Université Paris 1 Panthéon-Sorbonne
Institut d'Administration des Entreprises de Paris

école doctorale "Sciences de la Décision et de l'Organisation" - ED 471
équipe de recherche GREGOR - EA 2474

Renegotiation and performance in public-private contractual arrangements

An economic analysis

Thèse

présentée et soutenue publiquement le 25 novembre 2011

en vue de l'obtention du

Doctorat en Sciences Economiques

par

Julie de Brux

Directeur de Recherche

M. Stéphane Saussier
(Professeur, IAE de l'Université Paris 1 Panthéon-Sorbonne)

Rapporteurs

M. Frédéric Marty
(Chargé de recherche de première classe - CNRS. Section 37)

Mme. Paola Valbonesi
(Associate Professor (SECS P01) University of Padova, Italie)

Suffragants

M. Louis-Roch Burgard
(Directeur Général de VINCI Concessions)

M. Antonio Estache
(Professeur, Université Libre de Bruxelles, Belgique)

M. Bertrand Quélin
(Professeur, HEC Paris)

Acknowledgements

This document is the result of a three-year-and-a-half adventure, which fortunately did not look like Robinson Crusoe's: my travelling fellows were all but cannibals. I wish to thank all the people who helped me along the way.

Professor Stéphane Saussier was my PhD advisor and I thank him for putting his trust in me. Without his valuable criticisms and intuitions, I would still be on my desert island. Moreover, he encouraged me to present my works to several conferences and to meet experienced researchers who gave me very precious advice.

Thus, I am lucky for the more or less unexpected encounters I made during these visits, academic conferences and seminars. I specifically think about Jon K. Stern, from City University in London; Antonio Estache, in Brussels at the very beginning of my PhD, who accepted to take time to suggest some guidelines; Eva Hoppe and Patrick Schmitz, from University of Köln, who made very constructive comments on chapters 3 and 4; Ricard Gil, from University of California at Santa Cruz, for his interest on the empirical part of this dissertation; Steve Tadelis, from University of Berkeley Haas School of Business, whose short comments on Chapter 2 made the difference; Eshien Chong, from University Paris XI, for his ceaseless questioning, that make him a real researcher. Interacting with them has been priceless.

I would also like to thank two very special persons: Vincent Piron and Claudine Desrieux. They come from two worlds that would gain in communicating more: Vincent is from the practitioners' world and taught me how contracts work for real, whereas Claudine is from the academic world, she taught me rigorousness and was relentless in trying to extract the most out of me. I learnt so much all along these collaborations. Without their careful readings and our regular discussions, I would have been miserable. They both fed me intellectually a lot, but I hope they will not feel dispossessed of their ideas and contributions. Vincent and Claudine, thank you so much.

Many other people also offered me their confidence and allowed me to make links between theory and practice. In particular, Stéphane de Barros who accepted to open several cabinets, full of real car park contracts, and Joël Vélasque who spent several hours telling me the story of the Cambodian airports. Louis-Roch Burgard and Thomas Barbelet trusted me enough to believe in the utility of my work. Little by little, we succeeded in making our vocabularies converge. This open-mindedness is a pale reflect of their outstanding intelligence. I am honoured that VINCI Concessions gave me the opportunity to observe their business activity and extract some stylised facts that serve as a basis for this dissertation. From the public side, I met decision makers who gave me valuable advice and anecdotes.

I am very grateful to my colleagues of the *chaire EPPP*: Miguel Amaral, Laure Athias, Paula Berdugo, Jean Beuve, Lisa Chever, Eshien Chong, Freddy Huet, Aude Le Lannier, John Moore, Jean-Michel Oudot, Simon Porcher, Carine Staropoli, Tran Phuong Tra and Anne Yvrande-Billon. I particularly would like to thank those who accepted to read this dissertation over.

Some of them are not only valuable colleagues, but also precious friends. Jokes, happy hours, and solidarity played a great role in the outcome of this dissertation. Aude always had extraordinary adventures to tell, and "*C'est toi le radiateur*" will recognize himself. He also deserves the world award of the best "LaTeX repairman". I hope our friendship will perpetuate.

Many other friends and members of my family were of a great support: Audrey Larrouy, Anne-Sophie Barrau, Pierre de Brux, Maéva Riménesse, Mawi Bwiand, Marie Malmenayde, Marie Titatinois, Guillaume Poirier, Séverine Dausseur, Frédéric Piat, Maria Breidy, Claudine Desrieux, Claire Burlat, Fabien Tisserand, Camille Vélasque, Stéphanie Julien, Elsa Le Furet, Sylvie Beuve, Anne Sueur, Loulou Skalli, Galinette, Laurence Gourmelon, Kaki, Valentine Martin, Moune, Laure Athias, Martino Lapino, Henri Salami, Elenka Pisarska, Peluche, Arnaud de Brux, Liz Clarck, Flore de Brux, Piou, Sébastien Ferrari, Luanna Leal, Anh Basma, Nadège Crochemar, Gary Levy, Jonathan Horyn, Carine, Ariel, Reuven, Hanna and Guila Ohayon, Christine and Julio Amaral, Séverine and Thomas Amaral, Jacques Cuel, Mathieu Altbuch, Claude Ménard, Pierre Kopp, Eric Jablonski, Jacques Bénatar, Philippe Lacoste, Roger Fizelson, thank you for encouraging me, accepting my mood swings and my discontinuous presence.
I would like to express all my gratitude to my parents, Elie and Catherine, who supported me unconditionally and did not hesitate to show their pride. I would have liked Jean de Brux to read this dissertation.
Finally, I thank Miguel, who extraordinarily improved his pasta cooking skills during the past three months! Thank you for your love and patience.

