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ScienceDirect

International Journal of Project Management 32 (2014) 473–481

International Journal of Project Management

www.elsevier.com/locate/ijproman

Evaluation of restrictive competition in PPP projects using real option approach

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Received 12 April 2013; received in revised form 17 July 2013; accepted 23 July 2013

Abstract

In PPP projects, it is often necessary for host governments to provide guarantees to investors due to the large scale of investments involved, long tenure of the project, and hence greater risks. Although PPP has become a matured topic in construction management, research on evaluation of restrictive competition in PPP projects remains surprisingly scarce. With real option theory, this paper analyzes government's guarantee of restrictive competition in PPP projects, and constructs an evaluation model for restrictive competition. The results illustrate the significance of the valuation to both host government and investors, and provide them with a clear reference when negotiating on the level of restrictive competition.

Keywords: PPP projects; Real option; Government's guarantee; Restrictive competition

1. Introduction

Most infrastructure projects have the common characteristics of large scale investments, long durations of investment recovery and multi-dimensional risks. In order to promote the development of its economy, it is often essential for a public partner to build various types of infrastructures to support growth. However, one typical problem that the public partner faces is the shortage of capital. Since financially it becomes a challenge for the government to complete the construction of infrastructure projects based entirely on public finance, PPP (Public–Private-Partnership) has evolved as one of the desirable funding schemes, which gave birth to alternative project delivery methods and models such as build–operate–transfer (BOT), design–build–operate (DBO), design–build–finance–operate (DBFO) and build–own–operate (BOO) (Miller, 2000). One essential characteristic of a PPP scheme is to make use of capital and management experience of non-public institutions to realize the construction and operation of public infrastructure which originally falls under the government's mandate. Since the 1980s, more and more infrastructure projects around the world have adopted the PPP model (Chen and Zhu, 2011).

In view of the uncertainties embedded in large scale investments and long recovery cycles, investors and other stakeholders in PPP projects generally bear serious risks, including political risks, construction risks, market risks, credit risks and operational risks (Akintoye et al., 1998; Li et al., 2005; Shen et al., 2006; Zayed and Chang, 2002). To some extent, these risks are able to influence investors' confidence greatly. Therefore, in order to attract private capital or foreign investment to fund the development of these infrastructure projects, the government will usually provide

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0263-7863/$36.00
http://dx.doi.org/10.1016/j.ijproman.2013.07.007

the project company corresponding preferential policies or some kinds of guarantees, such as tax privileges, take-or-pay agreement, provision of land, supply of raw materials, energy supply and guarantee of restrictive competition (Chen, 2009; Huang and Chou, 2006; Ke et al., 2010). These incentives from the government can greatly reduce the construction and operational risks of the project company.

The guarantee of restrictive competition, also known as non-competition or exclusive rights by some researchers, means that the host country government promises that there will be no similar projects being set up in the same area in the foreseeable future. The purpose is to avoid reducing the strength of cash flow of the current intended project, which forms the fundamental basis of project financing, and affecting investors' returns due to new competition. This guarantee is especially important for PPP projects. When making investment decisions during the early stage of a project, investors typically make scientific forecasts about market demand and growth according to the state of the regional economy and its prosperity, based on which the investors would make decisions on the required capacity of the facility. Once a similar facility begins to operate near where the original facility is located, the new rival facility will certainly produce a shunt for the market share and introduce competition that leads to the decline of income of the project company. For the purpose of safeguarding the return of the project company, the government would generally provide a guarantee of restricting similar infrastructure projects from competing with the original project. For example, in the Channel Tunnel project, the British and French governments made a promise to the project company that there will be no other similar projects during the next 33 years. Another example is the National Stadium in Beijing, China (also commonly known as the 'Bird Nest'). Built for the 2008 Olympics held in Beijing, the government made a promise to investors that it would place serious restrictions on building any similar facilities in the northern part of the city (Wang and Ke, 2008).

Presently, researches on provisions of guarantees in PPP projects mostly focus on the guarantee of minimum revenue during the concession period of the project. In many of these cases, the guarantee levels are assessed based on the assumption of poor market demand. However, since future market demand is notoriously difficult to predict, the actual scenario could swing both ways. If market demand instead turns out to be significantly higher in the future, it would become necessary for the government to consider constructing a new facility to cope with the additional demand, even though it might have provided a guarantee of restrictive competition to the initial facility. Therefore, during the negotiation stage with the host government, investors should seek agreement on the equitable amount of compensation once such scenario takes place, which essentially represents the value of restrictive competition guarantee. By the same token, the government should have some knowledge about the level of the guarantee that it can provide, so that budget can be set aside according to the amount of guarantee value estimated.

The objective of this paper is to present a model that quantifies the value of restrictive competition guarantee so that it will enhance decision-making of both the host government and also the project sponsor when it comes to such form of guarantee negotiation. The paper is organized as follows. First, an overview of government guarantees that commonly exist in PPP projects, including restrictive competition guarantee, is presented. This is then followed by an illustration of how the guarantee of restrictive competition can be analyzed and modeled as a real option in PPP projects. To illustrate the application of the model, a real world case study in China is presented, followed by some discussions of the results. Finally, the paper closes with a conclusion section.

2. Literature review of government guarantees in PPP projects

There has been an abundant amount of research being conducted in various aspects related to government guarantees in PPP projects. Some of these researches focused on the analysis of necessity and legal foundation of government guarantees. In some cases, in order to address the risks taken by investors, it is necessary for the host government to provide some kinds of guarantees, including restrictive competition guarantee, to enhance the financial feasibility of BOT and PPP projects (Chen, 1995; Wibowo and Kochendoerfer, 2011). However, provision of guarantees is not always consistent with the existing legislations of a host country. For instance, in the past, it was not permissible to provide any kinds of government guarantees in China (Chen, 1995). Zou (2004) discussed the legal nature of government guarantees in BOT projects and provided useful interpretations of the meaning and importance of such guarantees. Yan and Lou (1996) explained the differences between "ordinary" guarantees and government guarantees in BOT projects, and then illustrated the rationale of government guarantees in project financing. Until now, many researchers seem to converge towards a common opinion that host government ideally should provide at least some forms of guarantees.

Among studies conducted on government guarantees, some have focused specifically on the issue of minimum revenue guarantee in PPP projects. Efforts were devoted to construct different models in the evaluation of guarantees depending on the specific contexts. In the context of minimum revenue guarantee, the real option approach has been suggested by some as a more superior method compared to traditional project evaluation methods such as the simple discounted-cash-flow (DCF) technique. For instance, Liu (2010) gave a real option representation of general government guarantees, and used Monte Carlo simulation to analyze embedded options in the form of government guarantees in a case study of the Malaysia–Singapore Second Crossing. Similarly, Liu and Cheah (2009) suggested that host government subsidies and guarantees can effectively reduce the risks of a project company, and used the Monte Carlo simulation method to evaluate government subsidies and guarantees found in a sewage treatment project in Southern China under the real option framework. To find the optimal minimum revenue guarantee in a toll road, Ashuri et al. (2012) developed a risk-neutral binomial lattice based on real option theory. Huang and Chou (2006) found a minimum revenue guarantee in a BOT infrastructure project and they evaluated it through solving partial differential equations (PDE). In contrast to the former research,