | | | | | |
| AFR | | | | 0.306 ** | | | | | |
| EAP | | | | | 0.735 ** | | | | |
| ECA | | | | | | −0.700 ** | | | |
| LAC | | | | | | | 0.151 | | |
| MENA | | | | | | | | 0 | |
| SAR | | | | | | | | | −0.908 ** |
| _cons | 1.752 ** | 1.758 ** | 1.675 ** | 1.730 ** | −2.175 ** | 1.948 ** | 1.760 ** | 1.615 ** | 1.556 ** |
| *N* | 3784 | 3784 | 3784 | 3784 | 3784 | 3784 | 3784 | 3724 | 3784 |
| **Models with Dummies (Cont'd)** | **(10)** | **(11)** | **(12)** | **(13)** | **(14)** | **(15)** | **(16)** | **(17)** | **(18)** |
| ENERGY | −0.284 ** | | | | | | | | |
| ICT | | 0.164 | | | | | | | |
| TRANSPORT | | | 0.129 | | | | | | |
| WATER | | | | 0.133 | | | | | |
| GOVRISK | | | | | −0.0661 | | | | |
| MARRISK | | | | | | −0.262 ** | | | |
| Contract period | | | | | | | −0.00713 | | |
| Greenfield | | | | | | | | −0.143 * | |
| Brownfield | | | | | | | | | 0.0925 |
| _cons | −1.590 ** | 1.765 ** | 1.725 ** | 1.741 ** | 1.654 ** | 1.723 ** | −1.291 ** | −1.548 ** | −1.705 ** |
| *N* | 3784 | 3784 | 3784 | 3784 | 3784 | 3784 | 2533 | (−4.26) | (−4.91) |

Notes: T-statistics in parentheses * $p < 0.10$, ** $p < 0.05$.

Two noteworthy discoveries emerged from our comparison of greenfield versus brownfield projects and market/revenue-based versus government-supported projects. Contrary to popular belief, our analysis revealed that greenfield projects and revenue-based projects, which are often regarded as riskier due to demand and construction risks, are significantly more likely to succeed. Conversely, government-supported and brownfield projects, which are typically viewed as less risky, proved to be insignificant. This finding implies that our perception of project-specific risks may be altered when considering the broader global context.

### *6.4. Policy Implications and Recommendations*

Table 14 provides a summary of the empirical findings, highlighting the impact of each variable on primary stakeholders. It becomes apparent that the government occupies a central position within the stakeholder network [105]. This centrality may be attributed to the inclusion of international variables. In light of global risk transmission, the government assumes a pivotal role in managing external risks, equipped with various financial and monetary policies at its disposal. Moreover, the Mundell–Fleming model [106,107] suggests that governments may have more fiscal flexibility when they consider external factors.

**Table 14.** Summary of empirical findings.

| Indicators | Impact | Impact on Primary Stakeholders |
|---|---|---|
| **Domestic variables** | | |
| Inflation | Positive | End users/Contractors |
| Openness/Trade Exposure | Positive | Government |
| PPP experience | Negative | Government/Private Partner |
| Federal or local government granted the contract | Negative | Government/Private Partner |
| FDI Inflow/Financial Exposure | Positive | Government |
| Exchange rate | Negative | Private Partners |
| **International variables** | | |
| U.S. GDP growth | Positive | All stakeholders |
| LIBOR fluctuations | Positive | Lenders |
| Stock market fluctuations | Positive | Private Partners |

It is crucial to recognize that while primary stakeholders are not necessarily the most impacted by risks, they may not always possess the most adept risk management capabilities. The dynamic nature of stakeholders underscores the importance of continual management, taking into account their diverse and evolving motivations. Such an approach fosters stakeholder relationship building, promotes checks and balances, and enhances overall project value. Based on these findings, the study proposes the following policy implications and recommendations:

Firstly, the study would like to reemphasize the dominant role which the government plays in the PPP initiatives of emerging economies. Government is at the center of formulating PPP-related policies and establishing an institutional environment that permits and encourages public–private partnerships [51]. Adverse actions of the government, including government interference, political instability, revocation of support, concession termination, and expropriation, have caused significant setbacks for many projects [63]. Institutional quality encompasses the quality of the country's legal and contractual environment. Equity investors and lenders require a well-defined legal and regulatory framework to establish the specific rights and responsibilities associated with private sector investments and promote private sector participation. Such a framework is crucial in increasing the certainty of long-term PPP contracts, which are essential for attracting private sector investment. The presence of clear legal and regulatory guidelines helps to provide a stable environment for private sector investment, thereby contributing to the outcomes of PPP projects [13].

Secondly, the policy implications of this study are particularly relevant to domestic monetary and fiscal policy. Both monetary and fiscal policy can stimulate output through low financing costs and lower interest rates, but at the cost of higher inflation [108]. The empirical findings suggest that lowering interest rates can reduce PPP project failure while rising inflation can increase it in the long run. Therefore, policymakers should be cautious when using monetary or fiscal policy to intervene in PPP projects, as such interventions may not always be effective [109]. In addition, the study found that variables such as GDP per capita and government support for projects were not significant predictors of success, further highlighting the limits of government intervention. These findings suggest that policymakers should consider alternative approaches to supporting PPP projects, such as improving the regulatory environment and enhancing private sector participation.

Lastly, the empirical findings suggest that while MDBs may not always be effective in supporting such projects, lower-income countries and the African region are significantly more vulnerable and require greater attention. As shown in Table 15, although MDBs do not have quotas or specific focuses on any region, income group, or sector, the study found that projects from LICs and Africa were less supported, possibly due to a lack of suitable projects in the pipeline. To address this gap, the study recommends that MDBs enhance their support for these countries and take their vulnerability to global risks into account. This could involve working closely with governments and private sector actors to identify suitable projects and facilitate their development, as well as providing targeted financial and technical assistance. Greater attention to PPP projects in lower-income countries and the African region could help to drive economic growth, reduce poverty, and promote sustainable development in these regions.

**Table 15.** MDB support rate.

| **MDB Support Rate (Supported Projects/Total Projects in That Category)** | | | | | |
|---|---|---|---|---|---|
| **Income Groups** | | **Regions** | | **Sectors** | |
| LIC | 76.8% | AFR | 77.3% | Energy | 85.2% |
| MIC | 84.3% | EAP | 94.6% | ICT | 84.7% |
| UMIC | 89.7% | ECA | 85.9% | Transport | 90.7% |
| | | LAC | 83.5% | Water and sewerage | 92.3% |
| | | MENA | 74.3% | | |
| | | SAR | 90.0% | | |

## 7. Conclusions

This research aimed to analyze the global determinants of risks in PPPs and investigate the mechanism of international risk transmission. A comprehensive theoretical foundation is provided by reviewing and selecting key determinants from various sources in the literature [110]. These determinants were then reorganized into a unified framework that incorporated both domestic and international variables. The framework also outlined the channels through which global risks are transmitted. This innovative framework makes a contribution to the field of PPP research, particularly in terms of analyzing risk factors and assessing their impact on project resilience. Specifically, the analysis underscores the pivotal role of the government and multilateral financial institutions in addressing risks that pose a threat to project outcomes.

