Using the Economic and Financial Reequilibrium Model to Decrease Infrastructure Contract Incompleteness

Carlos Oliveira Cruz[1] and Rui Cunha Marques[2]

Abstract: Renegotiations are becoming an undesirable protagonist in infrastructure concessions, raising doubts about the merit of this procurement model. Renegotiations emerge as a consequence of contract incompleteness. When contracts are unable to forecast conditions in the long run and anticipate all possible contingencies, they become obsolete, and both parties must negotiate new terms. The economic and financial reequilibrium (EFR) model, applied in most infrastructure concessions contracts in Portugal, provides a tool to manage the renegotiation process. Given that it is not possible, or affordable, to write complete contracts because of high transaction costs, parties negotiate the rules under which the process of renegotiation might occur. By doing so, it is possible to reduce the incompleteness of contracts, but the model is not immune to opportunistic behaviors. This paper reflects on the effects of the EFR model by providing real data and a case study of a concession and provides some alternatives that are able to improve the performance and management of infrastructure contracts regarding the renegotiation phenomenon. **DOI: 10.1061/(ASCE)IS.1943-555X.0000110.**

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Introduction

Public-private partnership (PPP) arrangements are attracting increasing attention from academia. They are a response to a growing involvement of the private sector in infrastructure delivery, given that in most countries there has been some reluctance towards full privatization (Vives et al. 2010). The failure of some experiences with full privatization of public interest sectors, such as water in Argentina, Bolivia, or the United States, or the telecom and railways in the United Kingdom, contributed to the opinion that the risks under this model are high, and can ultimately result in expensive bailouts or contract recaptures. Moreover, most developed societies have some mistrust regarding public ownership of enterprises, and there is a general belief that private management with the right incentives might provide a better value for money than public management, in which objectives are usually conflicting and poorly specified.

PPP contracts emerged as a model that is able to capture the benefits of private management, without the problems of full privatization, allowing the governments to keep some level of control on the public services, for which the public authorities are ultimately responsible (Marrewijk et al. 2008). There are several models under the designation of PPPs (Betancor and Rendeiro 1999; Allen 2001; Guasch 2004; M. Hammami, J.-F. Ruhashyankiko, and E. B. Yehoue, International Monetary Fund Working Paper, Washington, DC; Pantelias and Zhang 2010), with different classifications in accordance with the type of organization of the partnership (institutional when a new firm is created and both parties are co-shareholders, and contractual if the relation is corporatized and managed by a contract), and they can be developed at different levels of the public administration (federal, state, regional, or local); see Koch and Buser (2006).

The benefits and pitfalls of this procurement model have been extensively described in the literature (e.g., Truitt and Esler 1996; Engel et al. 2009; Martins et al. 2011), and the primary problem identified by the authors is the inevitability of renegotiations. Over the last 5 years, empirical studies have documented the experience of several countries with PPP projects (Engel et al. 2003; Nombela and Rus 2004; Guasch et al. 2008; Estache et al. 2009; Marques and Berg 2010; Cruz and Marques 2013) and found that the renegotiation problem is far more frequent than it was expected when the first theoretical studies on opportunistic behavior were developed between the late 1970s and 1990s (Williamson 1976; Tirole 1986; Dewatripont 1988; Hart and Moore 2003; Green and Lafont 1992; Crocker and Reynolds 1993; Aghion et al. 1994; Artana et al. 1998).

Renegotiations can be attributable to the difficulty in forecasting accurately for long periods, which unsurprisingly leads to contract misfit and also to strategic behavior by agents. The incomplete nature of contracts, in the face of new unforeseeable events, renders it inevitable to renegotiate the terms of the PPP arrangement. Both agents must handle problems such as opportunistic behavior, information asymmetry, and bilateral and non-competitive negotiation, and search for a solution that optimizes the objective functions of both agents. Public and private sectors have different aims (Jones 1994) and the search for the optimal solution is subjected to several external constraints that can bias the process, as confirmed by evidence of empirical studies (Cruz and Marques 2012).

Therefore, it is critical for the success of the model to discuss how to decrease contract incompleteness, and/or to improve the

[1]Assistant Professor, Dept. of Civil Engineering and Architecture, Instituto Superior Técnico, Technical Univ. of Lisbon, Ave. Rovisco Pais, 1049-001 Lisbon, Portugal (corresponding author). E-mail: ccruz@civil.ist.utl.pt

[2]Associate Professor, Center for Management Studies (CEG-IST), Technical Univ. of Lisbon, Ave. Rovisco Pais, 1049-001 Lisbon, Portugal. E-mail: rui.marques@ist.utl.pt

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renegotiation process to avoid eroding the benefits of competition. The authors' paper addresses this question, using the economic and financial reequilibrium (EFR) model, used in most infrastructure concessions in Portugal, as a tool able to deal with uncertainty. As far as the authors know, this issue has not been previously analyzed in the literature.

