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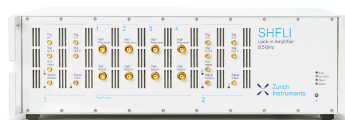
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Contract Renegotiation in PPPs: Evidence from Italy

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Abstract. Public-Private Partnership (PPP) has gained participation in the project deliveries because of its life-cycle approach incorporating the design, construction, and long-term operation of public infrastructure. Despite its multiple strengths, PPPs projects are characterized by heterogenous time and cost performances because of the frequent occurrence of missed deadlines and cost overruns. These heterogeneous performances vary among the multiple types of PPP such as Build Operate Transfer (BOT) and Build Lease Transfer (BLT), each, with different contractual characteristics. The PPP body of knowledge has studied the frequency and value of renegotiations in different countries. However, the PPP literature still lacks analyzing the risks that motivated these renegotiations based on a national PPP program basis. To address this gap, this study collected data from the Italian public dataset to examine the risks that lead to contract modifications in BOT and BLT PPPs from 2007 to 2021. Results demonstrate that three infrastructure types adopt significantly BLT as the preferred project delivery, namely, *healthcare*, *energy*, and *education infrastructure*. These types of arrangements are used to be driven by motivations regarding taxation savings contrasting to the partnership advantages promoted by BOT projects. Interestingly, two out of the three projects that preferred BLT schemes (i.e., *healthcare and energy*) were the infrastructure types with the highest renegotiations. Consequently, contractual arrangements motivated by taxation advantages rather than efficiency in the partnership may result in higher renegotiation rates. Conversely, BOT is the preferred project delivery for other infrastructure types such as transport infrastructure, waste treatment, and water PPP projects. Surprisingly, two out of the three most common causes of PPP renegotiations are endogenous risks that are allocated to the private sector, namely, *performance* and *technology/materials*. This intended allocation is not consequently adopted during long-term lifecycle projects through litigation resulting in effective contractual modifications. Results also demonstrate that the infrastructure type matters for renegotiations. Three risks demonstrated a much higher proportion of significance for BLT respecting BOT projects, namely, *change in law*, *technical issues*, and *design*. Consequently, BLT projects are especially focused on buildings for specific sectors that require a high level of requirements for the operation during the lease. As a result, these projects tend to be located in urban areas and the services that the concessionaire has to provide for the long-term leasing frequently motivates litigation aiming for contractual modifications. Conversely, BOT projects demonstrated a higher proportion of contractual modifications derived from performance and project site. Unlike BLT, BOT projects contain a higher proportion of linear and non-urban projects such as interurban transportation infrastructure and energy projects, among others. This higher impact of risks derived from unlikely events that entail meaningful consequences resulting in contractual modifications in BOT reveals that linear and non-urban projects are more susceptible to facing unforeseen unlikely events regarding project site and archeological unforeseen findings.

INTRODUCTION

Public-Private Partnerships (PPP) has positioned as the preferred project delivery for developing megaprojects in the last few decades [1], [2]. The integration of design, construction, operation, and maintenance on one single contract has been claimed as a meaningful advantage to reduce renegotiations by integrating activities under a single concessionaire [3], [4]. Despite this intended purpose, PPPs have not been exempted from time delays, cost overruns, and renegotiations [5]–[7].

The complexity and duration of PPPs result in higher contractual, transaction, and legal costs and uncertainty than traditional project deliveries [8]. To face uncertainty, risk management is implemented in project management for identifying, analyzing, and responding to project risk, which aims for maximizing the probability and consequences of positive events and the minimization of the probability and consequences of events adverse to the project objectives

[9], [10]. However, frequently the negative impacts of risks trigger renegotiations in PPPs, affecting the intended time and cost in the baseline [11]. Renegotiations trigger adjustments favorable to the private party when economic conditions deteriorate due to multiple reasons such as user demand, macroeconomic changes during the concession, or changes in technical features that impact economics, among others [12].

Despite the contractual clauses and the managerial efforts, project uncertainties are translated into risks affecting the PPP projects' lifecycle [13]. Risks management objectives are hindered by multiple elements such as the public sector's bounded rationality, uncertainty, and opportunism [14]. Cost and time indicators metrics allow for assessing the occurrence and impact of risks when compared with the baseline scenario. Simultaneously, non economic metrics may also be incorporated to assess the impact of social impacts [15].

