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Using Project Financing to Develop Constructed Facilities in Italy

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Abstract. Project Financing (PF) is a promising mechanism to widely develop a variety of public infrastructure and service facilities by leveraging private funding of design, build, and operations. However, not all financially free-standing projects are suitable to be delivered under such forms of contract. The aim of this work is to help identify the main factors that might influence the success of PF initiatives so that suitable projects might be identified by public planners and private promoters. To this end, an empirical analysis is carried out on a number of Italian awarded PF initiatives. Results suggest that large-sized projects developed under favorable business conditions have higher implementation chances.

Keywords: Contracting, Delivery system, Project finance, Public-Private Partnership, Statistics

1. Introduction

Project Financing (PF) is referred to as a funding and contracting system to establish a long-term public-private partnership for the purpose of building and operating a variety of infrastructure and service facilities. PF is typically ruled under the terms of a Build-Operate-Transfer (BOT) form of agreement between a public entity and a concessionaire. One or more investors join a special purpose vehicle (SPV) company to finance design, construction, and operations of a public facility for a specified government-granted concession period.

The public granting agency usually owns the property of the facility, but provides the private SPV with rights to collect revenues from long term operations, usually spanning from 20 to 60 years. After that period, the owner gets back the facility for its own usage, typically with no extra cost.

The initial investment is intended to be recovered through revenues from the service provided during the concession period, which is determined to pay off the debt incurred and earn an acceptable profit from the project cash flows [1]. End users pay directly the operating SPV for facility usage, such as in a pay toll road highway, or an electric power facility. If the constructed facility does not give a straight and fair compensation to the SPV, or is overly risky, the owner can contribute to the initial investment or pay an annual fee to assure profitability to the concessionaire [2]. From a financial perspective, a non-recourse highly-leveraged capital structure has to be designed so that both debt bankability and attractive rate of return to equity are secured [3].

With origins in common law countries, PF has recently gained worldwide popularity because of its potential to facilitate private finance and to leverage the private service efficiency in operating and maintaining public facilities [4]. Therefore, it allows local governments to procure desirable constructed facilities with limited public spending and additional borrowing [5].

These motivations are relevant to explain the diffusion of PF in Western Europe; In particular, since 1999 when BOT has been enacted, Italy has rapidly grown in the use of PF to deliver various types of construction projects with limited public finance, and it is currently one of the largest PF markets within the European Union (http://www.finlombarda.it). However, despite promises of unlimited application to various types of infrastructure and service facilities, PF still poses some limitations and often projects fail to go further out of the early contract procurement phases. It appears that not all projects are designed to meet the

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characteristics of a successful BOT contract; in other terms BOT projects are often initiated, but the development process is not carried out up to the construction phase.

With the purpose of understanding the key characteristics of a successful BOT project, in this work we explore an empirical dataset of a number of PF initiatives in Italy to identify the significant factors that might influence the ability of a project to be successfully developed. To this end, the paper is developed as follows. First, we illustrate the PF/BOT Italian background. Second, we explore a dataset of Italian BOT projects. Then, we present a binary logistic regression. Finally, we draw implications on the factors that might affect the probability of a project to reach the ground breaking ceremony.

2. The Project Financing Process in Italy

The rational of PFI is to combine the resources of the public and private sector to provide more efficient public services. Many countries around the world have successfully implemented PFI projects and have benefited from the results. United Kingdom, Japan, Italy, France, Germany, Australia and USA are the world leaders [6].

The formal process to set a BOT contract varies by country. In Italy the law mandates for the granting authority to prepare a feasibility study and then manage the bidding process, where bidders propose a tender package composed of basic design drawings, draft contract and bankable business plan. The bid selection is usually made based on a combination of multiple factors, such as quality of design, construction cost, user fees, contract conditions, etc. The awarder is then demanded to enter into negotiation with the conceding agency to sign the BOT contract agreement.

In Italy, the limits imposed on public spending and the shortage of public financing to carry out necessary or desirable investments have called for the recourse to PF to build, expand or upgrade a variety of infrastructure and service facilities, such as social buildings, sport venues, utility facilities, burial grounds, and car parks. However, not all projects appear to be fit for PF, so that there is the need to understand which are the key strategic factors to allow an ex-ante evaluation and assist the process of deciding whether a facility should be built under a BOT form of contract or not. This work is proposed to overcome the research gap. In fact, studies exploring the state-of-art of PF in Italy are available [7], but very little research has been carried out so far to specifically understand the macro-characteristics of a successful BOT project.