The remainder of the paper is organized as follows. The authors first provide a theoretical analysis on the incomplete nature of contracts and its particular importance in infrastructure concessions. This is followed by an analysis of renegotiations as a consequence of contract incompleteness, providing evidence from the Portuguese experience. The authors then discuss the ERF model, its rationale, benefits, and pitfalls. This is followed by a real case study of an infrastructure concession renegotiated six times over the course of 5 years, providing useful insights to support the policy implications. The authors then present the primary findings and policy implications.

Incomplete Nature of Concession Contracts

Infrastructure Concessions and Contract Incompleteness

Because of the problems of market power and natural monopoly features, private involvement in infrastructure provision and operation requires some level of regulation by the government (Ezulike et al. 1997). Broadly speaking, two different types of options can be presented, discretionary regulation and contractual regulation. In the first type, concessions are supervised by a regulatory agency, which can be captured when lobbies influence the regulator. In the second type, the regulation is performed based on a contract, and the regulator simply needs to verify contractual compliance. In discretionary regulation, regulatory capture can jeopardize the concession performance, but in contractual regulation there is the problem of contract incompleteness (Goméz-Ibañez 2003).

Concessions are seen as an alternative to eliminate the discretion and risks of regulatory capture by interest groups. The contract will be in force for several decades (typically ranging between 10–40 or more years), and must deal with the variability of the initial assumptions and unforeseen events. To effectively minimize those problems, the contract should be quasi-complete.

How to forecast 10–40 years in advance is a major challenge. The ability to forecast construction costs and demand (e.g., traffic and consumption) is not sufficiently accurate in most sectors (Flyvbjerg et al. 2004; Skamris and Flyvbjerg 1997). Demand forecasts, whether in transportation projects or water supply systems, are usually overestimated. The problem is more acute in greenfield projects, given that no a priori information is available, whereas in brownfield projects there is less uncertainty because of the existence of real information about the system. Moreover, uncertainty is not constant over the contract duration. Risks associated with construction costs are known as soon as the construction is complete, and demand forecasts are also tested very early (in the first couple of years of operation). Regarding other events such as *force majeure*, economic downturns, or political instability, the cumulative probability of occurrence increases over time.

The length of the contract and the inability to provide accurate forecasts are critical to contract design. The literature defines a contract as complete when all possible events are foreseen, and the legal, economic, and financial consequences are set a priori (Hart and Moore 2007). One can argue whether it is possible to identify all possible events occurring during the concession duration (10, 20, or 30 years). It is a rather difficult, or most likely impossible, task and, more importantly, it would be extremely expensive to do so. Therefore, the concept of transaction costs emerges.

Coase (1960) developed the notion of transaction cost, and analyzed the costs incurred by firms in pricing mechanisms. Subsequently, Williamson (1975, 1985) made important developments in the subject, identifying uncertainty, rationality, and opportunism as the primary determinants for driving transaction costs.

There is a cost associated with forecasts of future scenarios. Increasing the level of accuracy in future information will result in higher costs. Avoiding high transaction costs is one of the reasons for incompleteness in contracts.

The length corresponds to the period for which the contract must be in force. The longer the length the more difficult it will be to ensure adequate forecasts, particularly for construction and demand in complex and highly capital-intensive systems such as public infrastructure (Bosch-Rekveldt et al. 2011). This combination offers one of the primary challenges for infrastructure concession design.

In private contracts the problem of incompleteness also exists, but in this case the provider and customer negotiate directly, whereas in public service concessions the government represents the users. This raises the issue of trust but also of misrepresentation. First, there are no guarantees that the government will safeguard the users' rights, and second the heterogeneity of several groups of users (different socioeconomic characteristics or geographical locations) renders it impossible to represent them as a homogenous group. These issues increase the vulnerability of concession contracts.

Incompleteness and Bidding Bias

Most modern concession contracts are awarded through competitive bidding. The rationale that underlies competitive bidding is to ensure that the bid with higher value for money is selected, maximizing the social welfare. Given that there is no competition during the provision of the service (monopolistic features), the competition for the market replaces the absence of competition in the market (Chadwick 1859).

The implicit incentives in a free market competition are replaced by the competition of bidding (Demsetz 1968). As long as the number of bidders is enough to ensure real competition, the winner will provide the infrastructure/service at the lowest cost, and deliver the best value for money. The question is that contracts are not complete and, after a few years of operation, the contract can become obsolete and must be renegotiated (Guasch 2004; Cruz and Marques 2013). Renegotiations occur in a bilateral negotiation between the concessionaire and the grantor, without competitive pressure.