The PPP body of knowledge has studied the frequency and value of renegotiations in different countries [12], [16]. However, the PPP literature still lacks analyzing the risks that motivated these renegotiations based on a national PPP program basis. To address this gap, this study collected data from the Italian public dataset to examine the risks that lead to contract modifications in BOT and BLT PPPs from 2007 to 2021.

BACKGROUND

The Public-Private Partnership (PPP) does not have a single, unequivocal definition in the academic literature. There are, therefore, various definitions of PPP, which make it possible to make explicit the common points of this type of project delivery. However, most authors agree on recognizing PPP as a mechanism of cooperation between the private and public sectors aiming for the financing, construction, renovation, operation, or maintenance of infrastructure and services by integrating the operational, managerial, and innovative skills of the private sector with the social responsibility skills of the public sector [17].

PPPs are complex long-term contractual forms in highly regulated sectors leading to shortcomings [18]. For these reasons, renegotiations are very common in this form of cooperation between the public and private sectors. There is permanent contraposition between the need of the public sector for public PPP infrastructure and the significant cost- and time overruns due to renegotiations [17].

The impact of potential renegotiations in PPPs is mainly focused on cost and time overruns for these megaprojects. Given the complexity of PPPs and the uncertainty throughout their lifecycle, the likelihood of changes to timing and cost is certainly significant. Renegotiations are usually triggered by the private sector, but the public sector suffers the consequences of liabilities [19]. Renegotiations that impact cost and schedule may come from multiple causes even under non-extreme circumstances. Moreover, in the last few years global exogenous unforeseen events, such as the COVID-19 pandemic and Ukraine's war, have brought worse economic and financial conditions for PPPs leading to increasing renegotiations [20]–[22].

Previous literature has proposed multiple taxonomies of project risks using risk breakdown matrixes. However, the analysis of renegotiations in national PPP projects usually lacks identification of the risks that trigger these contractual modifications. Moreover, this study distinguishes two main types of PPPs, namely, Build-Operate-Transfer (BOT) and Build-Lease-Transfer (BLT).

RESEARCH METHODOLOGY

In order to analyze the Italian PPP projects, the authors collected data from the public dataset with the general information of the contracts (i.e., ANAC). This public dataset contains the information gathered from public agencies concerning the initial public procurement previous to any modification or renegotiation. This dataset is composed of more than 5 million registries referred to all the public projects procured in Italy from 2007 to 2021. The most significant information from the public database for this research is presented in Table 1.

Then, a screening process was conducted to remove non-PPP projects, as shown in Figure 1. Once the screening process was completed, the general database was paired with two additional databases focused on the modifications and suspensions of the projects using the software R.

Finally, the motivation for the suspensions and modifications were translated from legislative acts into renegotiation risks. For doing so, a rubric was created to standardize the risks derived from the legal framework referred to in the database into specific risks, which is a common approach for risk analysis [19], [23], [24]. The list of risks considered in the rubric is presented in Table 2. For example, in the Legislative Decree N° 163 of 2006, the article 205 paragraph one has been converted to "Archeological risk".