First, the research findings highlight the significance of the transmission of risks from the international to the domestic level. High inflation, changes in U.S. GDP growth, as well as the fluctuations in exchange rates and the global borrowing rate (i.e., LIBOR) play significant roles in determining these outcomes. This finding highlights the systematic effects and deep roots of the impacts from the international arena on the PPP outcomes of individual countries [53]. Consequently, governments should remain attentive to the global repercussions on PPP projects during major risk events such as high global inflation or recession. Under such circumstances, it is essential for governments to provide relief measures, special financing arrangements, and credit enhancement measures to ensure sustainable development, preventing projects from failing or falling into distress due to short-term shocks from the global market.

Second, the study unveiled a noteworthy adverse effect of trade and financial exposure on PPP project outcomes, which presents a paradox considering that these factors are fundamental determinants of both PPP development and foreign engagement in emerging economies [1]. This finding underscores the importance of governments and investors being vigilant about the potential risks associated with PPP projects, even as the market becomes increasingly open to foreign interests and the potential benefits of increased infrastructure investment. It is crucial for governments to conduct a comprehensive ex ante evaluation of their country's expertise and capacity to manage risks before implementing PPP models [110]. Additionally, governments should consistently enhance the policy environment to foster sustainable outcomes. The study's results emphasize the significance of adopting a balanced approach to PPP development that takes into account both the potential benefits and risks associated with these projects.

While this study provides a valuable empirical analysis of the factors influencing global PPP resilience in the face of global risks, it is important to acknowledge its limitations. Firstly, the analysis is based on project data available only from 1990 to 2016, which may limit its relevance in understanding more recent developments such as the global COVID-19 pandemic outbreak in 2020. The global economic performance since the COVID-19 pandemic has shown that vulnerable supply chains resulting from epidemic prevention and control measures lead to dramatic increases in raw material prices and inflation, coupled with escalated oil prices due to the Russia–Ukraine conflict, causing cost overruns in numerous infrastructure projects. Additionally, stimulus measures implemented by many governments during the pandemic have led several countries to hike interest rates in response to high inflation, which further exacerbates the solvency challenges for emerging economies. The ever-evolving nature of international risk transmission requires ongoing research to capture the changing landscape. Secondly, the concept of project resilience in this study is primarily defined in terms of a binary classification of 'success' or 'failure'. However, resilience encompasses multifaceted aspects including financial sustainability, environmental sustainability, and more. The rationale behind this is rooted in the extensive scope of the World Bank PPI database, encompassing more than 7200 projects. Consequently, delving into the specific causes of failure and comprehensively outlining the outcomes for each project becomes an intricate challenge. Future research should explore these additional dimensions to comprehensively analyze the sustainability

of PPP development. Nonetheless, crafting a comprehensive database to encompass the multifaceted performance and contentment associated with infrastructure projects presents a formidable challenge, primarily due to issues related to data availability and resources. Governments may be the suitable stakeholder to initiate this considering the establishment of such an extensive database needs to capture macro-level data. This endeavor would also necessitate the development of multidimensional metrics, serving as tools to effectively gauge and operationalize the sustainability of these projects [9,109].

**Author Contributions:** Z.L.: Conceptualization; Formal analysis; Methodology; Project administration; Writing—original draft; Writing—review and editing; H.W.: Data curation; Investigation; Software; Supervision; Validation; Visualization; Writing—review and editing. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Data Availability Statement:** All data presented are available upon request from the corresponding author.

**Conflicts of Interest:** The authors declare no competing interests.

## Appendix A. Description of the Variables

Dependent variables

(1) Has the private investor exited (cancellation) or considered exiting (distress) the project? FAIL (discrete)—1 if the project is listed as being "distressed" or "cancelled", 0 if otherwise. Source: World Bank's PPI database.

Independent variables
Legal and institutional framework [Instrumental]

(1) Rule of Law: the extent to which agents have confidence in and abide by the rules of society; includes the quality of contract enforcement and property rights, the police, and the courts, as well as the likelihood of crime and violence: RULE (continuous)—country's average annual score for this criterion in the WGI (1996–2015 if available). Source: World Bank's WGI database. [First Stage]
(2) Control of corruption: the extent to which power is exercised for private gain; includes both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests: CORRUPT (continuous)—country's average annual score for this criterion in the WGI (1996–2015 if available). Source: World Bank's WGI database. [First Stage]
(3) Voice and accountability: the extent to which a country's citizens can participate in selecting their government; includes freedom of expression, freedom of association, and a free media: VOICE (continuous)—country's average annual score for this criterion in the WGI (1996–2015 if available). Source: World Bank's WGI database. [First Stage]

Macroeconomic—economic conditions

(1) Average rate of per capita GDP growth—this is a proxy for capacity to pay: GDP p.c. growth (continuous). Source: World Bank [Significant] [First Stage]
(2) Standard deviation in real exchange rate: Real effective ex. (continuous). Source: World Bank [Significant] [First Stage]
(3) Average of inflation rate: Inflation (continuous). Source: World Bank [Significant]
(4) Average change in real interest rate: Real interest rate (continuous). Source: World Bank [Significant]

International transfer of risk

(1) Financial Exposure: Average of change in FDI net inflows: Net FDI inflow (continuous). Source: World Bank [Significant] [First Stage]

(2) Trade Exposure: Average of the ratio of total exports plus imports divided by GDP: Openness (continuous). Source: World Bank [Significant] [First Stage]
(3) Average of short-term debt to exports ratio: St. debt to exports (continuous). Source: World Bank
(4) Average ratio of fuel and industrial exports to total exports: Ratio ind. exports (continuous). Variables for manufacturing exports ratio and agricultural exports ratio was not included due to the concern of multicollinearity, because they equal to 100% minus fuel and industrial material exports. Source: World Bank
(5) GDP growth: GDP Growth (continuous). Source: World Bank
    a. U.S. [Significant]
    b. China
(6) Financial indicators (continuous). Source: Federal Reserve Economic Data
    a. LIBOR (std.) [Significant]
    b. BRENT Crude Oil (ac.)
    c. Nasdaq Composite Index [Significant]

Project design phase

(1) Political risk guarantee: MLS (discrete)—1 if the project received a political risk guarantee from MFIs, 0 if otherwise. Source: World Bank's PPI database.
(2) Contracted with federal or local government? Central Gov. (discrete)—1 if the project was contracted with the federal government, 0 if otherwise. Source: World Bank's PPI database. [Significant]
(3) Average net lending (cash surplus or deficit): Fiscal Position (continuous). Source: World Bank [Significant]
(4) Contract period: Contract Period (continuous). Source: World Bank's PPI database.