These renegotiations, although expected because of the incomplete nature of contracts, are often initiated because of the opportunistic behavior of agents (government and concessionaire).

Governments often find an opportunity to engage in unilateral changes in the contract, leveraging their bargaining power on the concessionaire commitment with large sunk investments (Guash 2004; Goméz-Ibañez 2003). However, the concessionaire knows that the grantor (government or public agency) is subjected to social pressure because these services are usually critical and no disruption can occur. Furthermore, the concessionaire operating the service has more information than the grantor, raising the problem of asymmetric information, and can initiate the renegotiation in a rent seeking strategy (Engel et al. 2009).

Williamson (1985) and Goldberg (1987) claim that *ex-post* opportunistic strategies by concessionaires can erode the benefits of competition, arguing that contract incompleteness in uncertain environments is unavoidable, eventually allowing agents to engage in strategies to recover surpluses (or losses, depending on the case),

as uncertainty unveils. Tirole (1986) and Hart and Moore (2003) claim that those strategies of rent seeking are not clear before investment decisions are known. Only after defining their level of commitment, through sunken investments, can the agents adopt strategies to capture surpluses.

The more competitive the market, the more likely it is to engage in strategic behaviors. Engel et al. (2009) found evidence of firms lowballing their bids to win the contract, expecting to break even in a posteriori renegotiations. This strategic behavior only occurs because of the following three reasons. First, the likelihood of renegotiation is high, and firms know it. Second, there is little control on how the renegotiation process is controlled, allowing the private partner to recover losses that are not originated by any unforeseeable event, but simply because of its own strategic behavior. Third, the selection criteria in most tender procedures places excessive weight on the final price paid by the concessionaire (or on the value of subsidy required, depending on the type of concession). This often leads to the winners' curse. Concessionaires overpay for concessions (or underpay, depending on the case), forcing governments to renegotiate, e.g., in Argentina airports (Hong and Shum 2002; Ubbels and Verhoed 2008; Baeza and Vassallo 2010).

Renegotiations as a Consequence of Contractual Incompleteness: Experience with Portuguese Concessions

Based on a data set of 87 Portuguese concessions, Cruz and Marques (2012) analyzed the number of renegotiations in several public infrastructures, covering sectors such as transportation, health, water, and energy (see Table 1).

Renegotiations are a relevant phenomenon in concessions; 58 contracts (67%) were renegotiated. Roads, rails, and water systems have a renegotiation rate of 100%. The study tried to identify the primary exogenous determinants that influence the probability of renegotiations. The authors found that the size of the concessions (longer investment and longer duration) is directly proportional to the probability of renegotiation, e.g., as the existence of a public tender, instead of a direct award procedure. This is suggestive of the strategic behavior and/or the winners' curse effect. In contrast, the existence of a regulatory agency when the contract is signed decreases the probability of renegotiation, and the age of the regulatory body also has a negative impact on the likelihood of renegotiation.

The high probability of renegotiations, primarily in transport and water concessions, can support one of the following two thesis, which are not mutually exclusive: (1) forecasts are unreasonable and extremely overoptimistic, and/or (2) renegotiation clauses are too tight and do not allow for sufficient flexibility to accommodate for revenue downturns.

Cruz and Marques (2013) make a distinction between exogenous and endogenous renegotiations. Exogenous determinants are factors that are external to the contract, e.g., the type of regulation, procurement process, or even some project features such as investment or duration of the contract. In contrast, endogenous determinants should be seen as the contractual clauses that influence the likelihood of renegotiation, e.g., clauses granting the right to renegotiate if the demand is lower than a certain limit. Cruz and Marques (2012) only analyzed exogenous determinants.

Renegotiating is a sign that the assumptions made in the contract were no longer valid, and therefore both parties must engage in bilateral negotiations to design new terms. This can lead to several outcomes, but the most frequent are the changes in costs incurred by the concessionaire (through increases in tax benefits, a decrease in royalties or a change of contract scope) or increase in revenues (either directly through lump sums, annual payments, or tariffs increase or indirectly through contract extension or delay in investments); see Cruz and Marques (2012).

Irrespective of the degree of optimism bias of forecasts, the next sections will consider the renegotiation clauses, trying to understand the extent to which deviations from the business case (model) are allowed.

Economic and Financial Reequilibrium Model

Definition of EFR

Because of the difficulty and cost of writing complete contracts, and assuming the inevitability of renegotiations, a model to manage unforeseen events was incorporated. This model is known as the EFR model and has been widely used in Portuguese concession contracts across several sectors (roads, railways, water, and health). Its purpose is to develop an instrument able to manage a posteriori renegotiations.