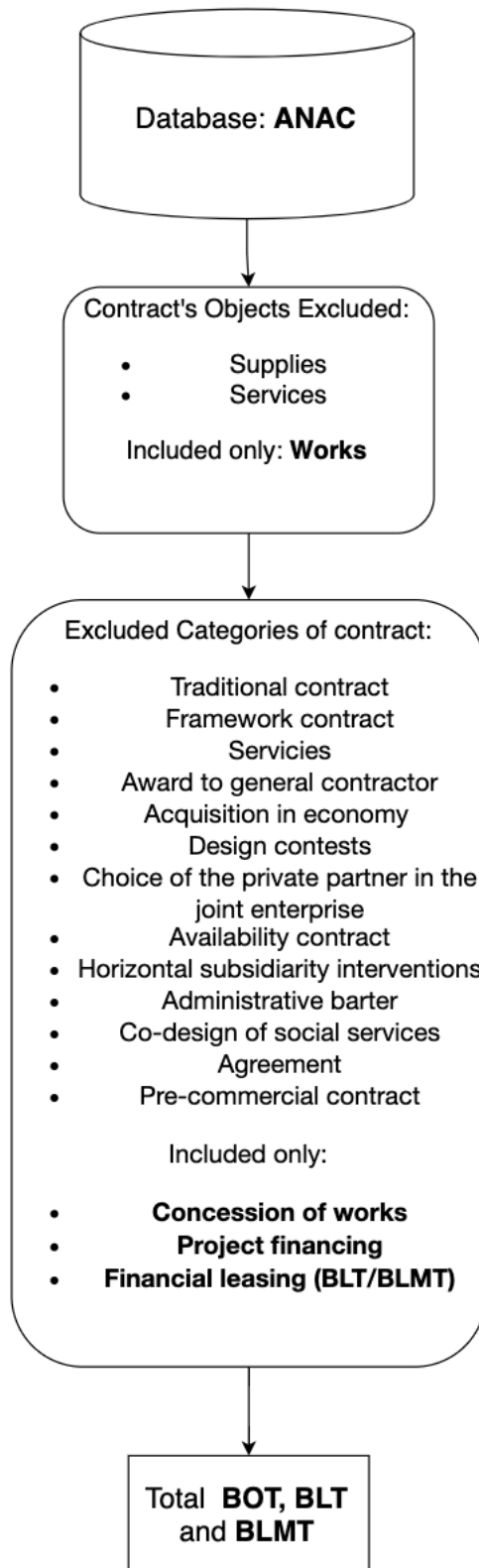


FIGURE 1. Source code related to filtering and creation of the file containing PPPs only

TABLE 1. Description of the public dataset information considered

Variable name	Description
Cig	Value to identify uniquely each contract
Tender's object	Summary description of the purpose of the contract
Total tender amount	Total amount for design, construction, and any maintenance and operation
Main object of the contract	Indicate whether the Contracting Authority operates in the ordinary sectors
Publication date	Date of publication of the notice
Type of choice of contractor	Direct award, negotiated procedure, restricted procedure, open procedure, and competitive dialogue
Type of contract	Description of how the tender will be carried out: Concession, traditional procurement, project financing, etc.
Contracting authority name	Name of the administration issuing the invitation to tender or purchase
Regional section	Regional reference section for sending data
Variant reason	Description of the reason for the variant
ID Variant	Value to identify uniquely each variant
Suspension of work reason	Description of the reason for the suspension
ID Suspension	Value to identify uniquely each suspension
Suspension date	Suspension start date
Date of resumption of work	End date of suspension of work

RESULTS & DISCUSSION

Once the screening process was conducted to remove non-PPP projects, 554 projects resulted initiated from 2007 to 2021 in Italy. In total, 113 renegotiations were conducted in 37 projects. To establish a comparative analysis between the multiple types of infrastructure, Figure 2 presents the projects and renegotiation according to the infrastructure type on a percentual basis.