Dummies

1. Sectoral variables (discrete)—the following variables are binary in nature; 1 if the condition is present, 0 if otherwise. Source: World Bank's PPI database.
    (1) ENERGY [Significant]
    (2) ICT
    (3) TRANSPORT
    (4) WATER
2. Country dummies (discrete)—the following variables are binary in nature; 1 if the condition is present, 0 if otherwise. Source: World Bank's PPI database.
    (1) LIC [Significant]/MIC/UMIC
    (2) AFR[Significant]/EAP/ECA/LAC/MENA
3. Time dummies (discrete)—time period between 2007 and 2008 (global financial crisis) and between 2010 and 2011 (sovereign debt crisis) are of particular interest; 1 if the condition is present, 0 if otherwise. Source: World Bank's PPI database.
    (1) D0708D if Investment Year = 2008/2009 or if Financial Closure Year = 2008/2009
    (2) D1011D if Investment Year = 2011/2012 or if Financial Closure Year = 2012/2013 [Significant]
4. Type of transaction (discrete)—the following variables are binary in nature; 1 if the condition is present, 0 if otherwise. Source: World Bank's PPI database.
    a. Brownfield
    b. Greenfield [Significant]

## Appendix B. Model Results

**Table A1.** Model Results (with Dummies).

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP p.c. growth (av.) | −1.123 | −0.594 | −0.882 | −1.088 | −4.795 ** | 0.183 | 0.122 | −1.178 | −1.467 | −1.085 | −0.745 | −0.863 | −0.904 | −0.877 | −0.568 | −0.0262 | −1.051 | −0.785 |
| | (−0.63) | (−0.33) | (−0.50) | (−0.61) | (−2.31) | (0.10) | (0.06) | (−0.65) | (−0.83) | (−0.59) | (−0.42) | (−0.48) | (−0.51) | (−0.49) | (−0.32) | (−0.01) | (−0.59) | (−0.44) |
| Inflation (av.) | 0.0655 ** | 0.0722 ** | 0.0652 ** | 0.0629 ** | 0.112 ** | 0.0830 ** | 0.0641 ** | 0.0648 ** | 0.0627 ** | 0.0633 ** | 0.0654 ** | 0.0674 ** | 0.0678 ** | 0.0647 ** | 0.0712 ** | 0.0341 * | 0.0628** | 0.0673 ** |
| | (3.99) | (4.30) | (3.99) | (3.77) | (3.96) | (4.31) | (3.79) | (3.80) | (3.82) | (3.53) | (3.92) | (4.04) | (4.11) | (3.89) | (4.31) | (1.71) | (3.79) | (4.09) |
| Fiscal position (av.) | −0.0000579 | −0.0000608 | −0.0000578 | −0.0000636 | −0.0000924 ** | −0.0000480 | −0.0000491 | −0.0000532 | −0.0000568 | −0.0000385 | −0.0000579 | −0.0000568 | −0.0000529 | −0.0000538 | −0.0000638 | −0.0000255 | −0.0000489 | −0.0000542 |
| | (−1.38) | (−1.47) | (−1.40) | (−1.52) | (−2.00) | (−1.15) | (−1.13) | (−1.24) | (−1.36) | (−0.92) | (−1.39) | (−1.37) | (−1.25) | (−1.28) | (−1.51) | (−0.64) | (−1.17) | (−1.30) |
| Openness (av.) | 0.00608 ** | 0.00612 ** | 0.00586 ** | 0.00605 ** | 0.00514 ** | 0.00779 ** | 0.00640 ** | 0.00575 ** | 0.00520 ** | 0.00566 ** | 0.00587 ** | 0.00593 ** | 0.00609 ** | 0.00587 ** | 0.00614 ** | 0.00781 ** | 0.00583 ** | 0.00603 ** |
| | (4.85) | (4.77) | (4.63) | (4.75) | (3.95) | (5.62) | (4.81) | (4.56) | (3.97) | (4.44) | (4.67) | (4.69) | (4.82) | (4.62) | (4.85) | (6.02) | (4.60) | (4.80) |
| Net FDI inflow (ac.) | 0.267 ** | 0.248 * | 0.260 ** | 0.276 ** | 0.242 * | 0.301 ** | 0.282 * | 0.280 ** | 0.264 ** | 0.246 * | 0.273 ** | 0.263 ** | 0.266 ** | 0.262 ** | 0.260 * | 0.314 ** | 0.256* | 0.263** |
| | (2.05) | (1.87) | (1.97) | (2.09) | (1.74) | (1.99) | (1.93) | (2.07) | (1.96) | (1.82) | (2.04) | (1.96) | (1.99) | (1.96) | (1.91) | (2.03) | (1.91) | (1.96) |
| Real effective ex. (std.) | −0.144 ** | −0.148 ** | −0.138 ** | −0.151 ** | −0.142 ** | −0.135 ** | −0.155 ** | −0.156 ** | −0.160 ** | −0.145 ** | −0.148 ** | −0.150 ** | −0.142 ** | −0.147 ** | −0.138 ** | −0.0518 | −0.145 ** | −0.148 ** |
| | (−2.47) | (−2.47) | (−2.27) | (−2.51) | (−2.34) | (−2.32) | (−2.58) | (−2.60) | (−2.46) | (−2.26) | (−2.47) | (−2.49) | (−2.37) | (−2.45) | (−2.24) | (−0.97) | (−2.40) | (−2.45) |