Without you all, this work would not have been possible.

Foreword

This Ph.D. dissertation, entitled "*Renegotiation and Performance in Public-Private Contractual Arrangements*", brings together four chapters in the field of contract economics. The General Introduction describes the different research questions addressed in these chapters, as well as the links that can be established between them. Nevertheless, each chapter can be read separately. This implies the presence of redundant information across chapters, notably concerning the related literature.

Abstract

Scholars and decision makers have shown a growing interest for public-private arrangements, as an alternative solution to public provision of infrastructure and services. This dissertation is an attempt to contribute to a better understanding of these public-private contractual schemes' performance. The starting point is the question of renegotiations, that have been frequently analyzed as the symbol of public-private arrangements' failure. However in this dissertation, two case studies seem to show that parties are sometimes able to renegotiate in a way that is not a zero-sum game, but a triple-win game. This suggests that renegotiations should not be analyzed in an univocal way. In order to go one step further, an econometric analysis is led, based on an original dataset constructed by the author, and including several hundreds of car park contracts and their amendments. The goal is to investigate the link between some features of renegotiations and contract renewals that are conceived as an indirect measure of parties' satisfaction. Innovative results about the issue of renegotiation are found: adaptation through renegotiation is not necessarily harmful for the contracting parties. It depends on the frequence, the scope and the celerity of renegotiations, as well as on the type of object that is renegotiated.

Then, given that *ex post* adaptations are likely to be satisfactory or unsatisfac-

tory, this dissertation seeks to explore the performance of different contractual schemes. In particular, a theoretical work based on an incomplete contract framework is led to compare a contractual scheme where the operator bears the demand risk to a contractual scheme where the operator does not bear the demand risk. A trade-off between affordability for users and incentives to make satisfactory *ex post* adaptations is underlined to assess the relative performance of these contractual schemes.

Finally, another theoretical work analyses the overall impact of the allotment public policy aiming at increasing *ex ante* competition for public services. It is shown that there might be a conflict between the choice that maximizes the public authority's share of surplus (to allot public services) and the choice that maximizes total surplus (not to allot public services).

In the end, this dissertation contributes to identify some situations where the interests of the different parties involved in such public-private arrangements are likely to be aligned or misaligned.

Keywords: Public services, Public-private arrangements, Renegotiation, Incomplete Contracts, Innovation, Cooperation, Opportunism

Résumé

Renégociations et Performances des Accords Contractuels Public-Privé

Une Analyse Economique

Chercheurs et décideurs publics nourissent depuis quelques années un intérêt croissant pour les accords contractuels public-privé, qui constituent une alternative à la fourniture purement publique des infrastructures et services publics. Ce travail de thèse vise à apporter des éclairages sur la performance de ces accords contractuels. Le point de départ consiste à s'intéresser à la question des renégociations, jusqu'alors largement perçues comme le symbole de l'échec des contrats public-privé. Pourtant dans cette thèse, deux études de cas semblent suggérer que les parties au contrat sont parfois capables de renégocier de façon à ce que le résultat ne soit pas un jeu à somme nulle, mais un jeu gagnant-gagnant-gagnant. Cela suggère que les renégociations ne doivent pas être analysées de façon univoque. Afin d'affiner cette réflexion, une analyse économétrique est menée, s'appuyant sur une base de données originale construite par l'auteur, et comprenant plusieurs centaines de contrats de parkings et leurs avenants. Son objectif est d'explorer le lien entre diverses caractéristiques de renégociations et les renouvellements des contrats,

qui mesurent indirectement la satisfaction des parties au contrat. Des résultats novateurs sont trouvés: l'adaptation des contrats au travers des renégociations n'est pas nécessairement dommageable pour les parties au contrat. L'impact dépend de la fréquence des renégociations, de leur étendue, de leur rapidité ainsi que du type d'objet sur lequel porte la renégociation.
Puis, étant admis que des modifications pendant la vie des contrats peuvent donner lieu à des résultats satisfaisants ou insatisfaisant, cette thèse vise à comparer la performance relative de différents schémas contractuels. En particuler, un travail théorique basé sur la théorie des contrats incomplets compare les schémas contractuels faisant supporter le risque demande à l'opérateur aux schémas contractuels ne faisant pas supporter le risque demande à l'opérateur. Un arbitrage entre accessibilité du plus grand nombre d'usagers et incitations à entreprendre des adaptations satisfaisantes est souligné pour apprécier l'efficacité relative des deux schémas contractuels.
Enfin, un autre travail théorique analyse l'impact total de la politique publique d'allotissement utilisée à des fins d'augmentation de la concurrence *ex ante*. Il est montré qu'il peut y avoir conflit entre le choix permettant à la partie publique de maximiser sa part de surplus (allotir les services publics) et le choix permettant de maximiser le surplus total (ne pas allotir les services publics).
En fin de compte, il est probable que cette thèse contribue à identifier des situations dans lesquelles les intérêts *a priori* divergents des différentes parties aux contrats, sont susceptibles de converger.