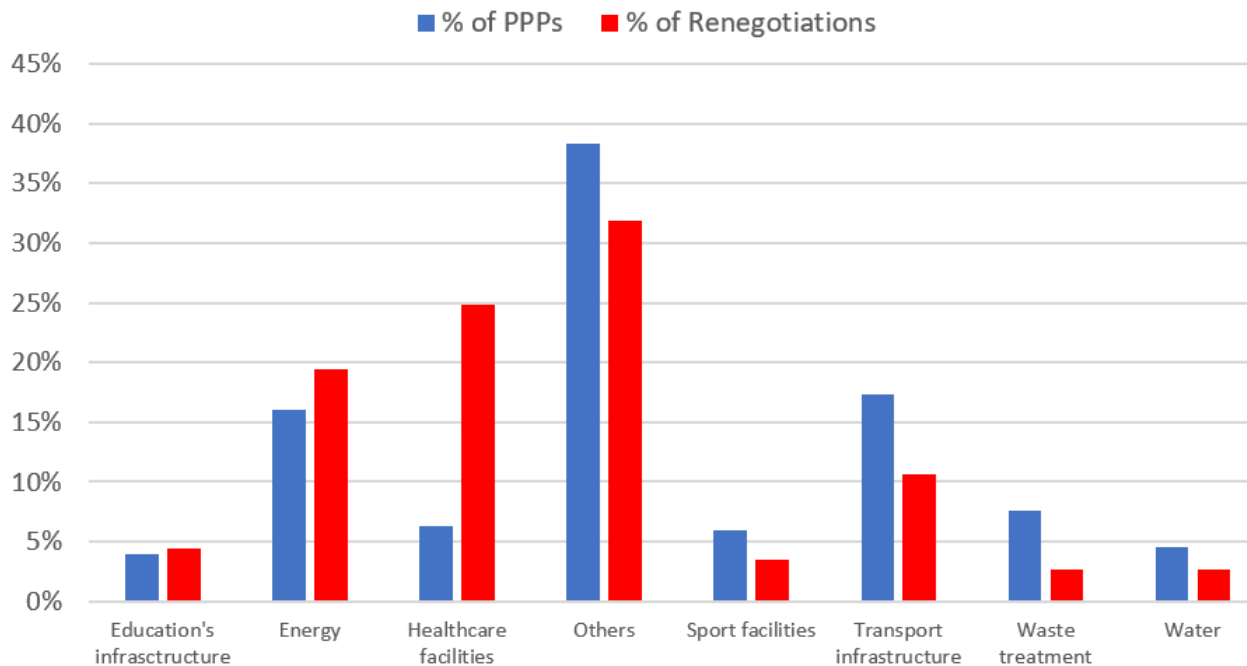


FIGURE 2. Distribution of PPPs and renegotiations according to their sectors

Most of the infrastructure types demonstrated a lower proportion of renegotiation in comparison to their market participation. However, two infrastructure types demonstrated a higher proportion of renegotiations: *energy* and *healthcare facilities*. In effect, those infrastructure types represent 16% and 6% of the PPPs but are responsible for 20% and 25% of the total number of renegotiations. This finding is especially significant considering the relevance of healthcare and energy projects to face the recent crises derived from the COVID-19 pandemic and the war in Ukraine.

The COVID-19 pandemic increased the pressure on healthcare facilities required for patients with significant respiratory complications. Italy is the 8th and 9th country around the world with the highest number of deaths and cases of COVID reported as of May 5, 2022 [25]. Moreover, the issues in the energy transition have been increased because of the war in Ukraine positioning the investment in energy production as a first-order priority in Europe, especially in countries highly dependent on Russian supplies such as Italy. The significance of healthcare and energy infrastructure nowadays contrasts with the highest proportion of renegotiations of these projects in Italy.

Figure 3 and 4 summarizes the participation of BOT and BLT among the infrastructure types. Overall, three infrastructure types adopt significantly BLT as the preferred project delivery, namely, *healthcare*, *energy*, and *education infrastructure*. These types of arrangements are used to be driven by motivations regarding taxation savings contrasting to the partnership advantages promoted by BOT projects [8]. Interestingly, two out of the three projects that preferred BLT schemes (i.e., *healthcare* and *energy*) were the infrastructure types with the highest renegotiations. This finding suggests that long-term contractual arrangements motivated by taxation advantages rather than efficiency in the partnership may result in higher renegotiation rates.