In the period before the contract signature, after the selection of the concessionaire through competitive bidding, the Portuguese procurement model allows for a negotiation period, wherein both parties discuss the details of the contract. One of the annexes to the contract is the outline business case (OBC). The OBC is a financial spreadsheet with all cash flows for the concession duration, incorporating several financial indicators, such as debt service coverage ratio (DSCR), loan life coverage ratio (LLCR), and shareholders' internal rate of return (IRR), just to name a few examples.

When some event initiates the renegotiation of the contract, the OBC is used as a reference scenario. The EFR represents a form of contractual renegotiation. Cruz and Marques (2013) delineates a distinction between discretionary and contractual renegotiation, regarding the type of rules for managing the renegotiation process.

Table 1. Summary of Renegotiations Data by Sector

Sector	No. of concessions	Average number of renegotiations per contract	Average time until first renegotiation (years)	No. of concessions renegotiated	Percent of concessions renegotiated (%)
Transportation	37	2.0	3.3	19	51
Roads	13	2.07	2.4	13	100
Rails	3	2.33	3.7	3	100
Ports	21	0.19	7.0	3	14
Health	5	0.20	1.0	1	20
Water	29	1.69	1.5	49	100
Energy	16	0.15	15.0	3	19
Total	87	1.8	6.3	58	67

Note: Data from Cruz and Marques (2012).

In the discretionary renegotiation, there are no specific rules to manage the process, whereas in contractual renegotiation there are explicit guidelines in the contract on how the process should be conducted.

Overview of EFR in Portuguese Concession Contracts

In Portugal, both types of renegotiation are used. Regarding contractual renegotiation, different sectors have different levels of thresholds. Table 2 summarizes the clauses of EFR that define their rules.

All road concession contracts are similar regarding the (1) reasons leading to contract renegotiation and (2) quantitative thresholds for initiating the process. The concessionaires are entitled the right to renegotiation when one or more of the following conditions occurs: unilateral changes from the public sector concerning the activities integrated in the concession, toll mechanisms that change from shadow to real toll, reasons of *force majeure*, law changes that have direct impact on the revenues or costs, and new roads that can bring competition to existing roads.

The concessionaire can ask for renegotiation if there is a 0.01% increase on the following key performance indicators (KPIs): debt service coverage ratio (DSCR), loan life coverage ratio (LLCR), and shareholder's IRR. The renegotiation should reinstate the ratios foreseen in the OBC. The Brisa contract is atypical. This contract states that the concessionaire can *per se* ask for renegotiation at any time, in what is a discretionary type of regulation. This implies a great deal of attention from the regulator to prevent opportunistic behavior.

In the case of the light rail systems, the events able to trigger a renegotiation are the following: (1) any unilateral change made by the government with negative impact in revenues and/or costs, (2) *force majeure*, (3) legal changes affecting revenues and/or costs, and (4) when the right to renegotiation is clearly stated in the contract (for example, regarding ridership forecasts, there is a lower limit below which renegotiation is allowed). The impact of those events is measured by decreases of 0.03% on one of the following ratios: DSCR, LLCR, and shareholder's IRR. The financial reequilibrium should reinstate the shareholders' IRR and/or the LLCR.

In hospital PPPs, the threshold that triggers a renegotiation differs on whether the contracts concern only infrastructure management or if they also include clinical services management. In the first case, the decrease in the shareholders' IRR must be above 0.5%, whereas in the second case the reduction is only 0.1%, and not just in the shareholders' IRR but also in the DSCR.

This difference might be explained by the increasing complexity of PPPs with clinical services. One could argue on the rationale of this difference. A more complex system is more uncertain, and therefore the triggers should not be so low; otherwise, the likelihood of reaching the triggers increases severely. However, a concessionaire will prefer lower triggers to decrease the downside of being exposed to more risk.

Regarding port concessions, the events that can trigger a renegotiation do not differ significantly from those in other sectors. The difference lies in the absence of quantitative indicators to initiate the renegotiation. Contracts only have a clause stating that the concessionaire may ask for the renegotiation of the contract, and the port authority can either approve or reject it based on the arguments of the concessionaire. The port authority must justify within a certain time frame (30 or 60 days depending on the concession) for the acceptation/rejection of the claim.

