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INCORPORATION OF INCENTIVES IN CONCESSION CONTRACTS THROUGH PUBLIC-PRIVATE PARTNERSHIPS AND THEIR RELATION TO ROAD SAFETY

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ABSTRACT

Public-Private Partnerships have emerged as a new model of investment efficiency worldwide. Its growing popularity has been due to its effectiveness in estimating the optimal quality level, maximizing the social benefit (public sector objective), and increasing profits (private sector interest). Importance emerges as an essential factor since 1.3 million people die worldwide due to road accidents. This paper seeks to resolve the question of incorporating incentives in concession contracts through Public-Private Partnerships and improving road safety indicators. Our results show that it is only possible to invest in safety measures when the marginal value provided by the incentive is greater than the cost of the investment. Therefore, governments must know and quantify the social benefits of safety improvements to apply the appropriate stimulus.

INTRODUCTION

Countries worldwide are implementing alternative ways to manage or finance their infrastructure projects, involving public-private partnerships; this type of mutual collaboration is known worldwide as public-private partnerships (PPPs) (Chan & Pribadi, 2022; Ito, 2022). Evidence worldwide shows how countries have successfully implemented this type of investment model (Demirel et al., 2022; Li & Love, 2022; Xu et al., 2021). This trend has three reasons: increasing budgetary constraints, searching for greater production efficiency, and improved quality through better allocation of risks and incentives (OECD,

2008). PPP investment models have allowed the structuring of infrastructure projects from their initial feasibility phase to the final stage reached in the project's materialization. This achieves adequate and efficient management for various requested service levels of the infrastructure. One of its challenges is to acquire financial and technological resources and an enormous institutional and management capacity in an associative manner (Suárez Alemán et al., 2020).

Traditionally, most concession contracts through PPPs have not considered explicit incentives to improve the quality of service, measured through indicators such as road operability, congestion, pavement condition, and road safety. However, the introduction of incentives to encourage PPPs to provide an optimal level of quality is currently being promoted (Rangel et al., 2012). Thus, any increase in efficiency will be transferred to user satisfaction. This aspect is of importance given that, according to World Health Organization figures, road accidents cause 1.3 million deaths each year and injure between 20 and 50 million people. The road actors most vulnerable to road accidents are pedestrians, cyclists, and motorcyclists, who account for about 50% of the cases. Road crashes are ranked as the leading cause of death among people between 15 and 29. Low and middle-income countries, where 53% of the world's vehicle fleet is concentrated, account for 92% of fatalities (WHO, 2013).

In road infrastructure projects, road safety is one of the services most closely related to socioeconomic benefit and an aspect on which the infrastructure manager has a significant capacity to act. However, due to its unique characteristics, its regulation cannot be assimilated into that of other services provided in the free market. Given these circumstances, PPP contracts began to incorporate incentives for road safety in straightforward, objective ways, oriented towards maximizing the net social benefit. In this way, private parties were expected to orient their efforts towards earning these bonuses or, on the contrary, they would be penalized (Christiano, 2011; Vassallo, 2007).

But, does the incorporation of incentives in PPP contracts improve road safety indicators? To answer this question, we present a review of aspects that allow us to understand how incentives incorporated in PPP contracts have affected road safety indexes. It also shows the state of the practice in various countries incorporating this type of management approach.

The paper is structured as follows: first, it contextualizes the details of road safety incentives in PPPs, showing evidence from different countries. Then, an analysis of the evidence is made, incorporating a vision of the approach to follow to balance public and private. Finally, the conclusions, implications, and future lines of research are described.

METHODOLOGY

A statistical data test of negative binomial regression, Propensity Score Probit Model, and logarithmic linear models are used. The working hypothesis was to know how incorporating incentives in concession contracts through PPPs affected road safety performance (Christiano, 2011; Vassallo, 2007).

The data came from a time series of up to 4 years. The road network understudy was about 12,075 km. For analysis is divided into sections with an average length of 7 km (Rangel et al., 2012). The review allowed us to know that these could come from up to two different sources: accident data reported by the police and vehicle count data, which can be disaggregated between light and heavy vehicles to obtain a more detailed analysis.

In addition to information on traffic flows and variables of geometric and operational characteristics of the road infrastructure, the research analyzed considered sections with and without accidents to avoid selection biases. The literature review also allowed knowing which infrastructure variables were public or private and the type of incentive could explain the relationship between PPPs and road safety (Christiano, 2011; Rangel et al., 2012; Vassallo, 2007).