Mots-clés : Services publics, Infrastructure, Contrats public-privé, Renégociations, Contrats Incomplets, Innovation, Coopération, Opportunisme.

Contents

General Introduction and Overview

Public services in Europe have been disrupted by several institutional and organizational changes for the past decades, notably through a rising recourse to externalization of supply. The considerations for efficiency and the "best value-for-money" concern in public spendings have played a great role in the implementation of public-private arrangements to provide public services. Public-private arrangements are a set of contractual arrangements whereby a public authority and a private operator agree on respective tasks to provide public infrastructure or services.

Public-private arrangements have been increasingly used over the world (Armstrong and Sappington [2006]), so that public services are supposed to benefit from the productive efficiency of private firms (Megginson and Netter [2001]), their economies of scale, as well as from their distance to political agendas (Boycko et al. [1996]). However, several drawbacks have also appeared. The economic literature has identified three stages (Williamson [1976]; Yvrande-Billon [2006]) during which pitfalls may occur. The first one is the selection stage, which raises difficulties about the design of award procedures. The auction theory, the agency theory and the transaction cost theory have paid high attention to these issues (Hong and Shum [2002]; Athias and Nunez [2008]; Bajari and Tadelis [2001]; Bajari et al. [2009]). Second, during the execution

of contracts, the transaction cost theory has highlighted that the private and the public partners may be in a bilateral dependency situation due to asset specificities, which makes the appropriation of quasi-rents possible (Klein et al. [1978]). Following this consideration, several works about opportunism during the execution of contracts in general, and about renegotiations in particular (Guasch [2004]; Athias and Saussier [2007]; Guasch et al. [2007, 2008]) have emerged. One element that is pointed as alarming by Guasch [2004] is that 41.5% of concession contracts are renegotiated.[1] Third, the reattribution of contracts may also be a tricky stage, since the incumbent may benefit from a first-mover advantage (Williamson [1985]) due to the asset specificities developped during the previous relation. *De facto*, other bidders to the competitive tendering are penalized (Zupan [1989]), which requires costly solutions to reduce the magnitude of the problem.

During these three stages, opportunistic behaviours may appear, leading to additional costs, surplus destruction or to unbalanced sharing of the gains. As pointed out by Williamson [1975], "*opportunism refers to a lack of candor or honesty in transactions, to include self-interest seeking with guile.*" Such opportunistic behavior may include shirking, delivering unsatisfactory products and services or appropriating the partners resources. Because these activities seriously jeopardize the viability and the success of relationships, a major goal for parties is to find way to deter opportunism, that is to say, to promote cooperative behavior.

Potential opportunistic behaviours may appear so often in public-private arrangements that Estache [2006] wonders whether one should talk about public-private *divorce* instead of public-private *partnership*. It is in this perspective that one should continue to wonder who are the "winners" and who are the "loosers" in the outcome of public-private arrangements, and more importantly when the interests of parties are likely to be aligned. In this respect, the cen-

[1] Guasch [2004]'s study is based on a dataset made of more than 1000 concession contracts granted in the Latin American and Caribbean region during 1985-2000.

tral point of this dissertation is about the allocative efficiency of public-private arrangements, which frequently require adaptations during their execution.

The standard microeconomic literature has studied the question of surplus and its allocation mainly through the prism of the price system. However, it turns more complicated when we introduce refinements to better suit real situations. In particular, if we focus on public services and infrastructure, the analysis becomes more complex. First, the surplus cannot be reduced to a question of prices but also incorporates qualitative dimensions. So the question of whether contractual arrangements provide enough incentives to deliver high quality services and infrastructure deserves investigations. Second, public-private arrangements are medium or long-term contracts that require adaptations during their execution, so that renegotiations can occur and the private operator may undertake opportunistic efforts. Then, quality and renegotiations are essential issues. Not to consider them boils down to take the risk of loosing the benefits of public-private arrangements. Third, public-private arrangements refer to arrangements that are neither fully public, nor fully private. Then it is worth wondering how the property and decision rights structure in the different types of public-private arrangements affect the allocation of losses and benefits for the parties.

In order to contribute to the analysis of these issues, this dissertation is divided into two parts. In Part I, we investigate in depth how renegotiations affect the efficiency of public-private arrangements. So far, they have been mostly analyzed as zero-sum games and leading to decrease the surplus of at least one party (the public authority, the private operator or users) (Guasch [2004]; Guasch et al. [2000, 2003]). **The starting point of this dissertation is to remark that renegotiations are sometimes leading to an increase of the surplus for all the parties. This suggests that there is**

an open research agenda to analyze the conditions and the contractual arrangements that are most likely to lead to desirable changes satisfying all the parties. Part I opens the agenda by examining the occurrence of satisfactory renegotiations. Part II takes for granted the fact that the operator may undertake satisfactory as well as unsatisfactory efforts to adapt the infrastructure and/or service he is in charge of. By enriching classical incomplete contract models, we analyze how the different contractual choices affect the incentives of the private operator to undertake efforts that affect quality, and thus the performance of public-private arrangements.