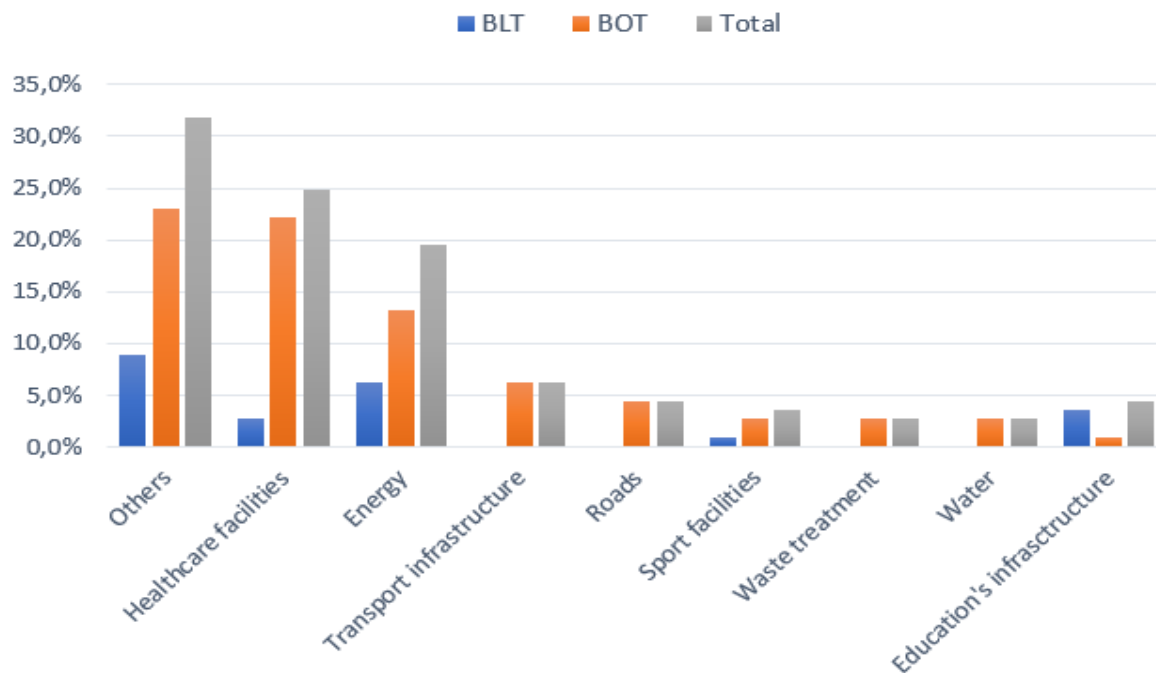


FIGURE 3. Distribution of renegotiation in all the PPP sectors

Conversely, BOT is the preferred project delivery for other infrastructure types such as *transport infrastructure*, *waste treatment*, and *water* PPP projects. Traditionally, BOT contracts focus on private efficiency where the

concessionaire is benefited by a life-cycle perspective looking for long-term savings and operation derived from planning and design focused on the operation rather than only on the construction of facilities [11], [18], [26].

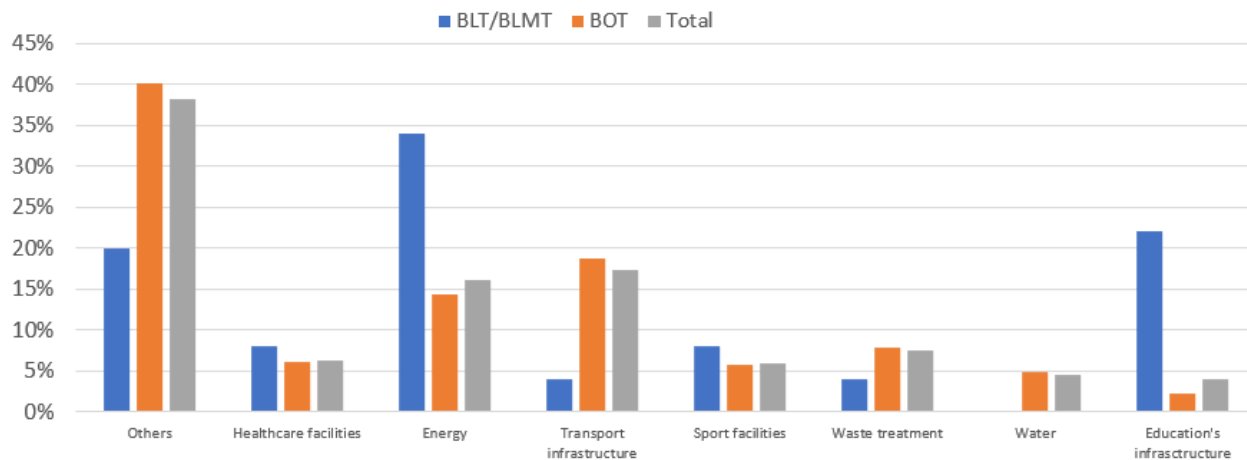


FIGURE 4. Distribution of BOT and BLT PPPs

The distribution of renegotiations regarding their sectors for BOT and BLT PPPs also was analyzed. Table 2 shows the number of renegotiations for each PPP sector. Unsurprisingly, the *Energy* and *Healthcare facilities* sectors occupied the two main positions for specific sectors regarding renegotiations in the BOTs and BLTs. Overall, the *Healthcare* and *Energy* sector represented 25% and 20% of the total changes/suspensions of work in the PPPs analyzed. This underperformance contrast with the scarce research on risk management focused specifically on these two sectors to propose suitable policies and recommendations for reducing this misbehavior.