| PPP experience | −0.565 ** | −0.577 ** | −0.599 ** | −0.594 ** | −0.448 * | −0.455 ** | −0.587 ** | −0.622 ** | −0.589 ** | −0.574 ** | −0.577 ** | −0.558 ** | −0.612 ** | −0.600 ** | −0.591 ** | −1.146 ** | −0.623 ** | −0.600 ** |
| | (−2.58) | (−2.64) | (−2.77) | (−2.73) | (−1.86) | (−1.98) | (−2.67) | (−2.73) | (−2.69) | (−2.61) | (−2.65) | (−2.54) | (−2.81) | (−2.76) | (−2.67) | (−3.63) | (−2.86) | (−2.75) |
| MLS | 0.0345 | 0.0351 | 0.0463 | 0.0319 | 0.00827 | 0.0181 | 0.0258 | 0.0178 | −0.00527 | −0.0116 | 0.0350 | 0.0160 | 0.0292 | 0.0296 | 0.0438 | 0.0128 | 0.0239 | 0.0252 |
| | (0.29) | (0.29) | (0.39) | (0.27) | (0.07) | (0.15) | (0.21) | (0.15) | (−0.04) | (−0.10) | (0.29) | (0.13) | (0.25) | (0.25) | (0.37) | (0.09) | (0.20) | (0.21) |
| Central Gov. | −0.104 | −0.0791 | −0.0977 | −0.134 | 0.0281 | −0.0133 | −0.0530 | −0.0671 | −0.0634 | −0.0222 | −0.0752 | −0.0792 | −0.0546 | −0.0751 | −0.0739 | 0.0499 | −0.0746 | −0.0741 |
| | (−1.07) | (−0.81) | (−0.99) | (−1.35) | (0.27) | (−0.13) | (−0.53) | (−0.69) | (−0.65) | (−0.22) | (−0.78) | (−0.82) | (−0.55) | (−0.78) | (−0.76) | (0.42) | (−0.78) | (−0.77) |
| Real interest rate (ac.) | −0.0128 * | −0.0136 * | −0.0125 * | −0.0127 * | −0.0174 ** | −0.0164 ** | −0.0137 * | −0.0131 * | −0.0129 * | −0.0139 * | −0.0129 * | −0.0134 * | −0.0130 * | −0.0131 * | −0.0122 | −0.0124 | −0.0132* | −0.0136* |
| | (−1.78) | (−1.87) | (−1.71) | (−1.76) | (−2.24) | (−2.20) | (−1.87) | (−1.79) | (−1.77) | (−1.77) | (−1.79) | (−1.86) | (−1.80) | (−1.81) | (−1.64) | (−1.58) | (−1.83) | (−1.87) |
| St. debt to exports | −0.00318 | −0.00492 | −0.00442 | −0.00271 | −0.00581 | −0.00120 | −0.00475 | −0.00532 | −0.00546 | −0.00461 | −0.00410 | −0.00472 | −0.00490 | −0.00444 | −0.00499 | −0.000228 | −0.00455 | −0.00457 |
| | (−0.86) | (−1.35) | (−1.20) | (−0.71) | (−1.52) | (−0.32) | (−1.27) | (−1.42) | (−1.47) | (−1.21) | (−1.10) | (−1.27) | (−1.33) | (−1.20) | (−1.34) | (−0.05) | (−1.23) | (−1.24) |
| Ratio ind. exports | 0.00160 | 0.00397 | 0.00346 | 0.00283 | 0.00682 ** | 0.00279 | 0.00318 | 0.00320 | 0.00332 | 0.00426 | 0.00350 | 0.00393 | 0.00393 | 0.00357 | 0.00404 | 0.000573 | 0.00354 | 0.00361 |
| | (0.58) | (1.52) | (1.30) | (1.07) | (2.29) | (1.06) | (1.20) | (1.20) | (1.27) | (1.61) | (1.32) | (1.49) | (1.49) | (1.35) | (1.53) | (0.18) | (1.34) | (1.37) |
| LIBOR (std.) | 0.762 ** | 0.751 ** | 0.755 ** | 0.767 ** | 0.691 ** | 0.641 ** | 0.746 ** | 0.770 ** | 0.761 ** | 0.799 ** | 0.771 ** | 0.750 ** | 0.737 ** | 0.755 ** | 0.705 ** | 0.557 ** | 0.745 ** | 0.745 ** |
| | (5.11) | (4.99) | (5.03) | (5.09) | (4.45) | (4.17) | (4.92) | (5.09) | (5.03) | (4.85) | (5.12) | (4.99) | (4.89) | (5.04) | (4.58) | (3.39) | (4.98) | (4.97) |
| China GDP growth | −0.00930 | −0.0142 | −0.00949 | −0.00748 | −0.0334 | −0.0302 | −0.0134 | −0.00756 | −0.00488 | −0.00988 | −0.00924 | −0.0151 | −0.0113 | −0.0103 | −0.0145 | 0.0100 | −0.00991 | −0.0136 |
| | (−0.37) | (−0.56) | (−0.38) | (−0.29) | (−1.18) | (−1.12) | (−0.52) | (−0.29) | (−0.19) | (−0.39) | (−0.36) | (−0.59) | (−0.45) | (−0.41) | (−0.57) | (0.34) | (−0.39) | (−0.53) |
| U.S. GDP growth | 0.214 ** | 0.208 ** | 0.210 ** | 0.216 ** | 0.114 * | 0.159 ** | 0.223 ** | 0.222 ** | 0.222 ** | 0.217 ** | 0.217 ** | 0.209 ** | 0.213 ** | 0.215 ** | 0.187 ** | 0.227 ** | 0.216 ** | 0.210 ** |
| | (4.37) | (4.20) | (4.26) | (4.32) | (1.76) | (3.04) | (4.39) | (4.44) | (4.37) | (4.41) | (4.36) | (4.22) | (4.29) | (4.30) | (3.61) | (4.06) | (4.33) | (4.23) |
| LIC | 0.574 ** | | | | | | | | | | | | | | | | | |
| | (2.40) | | | | | | | | | | | | | | | | | |
| MIC | | −0.0310 | | | | | | | | | | | | | | | | |
| | | (−0.28) | | | | | | | | | | | | | | | | |
| UMIC | | | −0.0801 | | | | | | | | | | | | | | | |
| | | | (−0.75) | | | | | | | | | | | | | | | |
| AFR | | | | 0.306 ** | | | | | | | | | | | | | | |
| | | | | (1.99) | | | | | | | | | | | | | | |