The rationale behind the existence of explicit renegotiation clauses is to avoid unnecessary renegotiations and/or control the process. Comparing the data from Tables 1 and 2, the sectors in which there are no formal clauses for renegotiations are those with lower renegotiation rate, i.e., energy and ports. Health sector also has a low renegotiation rate, but only five concessions are in operation just a couple of years until now, so it is not reasonable to extract robust conclusions about their behavior towards renegotiations. Roads, railways and water systems, with renegotiations rates of 100%, all have renegotiation clauses, and roads and water

Table 2. Summary of Clauses for EFR

Sector		Rules for EFR	State level
Transportation	Roads	The concessionaire can ask for renegotiation if there is a 0.01% decrease on the following indicators: • DSCR • LLCR • Shareholders' IRR	National
	Railways/light rail systems	The impact of those events is measured by a decrease of 0.03% on one of the following ratios: • DSCR • LLCR • Shareholders' IRR	National/local (light rail)
	Ports	Renegotiation should be agreed between the two parties[a]	National
Health		There are two types of hospital PPPs, a first type only for infrastructure management and a second type incorporating infrastructure and medical services. In the first case the decrease in the shareholders' IRR must be above 0.5%, whereas in the second the reduction is only 0.1%, and not just in the shareholders' IRR but also in the DSCR.	National
Water		The concessionaire can ask for renegotiation if there is a 0.01% decrease on the following indicators: • DSCR • Shareholders' IRR	Local
Energy		Renegotiation should be agreed between the two parties	National

Note: DSCR = debt service coverage ratio; LLCR = loan life coverage ratio; IRR = internal rate of return; and PPP = public-private partnership.
[a]Only one contract out of five has quantitative rules, as follows: reduction higher than 0.03, 0.05, and 0.1% in DSCR, LLCR, or shareholders' IRR, respectively.

systems have the lowest thresholds (0.01% for the established KPIs). Simultaneously, these sectors have the higher average number of renegotiations per contract (2.07, 2.33, and 1.69 for roads, railways, and water, respectively).

This may lead to concluding that what should be seen as a mechanism to minimize the probability of renegotiations seems to be fostering them. However, this conclusion might be biased by the fact that concessions with lower rates of renegotiation are those in which there is no governmental payment to the concessionaire. The revenues are enough to cover the costs and provide the concessionaire with an adequate return on investment. Consequently, one can claim that the EFR has been used in the most sensible concessions, i.e., those that do no allow for a stand-alone development, but require governmental subsidies. The low thresholds associated with the EFR in these concessions (0.01 and 0.03%, which allows that virtually any change will initiate the process of renegotiation) are being used as a guarantee for the concessionaire, minimizing its exposure to risk.

Setting the Right Thresholds

The thresholds are set to indicate when the renegotiation should be initiated. Taking into account the events that can trigger the renegotiation, if one or more of those events change the KPIs above the thresholds, then the contract is opened.

Determining the right thresholds is critical to the success of the EFR model. If the thresholds are too tight, indicating that the percentages are very low, then any small change will lead to renegotiation, and therefore the probability of renegotiation increases. However, if the thresholds allow for some adjustments over time, then the EFR can work as a flexibility instrument to decrease the probability of renegotiation, given that only significant events are able to trigger the process.

Somehow, this represents a trade-off between building some flexibility into the contract to avoid excessive renegotiation, indicating that events with a small impact within the boundaries of the thresholds do not force the renegotiation and additionally provide the concessionaires some degree of protection against external effects, ensuring that a minimum level of profitability will be attained. This is particularly important to control the level of risk premium required by the concessionaire.

Nevertheless, the levels set for the Portuguese concessions seem to be rather tight.

To illustrate the impact of the low thresholds set on most Portuguese infrastructure concessions on the probability of renegotiation, the consequences on IRR of changes in demand, investment, and operating costs for a concession of a light rail system in Portugal was simulated by using the OBC. The project initially had a planned investment in infrastructure of 320.3 million Euros (railways, stations, rolling stock, ticketing systems, and operation and maintenance park), and the operating costs were estimated to be 155.3 million Euros for 26 years of operation. Demand was estimated to be 87.6 million passengers in year 0 (beginning of operation), increasing to 95.9 million passengers in year 26. Table 3 presents the results.

Even though the sensitivity analysis is rather simple, it allows for drawing some interesting conclusions. Any increase of 10% in investment or operating costs will affect the IRR by −49.16 and −7.61%, respectively. If the increase was only 1%, it would represent approximately 5 and 0.8%, which is well above the 0.01% predefined threshold. The renegotiation can only happen for those events that are pre-established in the contract (usually, unilateral changes by the grantor, demand below a lower limit, natural hazard, and so on). However, considering the large complexity of these projects, it is easy to open the renegotiation. For example, because of public opinion pressure to change the location of stations, or delays of municipalities in granting the concessionaire the right to occupy public space on the street and city squares, the concessionaire can claim for the renegotiation and open the contract. In a 350 million Euro project, such as this case study, the 0.01% threshold indicates that any change with an impact above 90.000 Euros will trigger the renegotiation process.