Before describing in more details the different research questions that are tackled in this dissertation, let us first make a state of play to define public-private arrangements in further details, and to understand the scope of the issue.

Public-private arrangements are opposed to public provision. This latter is a mode of organization whereby a public service or infrastructure is fully delivered in-house by public agents. Alternatively, public-private arrangements, although they are not defined in any legislation on public contracts, refer to contractual arrangements whereby a public authority and a private sector entity[2] agree on a remuneration scheme, a duration and a sharing of the risks and of rights. The private partner ensures the provision of an infrastructure and/or of a service, and the public authority retains asset ownership[3] and the power to control and monitor some actions of the private operator. Public-private arrangements refer to two different forms: public procurement contracts and public-private partnerships (PPP). These two contractual categories have evolved through time to satisfy contractual needs. For instance, in

[2]In this dissertation, we disregard entirely the contractual solution where the public authority out-sources a service to a public firm.

[3]Depending on the legislations, property rights may be or may not be transfered to the private firm during the lifespan of the contract. In Figure 1, it is written that property rights are kept by the public authority, as in the French system. But this does not prevent from transfering some decision rights in public-private partnerships, as well as some payoff rights in concession contracts. We detail these characteristics in Chapter 3 and 4.

the PPP category, the availability contract solution, which comes from the UK through PFI contracts (Private Finance Initiative), was duplicated in France in 2004, through *contrats de partenariats*. Figure 1 proposes to summarize roughly the main characteristics of the different public-private arrangements. In practice, contractual arrangements are not so distinct, and we had better talk about a continuum of contractual arrangements.[4]

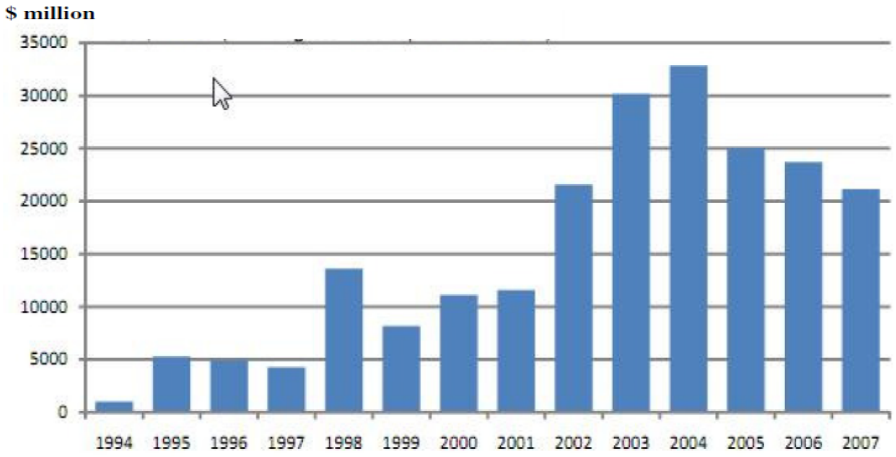
Figure 1: Main characteristics of the different modes of provision of public services

	Public Provision	Public-private Arrangements		
		Public Procurement	Public-Private Partnerships	
			Availability contract	Concession
Property Rights	Public	Public	Public	Public
Does the authority Make or Buy?	Make	Buy	Buy	Buy
Duration of the outsourced contract	—	Medium	Long	Long
Bundled or unbundled contract	—	Unbundled	Bundled	Bundled
Remuneration scheme of the operator	—	Fixed-price (no demand risk)	Fixed-price (no demand risk)	Users fees (demand risk)

PPPs have been implemented broadly around the world. The advent of concession contracts started in the 17^{th} century in Europe in the port sector, and in the 1980s, the United Kingdom pioneered the development of a particular form of PPPs, creating the Private Finance Initiative (PFI) in 1992 to further promote PPP agreements. Other European countries have also invested in PPPs, especially Ireland, France, Portugal, Greece, the Netherlands, and Spain (PricewaterhouseCoopers [2005]; EIB [2004]). Figure 2 shows the evolution of announced PPP deals between 1994 and 2007 in OECD countries.

[4]For instance, availability contracts such as PFIs may foresee that a part of the remuneration of the operator comes from users' fees. Moreover, in some countries, some "shadow toll" contracts are contracts for which the remuneration of the operator depends on the frequenting of the infrastructure. But users do not pay fees. It is the public authority who pays the operator. These are intermediary forms of PPPs.