3. Empirical analysis

3.1. Methodology

This paper studies the main factors that might influence the probability to start the construction works of a PF initiative. To this end, the research has been carried out according to the following steps. First, we gathered data from the database published by the Italian national observatory of public-private partnership (http://www.infopieffe.it), integrated with information obtained through direct inquires from local governmental agencies. The dataset records information related to a few key aspects of the 382 BOT projects awarded in Italy from January 1st, 2004 to December 31st, 2009, with regard to size, duration, and location of the project. All projects total approximately 6.4 billion euro with average investment size around 17 million euro each. Approximately 28 percent of the awarded projects included in the dataset are not reported to be constructed or under construction at the date of observation (December 2010).

Then, we conducted an exploratory analysis. Finally, under the assumption that whether construction is put into effect is assumed as the binary response variable, we completed a logistic regression analysis to understand which are the factors that might influence the probability of a BOT project to enter into the construction phase. The analysis was carried out after performing both classification of the observations in ordinal clusters and stratified sampling. On the one hand, logistic regression analysis is used for prediction of the probability of occurrence of an event making use of several predictors that may be either numerical or categorical [8]. On the other, stratified sampling is used to examine the empirical behaviour of a population. It is performed by taking random samples of strata of a data population and aggregating the resulting responses to produce estimates to the entire population [9].

3.2. Exploratory analysis

Table 1 decomposes the sample BOT projects by type of service facility. For each category, the number of awarded projects, the associated size of investment, and the success ratio (constructed over number of projects ratio) are recorded.

	Number	Min size (K€)	Mean size (K€)	Max size (K€)	Construction effective	Construction not effective	Success ratio
Sport venues	63	450	6,280	42,494	52	11	82.54%
Utility facilities	59	57	10,402	166,430	43	16	72.88%
Social buildings	72	294	54,058	840,369	52	20	72.22%
Car parks	94	167	10,088	92,503	65	29	69.15%
Burial grounds	94	272	6,235	60,305	61	33	64.89%

Table 1. BOT projects decomposed by type of service facility

Social buildings are the largest sized types of projects, while sport venues and burial grounds are the smallest ones. However, sport venues do demonstrate the highest probability to be constructed. On the contrary, burial grounds have the lowest success ratio. This proves that from this preliminary exploratory analysis it is not possible to directly draw clear conclusions on the relationships between the success ratio and the size of investment.

Table 2 is a summary illustration of the dataset: the factors that are considered to have influence on the likelihood of construction are recorded with associated distributions. The columns report, respectively, the lower, the median, the upper quartile, the standard deviation and the frequencies of each cluster. The response variable measuring whether construction is effective or not (CE/NE) is a binary variable: 1 indicates the facility is built or under construction; on the contrary, 0 means construction has not started yet.

Factor	Acronym	Lower quartile	Median	Upper quartile	Standard deviation	Class 1	Class 2	Class 3
Population	POP	522	234,969	2,743,796	585,744	176	101	105
Investment Size	SIZE	57,243	16,848,162	840,369,560	69,295,628	216	136	30
Concession Period	PER	2	26.19	60	8.40	145	211	26
Interval	INT	19	46.28	78	18.07	150	140	92
Geographical Area	AREA					164	67	151

Table 2. Summary of the dataset

In particular, each factor is classified into three clusters. The Population in the municipality (POP) variable is defined as the number of residents in the urban area where the project is planned to be located. This represents a proxy variable of the catching population for the services associated with the facility. It is expected that the more the POP, the higher the probability of the construction to be effective. The cluster thresholds selected for this variable are indicated by the Italian law, namely, less than 20,000, from 20,000 to 100,000, and greater than 100,000 people. The Geographical Area (AREA) variable identifies the area of Italy wherein the project is carried out. This is intended to explore if there is a relationship between the local area and the probability of a PF project to be constructed. AREA is a categorical variable classified according to the Eurostat parameters, specifically 1 northern, 2 central, and 3 southern Italy. The Investment Size (SIZE) factor is a measure of the extent of the investment expressed in euro amount. This variable is expected to positively influence the response variable: the larger the SIZE, the higher the probability that the project will enter the construction phase because of a few reasons: on the one hand, a large-sized project is meant to generate high revenues with subsequent high incentive for the concessionaire to start the construction; on the other hand, one large project is a easy way of communicating and proving the government capabilities toward the electorate rather than several small ones. The cluster boundaries are set according to the standards issued by the Italian Authority for Public Contracts, namely: investments valuing less that 5 million, from 5 to 25 million, and greater than 25 million euro. The Concession Period (PER) variable reports the duration of the concession during which the SPV collects revenues and runs operations. It is measured in years from the construction completion date. A longer concession period usually provides the SPV with longer chances to run a profitable project, therefore the probability of success should be higher. By the Italian law, the standard concession period should be as long as 30 years, but longer durations may be agreed whenever a longer period is necessary to cover the initial investment and provide the SPV for a reasonable return. Similarly, a shorter period is negotiated if profitability is quickly assured. Therefore, the PER cluster thresholds are as follows: less than 30, 30, and more than 30 years. The Interval (INT) variable is referred to as the number of months from the point in time the project is awarded to observation, i.e. December 2010. This parameter has been included to consider that negotiation might take long and, consequently, as a way to take into account that more recent projects have lower success probability due to the short time elapsed from awarding to observation. It is expected that the more the INT, the greater the probability that construction is initiated. INT is classified into less than 40, from 40 to 60, and more than 60 month-long clusters.