Table 3. Impact Simulation on the IRR of Changes in Demand, Investment, and Operating Costs

	Base case	Demand (%)		Investment (%)		Operating cost (%)	
		10	−10	10	−10	10	−10
IRR	7.75	8.98	7.71	3.94	18.34	7.16	8.33
Relative impact on IRR		15.87	−0.52	−49.16	136.65	−7.61	7.48

Note: IRR = internal rate of return.

The contract has specific clauses to addresses the issue of demand, through the existence of a band system to calculate different compensations per passenger kilometer in accordance with the levels of traffic. The scheme is biased in favor of the concessionaire because 1% decrease in demand only affects the IRR by −0.004%, but an increase of 1% in demand expands the IRR in 0.123%. The compensation per passenger kilometer increases for lower levels of traffic, limiting the value at loss for the concessionaire. This is a form of mitigating the risk for the concessionaire.

EFR and the Risk-Sharing Agreement

The EFR model was developed to allow the concessionaire to recover from losses led by the exposure to risks, particularly those risks assumed by the public sector. Theoretically, it should only be applied to those risks out of the control of the private agent, e.g., *force majeure*, unilateral contractual changes, and price of services (when determined by the government). Under the principle that risks should be allocated to the agent best able to deal with them (Grimsey and Lewis 2002; Bennett and Iossa 2006; Meda 2007; Nisar 2007; Ke et al. 2010; Marques and Berg 2011), most of those risks fall on the public sector's responsibility.

With respect to some of these events, the EFR model still has some problems that are typical of a discretionary renegotiation process. For example, when the grantor increases the initial investment planned, the costs of changing the project's features are still set in a bilateral negotiation process, without the benefits of competition (public tender). When the EFR is applied to risks under the private sector responsibility, then the transfers of risks are jeopardized, and might lead to overcompensating the concessionaire. The next case study illustrates this thesis.

Decreasing Contract Incompleteness with EFR: Case Study of Lusoponte Concession

Overview

The case of Lusoponte concession, one of the first PPP projects developed in Portugal, provides empirical evidence on how the EFR use can end up overcompensating the concessionaire. After the contract was opened, because of unilateral changes by the public sector, the private sector was able to recover from capital

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cost losses, which were exclusively under the concessionaire responsibility. The authors first provide a general historical overview of the project to enable the reader to understand the context.

In the early 1990s there was only one bridge connecting the city of Lisbon, located in the North bank of Tagus, to the South bank, the 25th of April Bridge, inaugurated in 1966. It is a 2.3 km bridge, initially with just a road deck, but in 1999 a second railway deck was built beneath the first one. Unable to cope with the increasing demand and high levels of congestion, in the early 1990s the government decided to build a second bridge, Vasco da Gama Bridge, 17.2 km in length. At this time, private finance initiatives (PFIs) were experiencing a major success in the United Kingdom, and the Portuguese government decided to opt for a PPP arrangement. This project represented not only a landmark, attributable to its physical characteristics, but also a new starting point for infrastructure procurement and financing. The idea was to develop a design-build-finance-operate (DBFO) scheme for the new bridge, and also incorporate the maintenance (complete or simply works related to the road deck) of the existing bridge.

Initial Contract

The contract was signed in 1994, and two years later the construction process began. It was finally opened to traffic on March 29, 1998, just in time for the World Exhibition taking place in Lisbon (known as Expo 98). Table 4 summarizes the primary features of the initial contract.

Renegotiation

Between 1995 and 2000, the initial contract was renegotiated six times, even though the bridge was only open to use in 1998. Several reasons led to successive renegotiations, some related to governmental interference, others to unforeseeable conditions. The government was unable to increase tolls on the 25th of April Bridge because of strong public opposition in 1994, a couple of months after the signing of the contract, which has been one of the assumptions of the public tender. The opposition was so intense that it led to clashes between opponents and police forces, weakening the government's action. To mitigate the negative public opinion, a toll-free month would be granted, every year, during August (the period of higher traffic volume, primarily attributable to travelers heading to the south beaches). The government also approved a frequent-user discount for those users that adopted Via Verde, an electronic device used by drivers for toll payment, avoiding delays in stop-and-pay toll plazas.

Simultaneously, other factors affecting the concessions' economic equilibrium occurred. When the contract was signed in 1994, interest rates were between 7 and 8%. By 1995 and 1996, they were around 12–13%. In a multimillion-euro project this led to significant increases in financial costs. The IRR had decreased from 11.43 to 10%, approximately 40 million Euros of extra costs because of more expensive access to private capital. No cap over interest rates was contracted at the time.

The EFR model explicitly used the DSCR to manage the renegotiation process. DSCR is equal to the net operating profit divided by the annual debt service. This indicated that considering the range of options available for compensating the concessionaire, direct payments by the government were necessary, because it was the only solution with a direct short-term impact on the ratio. At the end, a combination of all mechanisms was achieved.