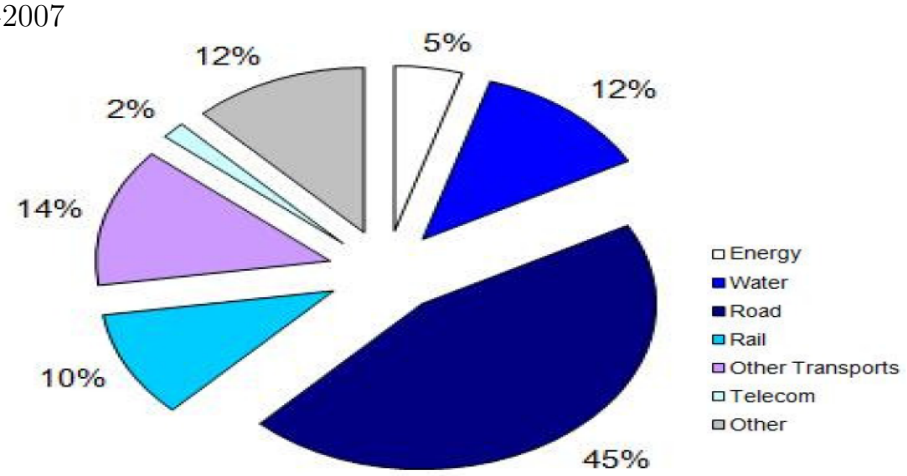
Figure 2: Value of announced PPP deals in OECD countries, 1994-2007



Source: Araujo and Sutherland [2010]

As underlined by Figure 3 and by Hammami et al. [2006], PPPs have been used in various sectors such as energy, transport and water, but more recently, the health, education and prison sectors have also experienced PPPs. Indeed, in the UK, about 595 millions of pounds are expected to be spent through PFI in Education, about 420 for environment, food and rural affairs, in 2011-2012. In the health sector, 64 PFI were launched in June 2009 in the UK, representing a total amount of 16 billions of euros (Treasury [2011]).

Figure 3: Distribution of sectors concerned by PPPs, in OECD countries, 2000-2007



Source: Araujo and Sutherland [2010]

Finally, public procurement contracts[5] account for a substantial share of public spendings. For example, in the European Union, in 2007, they are estimated at 16.6% of EU GDP,[6] which represents a spending of about 2 100 billions of euros. 40% of this amount was awarded for works contracts, and 35% for services contracts (Commission [2011]).[7] In France, FMVM and local [2006] highlight that public procurement is used in 8% of sewage services by French medium-size cities, 41% of waste collection services, 42% of waste treatment and 15% of urban public transports.[8]

The extent of public-private arrangements as a whole (including all types of PPPs and public procurement contracts) raises a lot of questions both for

[5]In Figure 1, it is indicated that public procurement contracts are not bundled, *i.e.* they are not global contracts. Let us note however that in August 25th 2011 a modification of Article 73 of the *Code des Marchés Publics* was introduced in France, in order to make global public procurement contracts possible in the field of energetic performance for public buildings.

[6]http://europa.eu/policies-activities/tenders-contracts/index-fr.htm

[7]The remaining 25% are dedicated to contracts to buy goods, which is not the target of our research.

[8]This report is based on cities for which the number of inhabitants is between 20,000 and 100,000.

users, practioneers and scholars.[9] What will draw our attention in this Ph.D. dissertation is the fact that public-private arrangements are medium or long-term contracts, so that all contingencies cannot be foreseen at the date of signature. For instance, external shocks such as a financial[10] or a geopolitical crisis may occur, and concerns for new expectations, such as sustainable development may emerge. Given these elements, some adaptations to the contract may be needed during their execution. Adaptation processes are likely to generate opportunistic behaviours.[11] In particular, **one fear is that private operators may favour their own profitability at the expense of quality**.

In this dissertation, we attempt to provide lighting about the impact of uncontracted-for contingencies that sometimes give rise to renegotiations, on the efficiency of public-private arrangements and how they benefit to the parties. In most of the existing papers that take renegotiations into account, renegotiations are considered as being constrained (due to institutional weakness or incompleteness) and, more importantly, as being a negative event that is detrimental to at least one party.

In the first part, which is made of two chapters, we focus precisely on the question of renegotiations.

The notion of renegotiations has not been explicitely defined by economists. Alternatively, lawyers are more precise (they rather use the term *amendment*), and they analyse the boundaries of amendments and new contracts. In the French legislation, it is legal to write an amendment provided that it does not

[9] We do not consider the fully private provision of public services. Indeed, private provision is excluded due to important market failures (externalities, natural monopolies, public goods) that characterize public services.

[10] This is what happened for instance in Argentine in 2001 when the Convertibility Law was abandonned.

[11] Opportunism does not necessarily come from *ex post* adaptation processes due to uncontracted-for contingencies. Opportunistic behaviours may also occur *ex ante*, when an operator intentionnally bids aggressively, so as to be awarded the contract, and then to renegotiate in a dependency situation. Such behaviours are described in Chapter 1 and are also suggested in Chapter 2 of this dissertation.

modify "*the economic equilibrium of the contract*"[12], *i.e.* provided that there is no disruption in the financial remuneration of the private operator.[13] In public procurement contracts, a 5% modification of the amount of the contract is a disruption.[14] Above this threshold, the contract must be the object of a new tender process. There is an exception to the necessity of a new tender process in case of unforeseen constraints that are not of the parties' responsibility.[15] Concerning longer-term contracts such as concessions or *contrats de partenariats* (the French availability contracts), instead of defining as illegal the amendments that "*modify the economic equilibrium of the contracts*", lawyers define as illegal the amendments that "*modify substantially one of the elements of the contracts, such as its duration, or the volume of investments*".[16] The definition of "substantial modification" is particularly vague, nonetheless the impossibility to change the contract terms as much as parties want is in line with the general trend of public policies to favour transparency and seek to avoid corruption in public contracts. Moreover, it is in line with the view according to which renegotiations are seen as a sign of opportunism. In this dissertation, we refer to renegotiation as all the changes in the contract terms approved by the law. Thus, renegotiations are not new contracts, but they are all the more or less important modifications brought to the contracts during their execution.