TABLE 2. Frequency of occurrence of modifications/suspensions derived from sectors in BOT and BLT PPPs

Sector	BOT	BLT	TOTAL PPPs
Others	26	10	36
Healthcare Facilities	25	3	28
Energy	15	7	22
Transport	7	0	7
Roads	5	0	5
Water	3	0	3
Waste Treatment	3	0	3
Sport Facilities	3	1	4
Education	1	4	5
Total	88	25	113

For analyzing the causes of the renegotiations, this study faces the challenge of identifying the risks and their subsequent quantification. Risk identification and quantification entail an intrinsic difficulty in obtaining quantitative and not qualitative and/or subjective values. There are several studies regarding possible taxonomies of risk matrices to be used in a construction project [11], but it is difficult for those who use them to quantify renegotiations derived from each risk. Based on the analysis of the public dataset and previous literature on risk taxonomy [25], the most significant risks that motivated contractual modifications or suspensions of works were retrieved, as shown in Table 3.

TABLE 3. Risks' Description

Risk	Brief Description
Weather Conditions	Adverse weather conditions
Performance	Failures in meeting the intended specifications
Technology/Materials	Equipment problems or inadequate technology
Technical Issues	Issues associated with technical failures
Unspecified	Other unspecified
Force Majeure	Unlikely events associated with Force Majeure
Project site	Events dependent on the nature and specificity of the assets and locations
Political opposition	Opposition to the project by public sector agencies
Contracting Authority	Issues caused by decisions of the contracting authority
Change in law	Change in laws directly affecting the project development
Archeological risk	Issues due to important archaeology discoveries
Design	Errors and/or omissions in the design

This list of possible risks constitutes the main triggers of renegotiations and modifications for BOT and BLT projects. This distinction allows us to analyze the significance of specific risks comparatively within the overall PPP projects.

Table 4 depicts the number of modifications/suspensions that occurred between 2007 and 2021 in BOT and BLT PPPs and their main risk trigger. Overall, the total number of risk events in BOT projects is almost four times the risk events produced in BLT, accordingly to the proportion of each type of PPP.

TABLE 4. Frequency of occurrence of modifications/suspensions derived from risks in BOT and BLT PPPs

Risk	BOT	BLT	TOTAL Renegotiations
Performance	29	5	34
Technology/Materials	14	4	18
Unspecified	13	5	18
Project site	10	1	11
Change in law	4	7	11
Contracting Authority	4	1	5
Weather conditions	3	1	4
Technical issues	3	3	6
Archeological risk	2	0	2
Force majeure	2	0	2
Political opposition	1	0	1
Design	0	1	1
Total	88	25	113

Surprisingly, two out of the three most common causes of modifications/suspensions for PPPs shown in Table 4 are endogenous risks that are allocated to the private sector, namely, *performance*, and *technology/materials*. In effect, the risk management literature emphasizes that endogenous risks regarding the performance of the private sector in the construction and operations phases should be completely allocated to the concessionaire because it is in a better position to manage these risks than the public sector. These risks are theoretically allocated to the private sector according to the Italian regulations; however, this intended allocation is not consequently adopted during long-term lifecycle projects through litigation resulting in effective contractual modifications.

Interestingly, three risks demonstrated a much higher proportion of significance for BLT respecting BOT projects, namely, *change in law*, *technical issues*, and *design*. This higher impact of those risks in BLT suggests that the infrastructure type matters. Consequently, BLT projects are especially focused on buildings for specific sectors that require a high level of requirements for the operation during the lease. As a result, these projects tend to be located in urban areas and the services that the concessionaire has to provide for the long-term leasing frequently motivates litigation aiming for contractual modifications.

Conversely, BOT projects demonstrated a higher proportion of contractual modifications derived from *performance* and *project site*, according to Figure 5. Unlike BLT, BOT projects contain a higher proportion of linear and non-urban projects such as interurban transportation infrastructure and energy projects, among others. This higher impact of risks derived from unlikely events that entail meaningful consequences resulting in contractual modifications in BOT reveals that linear and non-urban projects are more susceptible to facing unforeseen unlikely events regarding project site and archeological unforeseen findings.