**Table A1.** *Cont.*

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAP | | | | | 0.735 ** | | | | | | | | | | | | | |
| | | | | | (2.63) | | | | | | | | | | | | | |
| ECA | | | | | | −0.700 ** | | | | | | | | | | | | |
| | | | | | | (−3.45) | | | | | | | | | | | | |
| LAC | | | | | | | 0.151 | | | | | | | | | | | |
| | | | | | | | (1.23) | | | | | | | | | | | |
| MENA | | | | | | | | 0 | | | | | | | | | | |
| | | | | | | | | (omitted) | | | | | | | | | | |
| SAR | | | | | | | | | −0.908 ** | | | | | | | | | |
| | | | | | | | | | (−2.20) | | | | | | | | | |
| BRENT (ac.) | | | | | | | | | | 0.0144 | | | | | | | | |
| | | | | | | | | | | (1.42) | | | | | | | | |
| ENERGY | | | | | | | | | | −0.284 ** | | | | | | | | |
| | | | | | | | | | | (−3.24) | | | | | | | | |
| ICT | | | | | | | | | | | 0.164 | | | | | | | |
| | | | | | | | | | | | (1.14) | | | | | | | |
| TRANSPORT | | | | | | | | | | | | 0.129 | | | | | | |
| | | | | | | | | | | | | (1.43) | | | | | | |
| WATER | | | | | | | | | | | | | 0.133 | | | | | |
| | | | | | | | | | | | | | (1.32) | | | | | |
| GOVRISK | | | | | | | | | | | | | | −0.0661 | | | | |
| | | | | | | | | | | | | | | (−0.81) | | | | |
| MARRISK | | | | | | | | | | | | | | | −0.262 ** | | | |
| | | | | | | | | | | | | | | | (−2.10) | | | |
| Contract period | | | | | | | | | | | | | | | | −0.00713 | | |
| | | | | | | | | | | | | | | | | (−1.46) | | |
| Greenfield | | | | | | | | | | | | | | | | | −0.143 * | |
| | | | | | | | | | | | | | | | | | (−1.74) | |
| Brownfield | | | | | | | | | | | | | | | | | | 0.0925 |
| | | | | | | | | | | | | | | | | | | (0.98) |
| _cons | −1.752 ** | −1.758 ** | −1.675 ** | −1.730 ** | −2.175 ** | −1.948 ** | −1.760 ** | −1.615 ** | −1.556 ** | −1.590 ** | −1.765 ** | −1.725 ** | −1.741 ** | −1.654 ** | −1.723 ** | −1.291 ** | −1.548 ** | −1.705 ** |
| | (−5.06) | (−5.03) | (−4.73) | (−5.01) | (−5.21) | (−5.31) | (−4.95) | (−4.55) | (−4.43) | (−4.30) | (−5.07) | (−4.97) | (−5.01) | (−4.63) | (−4.91) | (−2.74) | (−4.26) | (−4.91) |
| *N* | 3784 | 3784 | 3784 | 3784 | 3784 | 3784 | 3784 | 3724 | 3784 | 3784 | 3784 | 3784 | 3784 | 3784 | 3784 | 2533 | 3784 | 3784 |

Notes: T-statistics in parentheses * $p < 0.10$, ** $p < 0.05$.

## References


1. Inderst, G.; Stewart, F. *Institutional Investment in Infrastructure in Emerging Markets and Developing Economies*; World Bank Publications: Washington, DC, USA, 2014. [CrossRef]
2. Akintoye, A.; Hardcastle, C.; Beck, M.; Chinyio, E.; Asenova, D. Achieving best value in private finance initiative project procurement. *Constr. Manag. Econ.* **2003**, *21*, 461–470. [CrossRef]
3. International Bank for Reconstruction and Development/The World Bank. *Guidance on PPP Contractual Provisions*, 2019th ed.; International Bank for Reconstruction and Development/The World Bank: Washington, DC, USA, 2019.
4. Buchanan, N.; Klingner, D.E. Performance-based contracting: Are we following the mandate? *J. Public Procure* **2007**, *7*, 301–332. [CrossRef]
5. Tate, W.L.; Ellram, L.M.; Bals, L.; Hartmann, E.; van der Valk, W. An Agency Theory perspective on the purchase of marketing services. *Ind. Mark. Manag.* **2010**, *39*, 806–819. [CrossRef]
6. Xu, Y.; Chan, A.P.C.; Yeung, J.F.Y. Developing a Fuzzy Risk Allocation Model for PPP Projects in China. *J. Constr. Eng. Manag.* **2010**, *136*, 894–903. [CrossRef]
7. Park, C.Y.; Jung, W.; Han, S.H. Risk Perception Gaps Between Construction Investors and Financial Investors of International Public-Private Partnership (PPP) Projects. *Sustainability* **2020**, *12*, 9003. [CrossRef]
8. Lee, M.; Han, X.; Quising, P.F.; Villaruel, M.L. Hazard analysis on public-private partnership projects in developing Asia. *J. Infrastruct. Policy Dev.* **2020**, *4*, 50–72. [CrossRef]
9. Liang, Y.; Wang, H. Sustainable Performance Measurements for Public-Private Partnership Projects: Empirical Evidence from China. *Sustainability* **2019**, *11*, 3653. [CrossRef]
10. Bocchini, P.; Frangopol, D.M.; Ummenhofer, T.; Zinke, T. Resilience and Sustainability of Civil Infrastructure: Toward a Unified Approach. *J. Infrastruct. Syst.* **2014**, *20*, 4014004. [CrossRef]
11. Ke, Y.; Wang, S.; Chan, A.P.C.; Cheung, E. Research Trend of Public-Private Partnership in Construction Journals. *J. Constr. Eng. Manag.* **2009**, *135*, 1076–1086. [CrossRef]
12. Aust, V.; Morais, A.I.; Pinto, I. How does foreign direct investment contribute to Sustainable Development Goals? Evidence from African countries. *J. Clean. Prod.* **2020**, *245*, 118823. [CrossRef]
13. Wang, Y.; Wang, Y.; Wu, X.; Li, J. Exploring the Risk Factors of Infrastructure PPP Projects for Sustainable Delivery: A Social Network Perspective. *Sustainability* **2020**, *12*, 4152. [CrossRef]
14. Francis, R.; Bekera, B. A metric and frameworks for resilience analysis of engineered and infrastructure systems. *Reliab. Eng. Syst. Saf.* **2014**, *121*, 90–103. [CrossRef]
15. South, A.J.; Levitt, R.E.; Dewulf, G.P. Dynamic stakeholder networks and the governance of PPPs. In *Advances in Public-Private Partnerships*; American Society of Civil Engineers: Reston, VA, USA, 2017; pp. 499–515.
16. Wegrzyn, J.; Wojewnik-Filipkowska, A. Stakeholder Analysis and Their Attitude towards PPP Success. *Sustainability* **2022**, *14*, 1570. [CrossRef]
17. Burke, R.; Demirag, I. Risk transfer and stakeholder relationships in Public Private Partnerships. *Account. Forum* **2017**, *41*, 28–43. [CrossRef]
18. Moykkynen, H.; Pantelias, A. Viability gap funding for promoting private infrastructure investment in Africa: Views from stakeholders. *J. Econ. Policy Reform* **2021**, *24*, 253–269. [CrossRef]
19. El-Gohary, N.; Osman, H.; El-Diraby, T. Stakeholder management for public private partnerships. *Int. J. Proj. Manag.* **2006**, *24*, 595–604. [CrossRef]
20. De Schepper, S.; Dooms, M.; Haezendonck, E. Stakeholder dynamics and responsibilities in Public-Private Partnerships: A mixed experience. *Int. J. Proj. Manag.* **2014**, *32*, 1210–1222. [CrossRef]
21. Kong, Z.; Ma, H.; Lv, K.; Shi, J.J.J. Liability of Foreignness in Public-Private Partnership Projects. *J. Constr. Eng. Manag.* **2023**, *149*, 4023085. [CrossRef]
22. Chudik, A.; Fratzscher, M. Liquidity, Risk and the Global Transmission of the 2007-08 Financial Crisis and the 2010–2011 Sovereign Debt Crisis. *Eur. Econ. Rev.* **2012**, *2012*, 2023452. [CrossRef]
23. Mazher, K.M.; Chan, A.P.C.; Choudhry, R.M.; Zahoor, H.; Edwards, D.J.; Ghaithan, A.M.; Mohammed, A.; Aziz, M. Identifying Measures of Effective Risk Management for Public-Private Partnership Infrastructure Projects in Developing Countries. *Sustainability* **2022**, *14*, 14149. [CrossRef]
24. Shi, L.; Zhang, L.; Onishi, M.; Kobayashi, K.; Dai, D. Contractual Efficiency of PPP Infrastructure Projects: An Incomplete Contract Model. *Math. Probl. Eng.* **2018**, *2018*, 3631270. [CrossRef]
25. Williamson, O.E. *The Economic Institutions of Capitalism*; Free Press: New York, NY, USA, 1985.
26. Jiang, Y.; Peng, M.W.; Yang, X.; Mutlu, C.C. Privatization, governance, and survival: MNE investments in private participation projects in emerging economies. *J. World Bus.* **2015**, *50*, 294–301. [CrossRef]
27. Zhang, X.Q. Critical success factors for public-private partnerships in infrastructure development. *J. Constr. Eng. Manag.* **2005**, *131*, 3–14. [CrossRef]
28. Osei-Kyei, R.; Chan, A.P.C. Review of studies on the Critical Success Factors for Public-Private Partnership (PPP) projects from 1990 to 2013. *Int. J. Proj. Manag.* **2015**, *33*, 1335–1346. [CrossRef]
29. Chan, A.P.C.; Lam, P.T.I.; Wen, Y.; Ameyaw, E.E.; Wang, S.; Ke, Y. Cross-Sectional Analysis of Critical Risk Factors for PPP Water Projects in China. *J. Infrastruct. Syst.* **2015**, *21*, 1. [CrossRef]