In the economic literature, it is commonly acknowledged that renegotiations are a proof for the weaknesses of public-private arrangements and the lack of credibility for long-term commitment. Chapter 1 recalls that renegotiations have been described as Achille's heel of public-private arrangements, and that they have been mostly analyzed through the lens of hold-up theories

[12]Article 20 of the French *Code des Marchés Publics*.

[13]Decision of the *Conseil Constitutionnel* of June 10th 1998.

[14]Article 49.1 of the Law of January 29th 1993, called *Loi Sapin*.

[15]Concl. Bergeal sous CE, June 22nd 1998, Préfet du Puy de Dôme, BJDCP, 1999, n°1, p.36.

[16]Recommendation of the *Conseil d'Etat*, April 19th 2005 concerning outsourcing of ski lifts.

(Crocker and Masten [1996]; Williamson [1975]) for the past decades. In this way, economists largely worked on the solutions to avoid them.
However, two situations that seem not to be in line with this view are described in Chapter 1: the case of an amendment in the airport concession in Cambodia following the Asian crisis and a local military insurection, and the case of an amendment in a French tunnel concession, following a skyrocket of the traffic. We observe in these two real cases that parties reached agreements through renegotiations that were beneficial to the private partner, the public authority and to users. This suggests that **the research agenda is open, since it seems that contrary to the widespread view about renegotiations, parties are sometimes able to share efficiently the losses and benefits resulting from unexpected events**.

Once the existence of renegotiations that are beneficial to all the parties is insinuated, it is essential to go further and to overstep the previous basic case studies. This is why the major challenge of Chapter 2 is to access data and build a sufficiently large database made of public-private contracts with their amendments, in order to overcome the unavoidable imperfect information inherent to questionnaires and surveys that are generally used to study contractual relationships. **The opportunity to access to all the 666 contracts with their respective amendments, signed between 1963 and 2008 between French municipalities and the leading company of the car park sector enabled to meet this challenge. Building such a new database contributes to the originality of this chapter, where we analyze empirically the impact of renegotiations on the satisfaction of the public and the private parties.** The car park sector is an interesting public service to investigate since there are important potential externalities, in terms of mobility and sustainable growth, resulting from a efficient management of this service. Moreover, it is a mature market, characterized by important competition, and where public-private arrangements are

widespread.

Given that in the French legislation public authorities can use the *intuitu personae* principle[17] to select their partner in concession contracts and that the private operator can freely decide to bid again or not for the contract, we make the central assumptions that contract renewals (being re-awarded the contract once the previous one expired) are a proxy for the satisfaction of the parties about how their previous relationship went on. So our point is to consider that if renegotiations led to surplus decrease, then parties would not be prone to contract again together. In this perspective, we analyze the impact of renegotiations on contract renewals.

Another originality of this empirical work is to go beyond existing studies on renegotiations by taking into account several features of renegotiations. Not only do we consider whether renegotiations have occurred but we also endeavor to characterize their nature by taking into account their timing, their frequency and their type. Concerning their type, we identify renegotiations dealing with changes in tariffs, quality, duration, additional investments or conditions of the financial equilibrium.

Our findings reveal that some renegotiation types, their frequency and their scope clearly impact on the probability to see a contract renewed as soon as public authorities have discretionary power on the decision to renew a contract with the same private partner, as it is the case in concession contracts. Hence, this chapter suggests a positive, negative or neutral impact on the contractual surplus depending on the kind of renegotiation and the kind of contract that is considered.

We believe that Part I of this dissertation contributes to the empirical literature on renegotiations by providing a different insight to the widespread view concerning the perverse effects of renegotiations. Indeed, we provide a

[17]Ruling from the *Conseil d'Etat*, dating back to October 30th 1936. Meantime, the *Sapin* Law, January 29th 1993 was signed in order to promote transparency (See footnote 14). However, the *intuitu personae* principle still applies.

broader landscape of the diversity of renegotiations and we go beyond existing studies on this issue by taking into account much more features of renegotiations. We highlight that parties are sometimes able to renegotiate their contracts in a way that satisfies them all.

While in Part I we enrich empirically the literature concerning renegotiations, Part II accounts theoretically for such a non univocal view about *ex post* adaptations. *Ex post* adaptations, called *ex post* investments in the incomplete contract literature, gather all the adaptations undertaken by the private operator that may give rise or not to a renegotiation process. These *ex post* investments may have a positive or a negative impact quality, and thus they have an impact on total surplus. The goal of part II is to wonder which types of contractual arrangements are most likely to lead to satisfactory *ex post* investments. In this perspective, we base our theoretical analysis on the **incomplete contract approach** (or "property right theory"), as developed by Grossman and Hart [1986]; Hart and Moore [1990]; Hart [1995], which offers a rigorous framework to evaluate contractual arrangements, and their *ex post* outcomes, given that there are some non-contractible contingencies. Since the founding articles previously cited, many papers used this approach to compare public and public-private arrangements (Hart et al. [1997]; Hart [2003]; Bennett and Iossa [2006]; Hoppe and Schmitz [2010]).