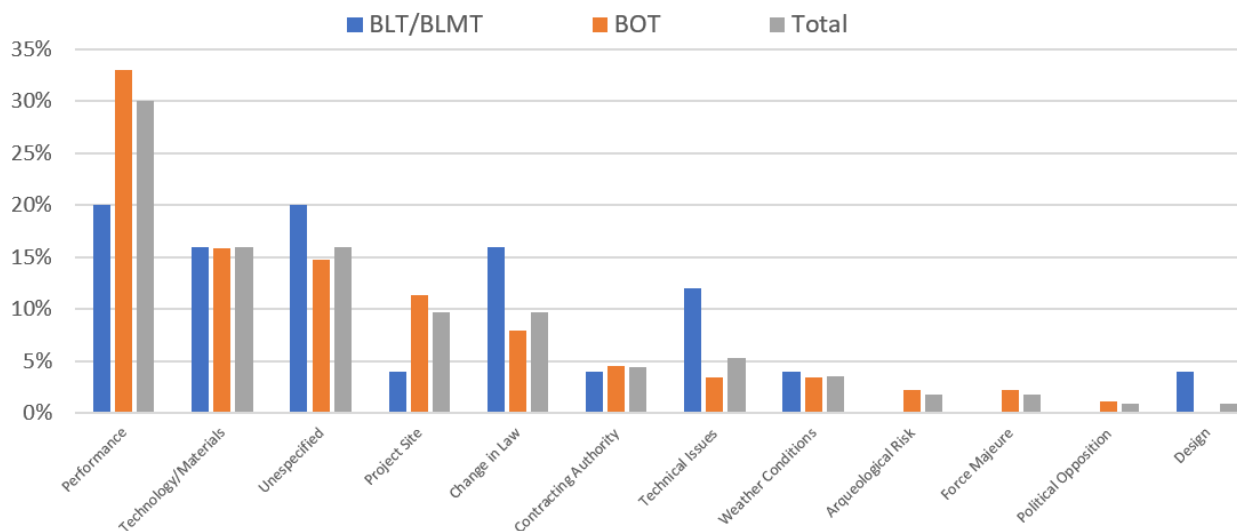


FIGURE 5. Distribution of renegotiations according to their risk causes

CONCLUSION

The PPP body of knowledge has studied the frequency and value of renegotiations in different countries. However, the PPP literature still lacks analyzing the risks that motivated these renegotiations based on a national PPP program basis. To address this gap, this study collected data from the Italian public dataset to examine the risks that lead to contract modifications in BOT and BLT PPPs from 2007 to 2021.

From the analysis of the available data carried out, results demonstrate that three infrastructure types adopt significantly BLT as the preferred project delivery, namely, *healthcare*, *energy*, and *education infrastructure*. These types of arrangements are used to be driven by motivations regarding taxation savings contrasting to the partnership advantages promoted by BOT projects. Interestingly, two out of the three projects that preferred BLT schemes (i.e., *healthcare* and *energy*) were the infrastructure types with the highest renegotiations, representing 25% and 20% of the total changes/suspensions of work in the PPPs analyzed. This finding suggests that long-term contractual arrangements motivated by taxation advantages rather than efficiency in the partnership may result in higher

renegotiation rates. Moreover, both infrastructure types are top priorities for European governments considering the relevance of healthcare and energy projects to face the recent crises derived from the COVID-19 pandemic and the war in Ukraine.

Conversely, BOT is the preferred project delivery for other infrastructure types such as *transport infrastructure*, *waste treatment*, and *water PPP* projects. Traditionally, BOT contracts focus on private efficiency where the concessionaire is benefited by a life-cycle perspective looking for long-term savings and operation derived from planning and design focused on the operation rather than only on the construction of facilities.

Surprisingly, two out of the three most common causes of modifications/suspensions for PPPs are endogenous risks that are allocated to the private sector, namely, *performance*, and *technology/materials*. Theoretically, endogenous risks regarding the performance of the private sector in the construction and operations phases should be completely allocated to the concessionaire because it is in a better position to manage these risks than the public sector. These risks are allocated to the private sector according to the Italian regulations; however, this intended allocation is not consequently adopted during long-term lifecycle projects through litigation resulting in effective contractual modifications.

Results demonstrate that there are meaningful differences between risks that drive contractual modifications in two different types of PPPs. A comparative analysis between BOT and BLT projects demonstrated that infrastructure type matters. Three risks demonstrated a much higher proportion of significance for BLT respecting BOT projects, namely, *change in law*, *technical issues*, and *design*. This higher impact of those risks in BLT suggests that the infrastructure type matters. Consequently, BLT projects are especially focused on buildings for specific sectors that require a high level of requirements for the operation during the lease. As a result, these projects tend to be located in urban areas and the services that the concessionaire has to provide for the long-term leasing frequently motivates litigation aiming for contractual modifications.

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