30. Ansell, C.; Gash, A. Collaborative governance in theory and practice. *J. Public Adm. Res. Theory* **2008**, *18*, 543–571. [CrossRef]
31. Irun, B.; Monferrer, D.; Angel Moliner, M. Network market orientation as a relational governance mechanism to public-private partnerships. *J. Bus. Res.* **2020**, *121*, 268–282. [CrossRef]
32. Fleta-Asin, J.; Munoz, F.; Rosell-Martinez, J. Public-private partnerships: Determinants of the type of governance structure. *Public Manag. Rev.* **2020**, *22*, 1489–1514. [CrossRef]
33. Slotterback, C.S. Public Involvement in transportation project planning and design. *J. Archit. Plan. Res.* **2010**, *27*, 144–162.
34. Freeman, R.E. *Strategic Management: A Stakeholder Approach*; Harper Collins: Boston, MA, USA, 1984.
35. Freeman, R.E.; Wicks, A.C.; Parmar, B. Stakeholder theory and "the corporate objective revisited". *Organ. Sci.* **2004**, *15*, 364–369. [CrossRef]
36. Clarkson, M.B.E. A Stakeholder framework for analyzing and evaluating corporate social performance. *Acad. Manag. Rev.* **1995**, *20*, 92–117. [CrossRef]
37. Mitchell, R.K.; Agle, B.R.; Wood, D.J. Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts. *Acad. Manag. Rev.* **1997**, *22*, 853–886. [CrossRef]
38. Okudan, O.; Cevikba, M. Alternative Dispute Resolution Selection Framework to Settle Disputes in Public-Private Partnership Projects. *J. Constr. Eng. Manag.* **2022**, *148*, 4022086. [CrossRef]
39. Dai, J.; Jiang, S.; Cheng, Z. Exploring the Applicability of the PPP in Tourist Toilets: Reflections on the Laoshan Case in China. *Buildings* **2023**, *13*, 790. [CrossRef]
40. Tserng, H.P.; Ho, S.-P.; Chou, J.-S.; Lin, C. Proactive measures of governmental debt guarantees to facilitate public-private partnerships project. *J. Civ. Eng. Manag.* **2014**, *20*, 548–560. [CrossRef]
41. Irwin, T. *Public Money for Private Infrastructure: Deciding When to Offer Guarantees, Output-Based Subsidies, and Other Fiscal Support*; World Bank: Washington, DC, USA, 2003.
42. Wang, Y.; Chen, L.; Zhuang, J. Pricing of Credit Default Swaps from the Perspective of Credit Enhancement in PPP Projects. *J. Constr. Eng. Manag.* **2023**, *149*, 5023006. [CrossRef]
43. Ho, S.P. Model for financial renegotiation in public-private partnership projects and its policy implications: Game theoretic view. *J. Constr. Eng. Manag.* **2006**, *132*, 678–688. [CrossRef]
44. Weber, B.; Alfen, H.W. *Infrastructure as an Asset Class: Investment Strategies, Project Finance and PPP.*; Wiley: West Sussex, UK, 2010.
45. Cesa-Bianchi, A. Housing cycles and macroeconomic fluctuations: A global perspective. *J. Int. Money Financ.* **2013**, *37*, 215–238. [CrossRef]
46. Wang, S.Q.; Tiong, R.L.K.; Ting, S.K.; Ashley, D. Evaluation and management of foreign exchange and revenue risks in China's BOT projects. *Constr. Manag. Econ.* **2000**, *18*, 197–207. [CrossRef]
47. Nielsen, B.B.; Asmussen, C.G.; Weatherall, C.D. The location choice of foreign direct investments: Empirical evidence and methodological challenges. *J. World Bus.* **2017**, *52*, 62–82. [CrossRef]
48. Liu, H.J.; Love, P.E.D.; Sing, M.C.P.; Smith, J. Ex Post Evaluation of Economic Infrastructure Assets: Significance of Regional Heterogeneities in Australia. *J. Infrastruct. Syst.* **2019**, *25*, 5019005. [CrossRef]
49. Gatti, S. *Project Finance in Theory and Practice: Designing, Structuring, and Financing Private and Public Projects*; Academic Press: Burlington, MA, USA, 2008.
50. Songer, A.D.; Molenaar, K.R. Selecting design-build: Public and private sector owner attitudes. *J. Manag. Eng.* **1996**, *12*, 47–53. [CrossRef]
51. Cao, F.; Wang, C. Accountability, Corruption and the Attention Paid to User Satisfaction in PPP Specifications: Evidence from China. *Buildings* **2023**, *13*, 492. [CrossRef]
52. Albalate, D.; Bel, G.; Gragera, A. Politics, risk, and white elephants in infrastructure PPPs. *Util. Policy* **2019**, *58*, 158–165. [CrossRef]
53. Krugman, P.R.; Obstfeld, M. *International Economics: Theory and Policy*, 7th ed.; Pearson: London, UK, 2012.
54. Appleyard, D.R.; Field, A.J.J.; Cobb, S.L. *International Economics*; McGraw Hill: New York, NY, USA, 2002.
55. Bhasin, N.; Paul, J. Exports and outward FDI: Are they complements or substitutes? Evidence from Asia. *Multinatl. Bus. Rev.* **2016**, *24*, 62–78. [CrossRef]
56. Rugman, A.M.; Verbeke, A.; Nguyen, Q.T.K. Fifty Years of International Business Theory and Beyond. *Manag. Int. Rev.* **2011**, *51*, 755–786. [CrossRef]
57. Dovern, J.; van Roye, B. International transmission and business-cycle effects of financial stress. *J. Financ. Stab.* **2014**, *13*, 1–17. [CrossRef]
58. Cashin, P.; Mohaddes, K.; Raissi, M. China's slowdown and global financial market volatility: Is world growth losing out? *Emerg. Mark. Rev.* **2017**, *31*, 164–175. [CrossRef]
59. Song, J.; Hu, Y.; Feng, Z. Factors Influencing Early Termination of PPP Projects in China. *J. Manag. Eng.* **2018**, *34*, 5017008. [CrossRef]
60. Yu, Y.; Chan, A.P.C.; Chen, C.; Darko, A. Critical Risk Factors of Transnational Public-Private Partnership Projects: Literature Review. *J. Infrastruct. Syst.* **2018**, *24*, 4017042. [CrossRef]
61. Ng, S.T.; Wong, Y.M.W.; Wong, J.M.W. Factors influencing the success of PPP at feasibility stage—A tripartite comparison study in Hong Kong. *Habitat Int.* **2012**, *36*, 423–432. [CrossRef]
62. Hammami, M.; Ruhashyankiko, J.F.; Yehoue, E.B. Determinants of public-private partnerships in infrastructure. *Int. Monet. Fund* **2006**, *2006*, 99.