There are three reasons to believe that the incomplete contract framework is the most relevant one to study the issues we raise.
First, this approach permits to analyze the allocation of property rights and decision rights under different contractual arrangements. In most European countries, the assets remain publicly owned in public-private arrangements. However, the allocation of decision rights allows to analyze which *ex post* investments are implemented and how the losses and benefits are shared among

the parties. We also propose to add the payoff rights dimension.

Second, the incomplete contract approach pays special attention to the issue of quality. Three types of quality aspects can be defined in this framework. The first type is when the quality aspect can be contracted-on *ex ante*, in the initial contract. This suggests that a third party can verify whether the commitments have been fulfilled. The second type is when the quality aspect cannot be written *ex ante* (because it is impossible or prohibitively expensive for a third party to verify if the commitment has been fulfilled), but it becomes verifiable *ex post*. The third type is when the quality aspect cannot be written *ex ante* (because it cannot be verified), and it is still not verifiable *ex post*. Then, this theoretical framework that allows to analyse specifically the evolution of quality, suits well one of the major concerns of public service policies.

The third reason to believe that the incomplete contract framework best suits our research questions is derived from the second reason. Since there are some parameters that cannot be written in the contracts, and since contingencies evolve, the private operator may undertake efforts to implement investments[18] that have an impact on quality. Such investments[19] may have a beneficial effect on quality, as well as an adverse effect. They also have an effect on the cost to provide the infrastructure or the service. When *ex post* investments have a verifiable effect on quality, it is frequent that parties, depending on the decision right structure, renegotiate the contract to implement or not to implement such investments. This *ex post* verifiability assumption leading to renegotiations suits the occurrence of renegotiations underlined in Part I. As in Hart et al. [1997] and Bennett and Iossa [2006], we use this assumption in Chapter 4. However when the *ex post* investments have a non-verifiable impact on quality, the private operator can decide alone to implement them or not, whatever the effect on quality. Such investments are the most worrisome since

[18]In the Incomplete Contract Theory, "investments" or "innovations" are used indifferently.

[19]The fact that the investments were not written in the contract does not mean that parties have bounded rationality. On the contrary, they have rational expectation, but they are "constrained in contracting only by the fact that complicated states of the world cannot be verified" (Hart and Moore [1999]:134), or because states are too expensive to describe *ex ante*.

the public authority cannot monitor their implementation through a renegotiation process. As in Hart [2003], we use this unverifiability issue in Chapter 3, in order to better take into account the mistrust towards public-private arrangements, whereby the private operator may sacrifice quality in the name of profitability.

Therefore, the incomplete contract approach enables to compare the consequences of the various allocations of rights entailed by the different contractual arrangements on the incentives parties may have to make *ex post* investments that affect quality. As a consequence, this theoretical framework allows to take into account the three elements that we underlined previously as crucial to study the performance of public-private arrangements, page 17: property and decision rights, quality and *ex post* investments.
An important assumption of the incomplete contract framework is that there is no asymmetry of information.[20] Such a view can be justified because many problems in the delivery of public services are linked to *ex post* adaptation to unforeseen contingencies rather than *ex ante* screening (Bajari and Tadelis [2001]).

In this context, we take for granted that contingencies may arise during the execution of contracts, which sometimes gives rise to renegotiations (only in Chapter 4). We explore the relative performance of different types of public-private arrangements. To relate this to the research agenda we opened

[20]Many contributions of the agency theory framework have focused on informational problems in public-private arrangements (Martimort and Straub [2006]; Guasch et al. [2003]; Laffont and Martimort [2002]; Laffont and Pouyet [2004]), and they have analyzed the optimal incentive contracts to elaborate, given that there are adverse selection and moral hazard issues. However, this literature mainly relies on a complete contract environment, which might not be adapted to capture some important features of public-private arrangements for the provision of public services (Sappington and Stiglitz [1987]; Malin and Martimort [2000]). Thus, we rather contribute to the growing literature using the incomplete contracting approach (and assuming symmetric information between the parties) to stress the impact of evolving contingencies, that lead to investments by the operator to adapt to such contingencies.

thanks to Chapter 1, **now we know that more or less satisfactory contract adaptations may occur during the execution of contracts, we have to wonder what type of contractual arrangements and legal environment are the most likely to lead to efficient outcomes for all the parties. The results are not one-track and we show that they depend on the efficiency criteria that is considered.**

Chapter 3 aims at comparing concession contracts and availability contracts which are both bundled public-private partnerships. The difference between these two contractual arrangements relies on the remuneration scheme of the private operator (See Figure 1, page 16). While he is paid a fixed price by the public authority in availability contracts, the operator is remunerated through users' fees in concessions contracts. This difference should intuitively lead to higher incentives for the operator to make *ex post* investments for a better quality in order to attract users and thus receive a higher revenue in concession contracts. However, several examples reveal that the quality of service is not always as high as expected in these contracts. For instance, a survey made in 2005 based on 900 users of the A77 concession highway shows that one third of users have an unfavorable or very unfavorable opinion about the quality of service on this highway.[21]