3.3. Regression analysis

The goal of a regression analysis is to test if the independent variables are significant factors and whether they have positive or negative effect on the response variable. Given the binary nature of the response variable at issue, a logistic regression was performed. The aim of a binary regression analysis is to estimate the probability of occurrence of an event, that is the probability of construction to succeed.

Based on the population consistent with the total awarded projects, we conducted a stratified sampling. Each observation is classified according to a disjoint subset of the sample space called stratum, from which the sample is drawn [9]. In our case we used a proportionate allocation by type of service facility and observations were randomly extracted to obtain a representative sample of the population and, thus, reducing the sampling error. Table 3 shows the structure of the sample used for the logistic regression.

	total	**relative frequencies**	**observations in the sample**
Burial grounds	94	24.61%	25
Social buildings	72	18.85%	19
Sport venues	63	16.49%	16
Utility facilities	59	15.45%	15
Car parks	94	24.61%	25
Total	382	1	100

Table 3. Stratified sample

Results of the regression analysis are provided in Table 4, where columns report the estimate of the regression coefficient, the standard error of the regression estimate, and the Z value with associated P-value. Table 4 shows the values for the G-Test, the degree of freedom and P value too. AREA, SIZE and INT are significant factors of success, which means that they influence the probability that a BOT project is built**.** G equals 20.4 and P-value equals 0.01 ensure the reliability of the model.

	Coeff	**SE Coef**	**Z**	**P**
Cluster POP	-0.39	0.34	-1.16	0.244
Cluster SIZE	1.04	0.42	2.47	**0.014**
Cluster AREA	-0.57	0.258	-2.22	**0.026**
Cluster PER	-0.038	0.41	0.1	0.924
Cluster INT	0.78	0.3	2.6	**0.009**

G- Test	20.04
Degree of Freedom	5
P-value	0.01

Table 4. Results of the logistic regression analysis

3.4. Interpretation of results and discussion

The analysis results originate some considerations on the characteristics of the Italian PF market and on the main aspects that can influence the success of the development process of a BOT project. In particular, it is revealed that location, size of the investment and time elapsed since awarding are significant predictors that influence the probability that an awarded project is constructed.

The negative relationship between the response variable and the AREA highlights that in the wealthy North of Italy a PF project is more likely going to be constructed rather than in central and southern regions.

The significance of the SIZE variable proves that the larger PF initiatives are more likely to be constructed. This confirms the mental model based on the assumption that for large initiatives, involving a lot of actors since they move and transfer relevant amounts of money, the probability of ground breaking is high. Moreover, since the administrative efforts for either small or large projects can be considered as equivalent, it is more convenient to focus investment on large-sized projects. In this way, local authorities can testify their political and management acts to the voters. The positive influence of INT reaffirms that a long time from awarding to construction is required to perform negotiation and administrative procedures. This proves that the one-year period from awarding of the last project to the date of observation is not long enough and this is a limitation of the dataset, because still some of the most recent projects are likely to be constructed after the date of observation. On the contrary, the catchment population and the duration of the concession do not prove to influence the likelihood of building the facility.

4. Conclusion

An empirical analysis to explore some key factors that can influence the likelihood of undertaking the construction works is carried out on BOT facility projects awarded in Italy during the recent past. To this aim, we completed a logistic regression analysis on a large dataset of Italian PF initiatives, where the dichotomous outcome variable describes whether construction has been put into effect.

Results demonstrate that large-sized projects to be developed in wealthy business areas have higher chances to be completed, especially whenever sufficient time is given to the parties to negotiate the contract provisions. In other terms, this study provides hints for policy makers and infrastructure planners to learn that PF is likely to be a more suitable contracting system for large-sized and non-urgent facility projects that are planned to be developed in wealthy regions, while urgent infrastructure in poorer regions might pose more problems in getting implemented into construction.

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