63. Reside, R.E. Global Determinants of Stress and Risk in Public-Private Partnerships (PPP) in Infrastructure. *J. Int. Bus. Res.* **2009**, *8*, 133.
64. Reside, R.E.; Mendoza, A.M. Determinants of Outcomes of Public-Private Partnerships (PPP) in Infrastructure in Asia. UP School of Economics Discussion Papers. 2010. Available online: http://hdl.handle.net/10419/46616 (accessed on 13 July 2022).
65. Jimenez, A.; Russo, M.; Kraak, J.M.; Jiang, G.F. Corruption and Private Participation Projects in Central and Eastern Europe. *Manag. Int. Rev.* **2017**, *57*, 775–792. [CrossRef]
66. Jimenez, A.; Salvaj, E.; Lee, J.Y. Policy risk, distance, and private participation projects in Latin America. *J. Bus. Res.* **2018**, *88*, 123–131. [CrossRef]
67. Dailami, M.; Klein, M. Government Support to Private Infrastructure Projects in Emerging Markets. *Policy Research Working Paper Series*. 1998. Available online: https://books.google.co.jp/books?hl=zh-CN&lr=&id=OAt2r9QCSroC&oi=fnd&pg=PA1&dq=Government+support+to+private+infrastructure+projects+in+emerging+markets&ots=hLb3vDueXw&sig=xSqhMtAj_4E7VVfLrT2uZIL0oxw&redir_esc=y#v=onepage&q=Government%20support%20to%20private%20infrastructure%20projects%20in%20emerging%20markets&f=false (accessed on 21 July 2022).
68. Chiang, Y.-H.; Cheng, E.W.L. Perception of Financial Institutions toward Financing PFI Projects in Hong Kong. *J. Constr. Eng. Manag.* **2009**, *135*, 833–840. [CrossRef]
69. Hwang, B.-G.; Zhao, X.; Gay, M.J.S. Public private partnership projects in Singapore: Factors, critical risks and preferred risk allocation from the perspective of contractors. *Int. J. Proj. Manag.* **2013**, *31*, 424–433. [CrossRef]
70. Choi, S.M.; Kim, H.; Ma, X. Trade policies and growth in emerging economies: Policy experiments. *Rev. World Econ.* **2021**, *157*, 603–629. [CrossRef]
71. Zhao, Y. Borrowing constraints and the trade balance-output comovement. *Econ. Model.* **2013**, *32*, 34–41. [CrossRef]
72. Carbonara, N.; Pellegrino, R. Revenue guarantee in public-private partnerships: A win-win model. *Constr. Manag. Econ.* **2018**, *36*, 584–598. [CrossRef]
73. Shu, X.; Smyth, S.; Haslam, J. Post-decision project evaluation of UK public-private partnerships: Insights from planning practice. *Public Money Manag.* **2021**, *41*, 477–486. [CrossRef]
74. Tyson, J.; Karpowicz, I.; Delgado Coelho, M.; Burger, P. The Effects of the Financial Crisis on Public-Private Partnerships. In *International Monetary Fund Paper No.09-144*; International Monetary Fund: Washington, DC, USA, 2011. [CrossRef]
75. Jimenez, A.; Bayraktar, S.; Lee, J.Y.; Choi, S.-J. The multi-faceted impact of host country risk on the success of private participation in infrastructure projects. *Multinatl. Bus. Rev.* **2022**, *30*, 17–39. [CrossRef]
76. Henisz, W.J. The Institutional Environment for Economic Growth. *Econ. Politics* **2000**, *12*, 1–31. [CrossRef]
77. Soomro, M.A.; Zhang, X. Evaluation of the Functions of Public Sector Partners in Transportation Public-Private Partnerships Failures. *J. Manag. Eng.* **2016**, *32*, 4015027. [CrossRef]
78. Xiao, Z.; Lam, J.S.L. Willingness to take contractual risk in port public-private partnerships under economic volatility: The role of institutional environment in emerging economies. *Transp. Policy* **2019**, *81*, 106–116. [CrossRef]
79. Lomoro, A.; Mossa, G.; Pellegrino, R.; Ranieri, L. Optimizing Risk Allocation in Public-Private Partnership Projects by Project Finance Contracts. The Case of Put-or-Pay Contract for Stranded Posidonia Disposal in the Municipality of Bari. *Sustainability* **2020**, *12*, 806. [CrossRef]
80. Holburn, G.L.F.; Zelner, B.A. Political capabilities, policy risk, and international investment strategy: Evidence from the global electric power generation industry. *Strateg. Manag. J.* **2010**, *31*, 1290–1315. [CrossRef]
81. Pan, X.; Guo, S.; Han, C.; Wang, M.; Song, J.; Liao, X. Influence of FDI quality on energy efficiency in China based on seemingly unrelated regression method. *Energy* **2020**, *192*, 116463. [CrossRef]
82. Benassy-Quere, A.; Fontagne, L.; Lahreche-Revil, A. Exchange-rate strategies in the competition for attracting foreign direct investment. *J. Jpn. Int. Econ.* **2001**, *15*, 178–198. [CrossRef]
83. Jiang, X.; Lu, K.; Xia, B.; Liu, Y.; Cui, C. Identifying Significant Risks and Analyzing Risk Relationship for Construction PPP Projects in China Using Integrated FISM-MICMAC Approach. *Sustainability* **2019**, *11*, 5206. [CrossRef]
84. Chowdhury, A.N.; Chen, P.-H.; Tiong, R.L.K. Credit enhancement factors for the financing of independent power producer (IPP) projects in Asia. *Int. J. Proj. Manag.* **2015**, *33*, 1576–1587. [CrossRef]
85. Sung, T.; Park, D.; Park, K.Y. Short-Term External Debt and Foreign Exchange Rate Volatility in Emerging Economies: Evidence from the Korea Market. *Emerg. Mark. Financ. Trade* **2014**, *50*, 138–157. [CrossRef]
86. Jayasena, N.S.; Chan, D.W.M.; Kumaraswamy, M.M.; Saka, A.B. Applicability of public-private partnerships in smart infrastructure development: The case of Hong Kong. *Int. J. Constr. Manag.* **2023**, *23*, 1932–1944. [CrossRef]
87. Liang, X.; Li, P. Empirical Study of the Spatial Spillover Effect of Transportation Infrastructure on Green Total Factor Productivity. *Sustainability* **2021**, *13*, 326. [CrossRef]
88. Spoann, V.; Fujiwara, T.; Seng, B.; Lay, C.; Yim, M. Assessment of Public-Private Partnership in Municipal Solid Waste Management in Phnom Penh, Cambodia. *Sustainability* **2019**, *11*, 1228. [CrossRef]
89. Munir, K.; Bukhari, M. Impact of globalization on income inequality in Asian emerging economies. *Int. J. Sociol. Soc. Policy* **2020**, *40*, 44–57. [CrossRef]
90. Kolerus, C.; Saborowski, C. *China's Footprint in Global Commodity Markets*; International Monetary Fund: Washington, DC, USA, 2016.
91. Aastveit, K.A.; Bjornland, H.C.; Thorsrud, L.A. What drives oil prices? Emerging versus developed economies. *J. Appl. Econom.* **2015**, *30*, 1013–1028. [CrossRef]