The process of renegotiating had several stages, although it is not clear what was achieved in some of those stages, and what was being renegotiated in each of them. Nevertheless, it is possible to draw the contract evolution from the initial structure, to the end of stage 1 of renegotiations and, finally, the ultimate contract in 2000 (Table 5).

The governmental subsidies suffered an increase from the 100 million Euros initially planned to 306.5 million Euros with the final contract of the year 2000. The contract length also changed from a variable term, with an expected end between 2019 and 2023, to a fixed term, ending in 2030. This represents a minimum contract extension of 7 years.

The rules for earlier termination also changed. In the initial contract the public sector was required to bear the bank debts, whereas in the final contract, in addition to debts, it also was required to pay for shareholder equity.

Table 4. Primary Features of the Initial Contract

Object	DBFO for Vasco da Gama Bridge and maintenance of the 25th of April Bridge, exclusivity of river crossings until 40 km upstream
Investment	850 million Euros 645 million Euros regarding construction
Financing sources	European Union Cohesion Fund: 320 million Euros, 35.0%, not reimbursed European Investment Bank: 115 million Euros in Deutsche Marks, 13.0% and 185 million Euros in Portuguese Escudos, 20%, loan over 20 years with a grace period of 120 months, and fixed interest rate over the first 15 years Existing revenues of the 25th of April Bridge, 50 million Euros, 6% Shareholder funding: 25, 35, and 6 million Euros in equity, supplemental equity, and deferred supplies, respectively, 7.5% Other, e.g., other loans and government grants, 164 million Euros, 18.5%
Duration	Variable term, contract ends after two conditions, the threshold of 2.250 million vehicles and full payment of debt; nevertheless, there is a cap of 33 years
Risk-sharing agreement	Concessionaire The concessionaire assumes the risk of construction, financing, and even demand, i.e., traffic, risk because the contract had a variable term Government The government was responsible for increasing tolls on the 25th of April Bridge, 0.75 Euros in 1995, to converge to the toll of Vasco da Gama when it opened; it was an assumption of the base case that tolls should be equal for both bridges Up-front payment of 120 million Euros
Renegotiation clauses	Reequilibrium clauses: unilateral contract modifications performed by the government, resulting in cost increase or revenue reduction; financial rebalance can be achieved through contract extension, toll increase, and direct reimbursement by the government and a combination of these mechanisms
Other	This was a stand-alone project, although there was an initial up-front payment by the government; cash flows would be sufficient to ensure capital recovery and an adequate rate of return to shareholders

Note: DFBO = design-finance-build-operate.

Table 5. Evolution of Lusoponte Concession Contract over Several Renegotiation Processes

Contract features	Initial contract of 1995	Intermediate agreement	Final contract of 2000
Tolls	Same toll for both bridges	No increase in tolls	Different tolls for the two bridges
Commercial discounts	No discounts	Discounts for frequent users, no tolls during August	Discounts for frequent users, no tolls during August
Tax benefits	No up-front minimum tax fee	Reduction of VAT from 17 to 5%	VAT kept at 5%
Governmental payment	100 million Euros	162.7 million Euros	306.5 million Euros
Assumptions, i.e., inflation	4.1%	4.1%	2.5%
Contract duration	Variable term with a 33-year cap, when 2.250 million cumulative vehicles are expected, 2019/2023	Variable term with a 33-year cap, when 2.250 million cumulative vehicles are expected, 2019/2023	Fixed term, 35-year, ending in 2030
Interest rate	Entirely assumed by the concessionaire	Compensation of 42.5 million Euros	Public sector assumes them all through concession rebalance
Earlier termination	Public sector assumes all bank debts	Public sector assumes all bank debts and shareholder equity	Public sector assumes all bank debts and shareholder equity
IRR to shareholders	11.43%	11.43%	11.43%
Clawback[a] mechanisms for the public sector	None	None	None

Note: VAT = value-added tax.
[a]For sharing hidden revenues.

One might argue that these renegotiations ended up over compensating the concessionaire, given that its IRR (for shareholders) kept exactly the same value, regardless of the increase in capital cost, a responsibility of the concessionaire. Concerning the calculation of the compensations, some assumptions are arguable. For example, the difference in revenues arising from disparities in toll levels (attributable to discounts) collected in Vasco da Gama Bridge was multiplied by the forecasted traffic rather than the real one (lower than initially estimated). In contrast, the revenues over the 25th of April Bridge were significantly higher than expected.

At the same time there were also some tax benefits, not initially planned, that allowed for the concessionaire to increase its revenues (hidden revenue) although no claw-back mechanism was used, primarily because such a mechanism did not exist.