ANALYSIS AND RESULTS

At the beginning of PPP contracts, the revenues obtained are based on the tariffs charged for tolls rather than on performance or operational performance measures. However, most concession contracts have promoted and introduced incentives linked to bonuses and penalties based on road safety indicators (Rangel et al., 2012).

Among the incentives granted to PPPs, they are classified into two types: extension in the duration of the concession contract and an increase in toll rates. Incentives must comply with the project's objectives; for example, if the contractor does not comply with the contractually established requirements, the authority penalizes the contractor or even terminates the contract. On the other hand, the contractor may be affected by not meeting or exceeding the authority's expectations.

Experience in various countries shows some different facets. In the United Kingdom, they have mostly replaced contracts based on the demand approach (Debande, 2002) with operational performance. Spain has incorporated bonuses and penalties based on operating performance standards (Delgado et al., 2007). The findings show that safety incentives in Spain are not an essential source of income for contractors compared to countries such as Finland and the United Kingdom. Although safety incentives in Spain are small compared to other countries, the application of PPPs has positively influenced reducing the number of fatalities, injuries, and accidents (Rangel et al., 2012).

Italy has introduced tariff caps linked to road safety indicators so that the concessionaire sets higher toll rates for improving safety indicators. In Ireland, concession contracts include some road safety indicators but do not provide bonuses for strengthening them. In Denmark, the Netherlands, and Belgium, new concession contracts are being implemented, but they do not have positive incentives (Rangel et al., 2012).

There are more accidents on non-concession roads than on PPP concession roads. There are more accidents on roads without incentives than on roads with incentives. When analyzing the variable associated with the type of incentives,

the result is statistically significant for the accident and injury frequency models. This result demonstrates that indicators related to accidents and injuries better reflect the ability of concessionaires to influence safety rates than fatality rates. From an economic perspective, Pérez de Villar (2012) states that any company adjusts its prices and conditions according to demand in perfect markets. For PPPs, it would be possible to think of a freely exercised quality management. However, there are obstacles: regulated tariffs fixed in advance, the monopoly nature of PPPs, low elasticity of demand, and finally, the nature of the service provided, which means that users do not value improvements.

Pérez de Villar (2012) showed that for several PPP concessions in Spain, both traditional and new generation incentives are ineffective in reducing road safety rates for two reasons: they are much lower than the social benefit derived from them. They are much lower than the cost of the measures to improve them.

The most recent concessions in Europe have introduced specific bonuses; these are insignificant due to their low amount. Along the same lines, Albalete (2011) finds that charging for the use of road improvements could negatively affect road safety.

These incentives based on operational performance have to be correctly introduced in concession contracts. To this end, the marginal reward to the contractor for achieving a certain level of quality should never be higher than the marginal social benefit. Thus, if incentives are defined, the contractor will be encouraged to provide the best service compatible with its production costs (Vassallo, 2007). While the authorities pursue the maximization of social welfare, it is clear that the private sector focuses on maximizing its economic profit.

The introduction of incentives or penalties based on operational performance and linked to social objectives in contracts is a popular way to align private and government goals to achieve value for money. To this end, PPP contracts must include the necessary provisions to ensure that the public-private relationship is at its best for the duration of the contract. One way to achieve this trade-off is to meet these two requirements: first, to ensure that the most efficient bidder, in terms of price and quality, is awarded the contract, and second, to provide incentives for the contractor to perform its contractual obligations to the highest quality at a reasonable cost.

CONCLUSION

There is no absolute and verifiable truth to the argument that incentives are the solution to reduce accident rates in road infrastructure. Evidence shows that there are cases where incentives and bonuses have been effective. However, these are insufficient due to their low amount. In future concessions, the incentives would be more closely linked to the social benefit derived from the management of the concessionaire to prevent accidents.

When defining the objectives of public and private companies, it is advisable to create clauses in the contracts to encourage infrastructure operators and achieve the social benefit of the safety level. Incentives should be linked to the number

of accidents avoided and the socioeconomic value derived from their prevention. Thus, private companies will invest in safety measures. Therefore, governments must know and quantify the social benefits derived from safety improvement to apply the appropriate incentive. For future research, it is necessary to review the size of the set of economic incentives in the PPP contract. Likewise, it would be worthwhile to determine what other elements could be incorporated into the contracts to improve road safety rates.

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