92. Gauvin, L.; Rebillard, C.C. Towards recoupling? Assessing the global impact of a Chinese hard landing through trade and commodity price channels. *World Econ.* **2018**, *41*, 3379–3415. [CrossRef]
93. McFadden, D. Conditional Logit Analysis of Qualitative Choice Behavior. In *Frontier of Econometrics*; Zarembka, P., Ed.; Academic Press: New York, NY, USA, 1974.
94. Newey, W.K. Efficient estimation of limited dependent variable models with endogenous explanatory variables. *J. Econom.* **1987**, *36*, 231–250. [CrossRef]
95. Rivers, D.; Vuong, Q.H. Limited information estimators and exogeneity tests for simultaneous probit models. *J. Econom.* **1988**, *39*, 347–366. [CrossRef]
96. Stock, J.; Watson, M. *Introduction to Econometrics*, 3rd ed.; Addison-Wesley: Boston, MA, USA, 2011.
97. Cameron, A.C.; Trivedi, P.K. *Microeconometrics Using Stata*, Revised ed.; Stata Press: College Station, TX, USA, 2010.
98. Baum, C.F. *An Introduction to Modern Econometrics Using Stata*; Stata Press: College Station, TX, USA, 2006.
99. Campos, J.; Ericsson, N.R.; Hendry, D.F. General-to-Specific Modeling: An Overview and Selected Bibliography. *Federal Reserve International Finance Discussion Papers*. 2005. Available online: https://www.federalreserve.gov/pubs/ifdp/2005/838/ifdp838.pdf (accessed on 17 August 2022).
100. Naoum, S.G. *Dissertation Research and Writing for Construction Students*; Elsevier: Oxford, UK, 1998.
101. Neter, J.; Wasserman, W.; Kutner, M.H. *Applied Linear Statistical Models: Regression, Analysis of Variance and Experimental Designs*, 2nd ed.; Irwin: Huntersville, NC, USA, 1985.
102. Inderst, G. Infrastructure as an Asset Class. *EIB Pap.* **2011**, *15*, 70–105.
103. Chunling, L.; Memon, J.A.; Thanh, T.L.; Ali, M.; Kirikkaleli, D. The Impact of Public-Private Partnership Investment in Energy and Technological Innovation on Ecological Footprint: The Case of Pakistan. *Sustainability* **2021**, *13*, 10085. [CrossRef]
104. Shi, J.-g.; Si, H.; Wu, G.; Su, Y.; Lan, J. Critical Factors to Achieve Dockless Bike-Sharing Sustainability in China: A Stakeholder-Oriented Network Perspective. *Sustainability* **2018**, *10*, 2090. [CrossRef]
105. Mundell, R.A. Capital mobility and stabilization policy under fixed and flexible exchange rates. *Can. J. Econ. Political Sci.* **1963**, *29*, 475–485. [CrossRef]
106. Fleming, J.M. Domestic financial policies under fixed and floating exchange rates. *IMF Staff Pap.* **1962**, *9*, 369–379. [CrossRef]
107. Gong, J.; Lu, Y.; Xu, Y.; Fu, J. Fiscal Pressure and Public-Private Partnership Investment: Based on Evidence from Prefecture-Level Cities in China. *Sustainability* **2022**, *14*, 14979. [CrossRef]
108. Cong, X.; Ma, L. Performance Evaluation of Public-Private Partnership Projects from the Perspective of Efficiency, Economic, Effectiveness, and Equity: A Study of Residential Renovation Projects in China. *Sustainability* **2018**, *10*, 1951. [CrossRef]
109. Sukasuka, G.N.; Musonda, I.; Ramabodu, M.S.; Zulu, S.L. Social Dimensions in Ex-Post Evaluation of Public Private Partnership Infrastructure Projects: A Scoping Review. *Sustainability* **2022**, *14*, 15808. [CrossRef]
110. Fernandes, C.; Cruz, C.O.; Moura, F. Ex post evaluation of PPP government-led renegotiations: Impacts on the financing of road infrastructure. *Eng. Econ.* **2019**, *64*, 116–141. [CrossRef]