By the end of the renegotiation, there were substantial changes to the OBC. According to the EFR rules, the government should compensate the concessionaire for the unilateral contractual changes in the tolls. However, it should not compensate the concessionaire for the increase in the financial costs. Table 6 presents the major changes, in net present value (NPV), for the concession duration. At the end of the process, the concessionaire had a 76 million Euros increase in the project's NPV, even considering the enormous rise in financial costs. The financing of the project was a responsibility of the concessionaire, and consequently it should not be incorporated in the EFR model. This has biased the procedure and clearly resulted in overcompensation to the concessionaire.

The use of the EFR model might be jeopardized if other events are brought to the process, in addition to those that triggered the renegotiation.

Table 6. Impact of Contract Renegotiation

Financial flow	OBC	Final contract	Difference[a]
Tolls revenue	2,065	2,115	+50
Financial costs	230	495	−265
Operational costs	330	245	+85
Governmental compensations	100	306	+206
Total			+76

Note: Data from the Court of Audit. Units are in net present value (millions of Euros). OBC = outline business case.
[a]The sign represents a gain (+) or loss (−), from the concessionaire's perspective.

Primary Findings and Policy Implications

Renegotiations can jeopardize and erode the advantages of competitive bidding, questioning the entire concept of PPPs use. Nevertheless, irrespective of the improvements that are made in mathematical forecasting, there will always be a high degree of uncertainty in forecasting for the long term. The question becomes how to manage renegotiations, rather than avoid them, to decrease the risk of opportunistic use.

Renegotiations happen because of two different effects. One is the problem of contract asymmetry and opportunistic behavior by governments and concessionaires (as noted previously). The other problem is related to unforeseeable events, for which none of the parties has privileged information, e.g., natural disasters and wars. These events are usually termed *force majeure*. In this type of event, agents have symmetric information or, more accurately, no information at all. The effort to increase contract completeness, foreseeing all possible contingencies, can incur unbearable transaction costs.

Acknowledging that renegotiations will eventually happen can help improving contract design. The rationale for the EFR model is that concessionaire and grantor agree on the rules to follow in case of renegotiation, and also on what type of events can trigger the renegotiation (and the KPIs to measure them). Uncertainty is not foreseeable, but it can be manageable. This is the primary advantage of the EFR model, i.e., setting the rules for future renegotiations.

Despite these benefits, there are some problems. When the thresholds are excessively low, renegotiations occur with a minimal change. The contract does not have any flexibility, and events with small impacts can initiate the renegotiation process. This incurs transaction costs, and can also increase the opportunity for opportunistic behavior. This leads to the second problem. After the contract is open, if the concessionaire is able to bring to negotiation other changes to the OBC, e.g., operational and/or financial costs not directly related to the event that triggered the renegotiation, the process is biased and can induce strategic behavior.

As noted previously, the possibility of an *ex-post* renegotiation in which the concessionaire can recover losses is a perverse incentive to bid aggressively for the market.

Therefore, there are two drivers for opportunistic use of EFR. One is by establishing low thresholds to open the contract and the other is by bringing to the process renegotiation claims

(by the private sector) that should not belong to the renegotiation perimeter.

Regarding the first reason, Portuguese concessions, particularly in roads and water systems, have proven to be inadequate, with excessively low triggers. These sectors have been prone to opportunistic behavior by concessionaires. Very low thresholds will allow them to open the contract very easily, and can be used strategically by concessionaires to initiate the process. If the concessionaire is allowed to bring to the process other claims in addition to the event that triggered the renegotiation, then success is jeopardized. In addition to providing incentives to aggressive bidding, this outcome transforms the contract into a cost-plus scheme. Furthermore, if the model bears more resemblance to a cost-plus scheme, then the award criteria should take into account the IRR required by each bid. A concessionaire can underestimate the construction costs, or operating costs, lowering the final price of its bid, and retain a high IRR. Once the contract is open (and the data shows that is not a question of if, but rather of when), the contractual mechanisms that ensure the reequilibrium of the IRR can allow the concessionaire to recover initial losses. The grantor will be paying a premium (IRR) that may not be the lowest, because the IRR is also not evaluated in the awarding process.

How can this problem be avoided? Regarding the design of triggers, it seems clear that larger thresholds should be applied to accommodate small changes, with virtually no impact on the concessionaire return. Decreasing the risk of opening the contract will decrease the changes of harming the public interest during renegotiation.

Simultaneously, it is necessary to ensure that the EFR model is only applied to the events that originated the renegotiation. This requires a third agent, regulatory agency, or court of audit to supervise the process. Given the specificity of the sectors, and the level of technical detail in some renegotiations, sector-specific regulation, through a contract manager with deep knowledge of the contract itself, should be the first best solution.

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