This suggests that there is a need to explore more deeply whether public authorities should prefer concession contracts with respect to availability contracts, with the hope to provide the operator with higher incentives to satisfy users and avoid unsatisfactory *ex post* investments. We highlight a trade-off between affordability for users and incentives to improve quality of service. In this way, we suggest that neither the concession solution nor the availability contract solution is intrinsically superior to the other, since the choice must depend on the prefer-

[21] www.appr.com/fr/amenagement-reseau/Bilan-LOTI-A77-LOTI-2-Synthèse.pdf?FileID=pdf%2FBilan-loti-a77-loti-2-synthèse.pdf

ences of the public authority and the characteristics of the population.
More precisely, we propose a theoretical analysis that allows to show that when quality is hardly contractible, concession contracts provide higher incentives to the private operator to make investments that have a positive effect on quality to attract more users, since there are consequences on his revenue. Nonetheless, the level of total surplus reached depends both on this level of satisfactory investments and on the level of the fees that are charged to users under concession. And the level of the fee both has a positive impact on the incentives to make satisfactory *ex post* investments, and a negative impact on the quantity of users who can afford the service or infrastructure.

An underlying issue that emerges from Chapters 2 and 3, is about the way *ex ante* competition for the market is organized. In Chapter 2, we show how important the *intuitu personae* principle may be to choose a private partner. For a matter of simplicity, we assume perfect price competition in Chapter 3. In addition, as reminded at the beginning of this general introduction, one important element that is studied in the literature to explain difficulties in public-private arrangements is about competition (Amaral et al. [2011]). It is claimed that market structures are often too concentrated to generate sufficient competition (Guérin-Schneider and Lorrain [2003]; Athias and Nunez [2008]). Besides, European institutions seized this issue and are looking for some ways to increase competition in public procurement contracts. It stands to reason that, in addition to the issue of the incentives to consider quality, the problem of competition needs to be considered in the final chapter.
This is why **Chapter 4 analyzes the practice of allotment that has been promoted by the 2004/18/EC European Directive in order to split contracts into several smaller contracts, with the idea to increase competition. We investigate the consequences of this practice both on the pursuit of cost-cuttings in public spendings, and on the pursuit of innovative quality improving solutions implemented by pri-**

vate operators. We focus on the case of public procurement contracts that are directly concerned by the reform of allotment. Examples of allotment are the safekeeping service in the French Island "La Réunion", which is divided into four lots[22], or the municipal school catering in the French municipality Le Luc-en-Provence, which was divided into two lots.[23] In Germany, a public procurement notice for a transport service in the municiaplity Cottbus (notice n°138-229696) has been published in the German Official Journal for public procurement on July 21^{th}, 2011. A fourth example is the competitive tendering for conveyor maintenance services in London that has recently been opened, and two lots are proposed.[24]

The impact of the number of bidders during a competitive tendering on the final price paid by the public authorities has been widely documented in the economic literature (Gomez-Lobo and Szymanski [2001]; Brannman et al. [1987]; Estache and Limi [2011]). However, while the focus has been put on price decreases (Amaral et al. [2011]), knowing whether quality is affected by the introduction of allotment has been left aside. Yet, the consideration for quality in public goods and services is all the more important than it has strong consequences on economic growth (Barro [1990]; Barro and Sala-i Martin [1992]). Moreover, public goods and services have been the object of many innovations for the past decades and the European Commission is relentless in trying to encourage innovation in public procurement contracts (Commission [2005, 2007]).

As a consequence, in this chapter we develop a theoretical model which shows that higher incentives to renegotiate in order to implement quality innovations are reached when allotment is not practiced, thanks to a larger possibility to diffuse the innovation. However, when we analyze the impact of the decision to allot or not to allot on the allocation of surplus, we find an innovative result, which depends on the type of *ex ante* competition. We highlight that under

[22]Decision of the *Conseil d'Etat, July 23rd 2010 Région Réunion n° 338367*

[23]Notice n°68-065677, published in the French Official Journal for public procurement, April 7th 2005. The contract began in 2005 and ended in August 2009.

[24]Notice n°138-229700, notice published in the British Official journal for public procurement, on July 21^{st}, 2011.

perfect price competition, the public authority captures all the surplus. However, the assumption of perfect price competition is questionable. So turning to the case of imperfect price competition, we find that there is a trade-off between the solution that maximizes total surplus through higher incentives given to the private operator to find innovations (no allotment) and the solution that allows the public authority to have a bigger share of the surplus (allotment). In a context where public authorities have strong financial constraints, this may explain why they use allotment in public procurement.

In a nutshell, Chapters 3 and 4 come as a way to explore some directions that have been under-investigated so far by the incomplete contract literature. In particular, the incomplete contract framework has focused on contractual arrangements where the operator is paid by the public authority. In Chapter 3, we modelize public services implying a payment by users, as it is the case in concession contracts, which to the best of our knowledge, has never been analyzed in an incomplete contract framework. Moreover, in accordance with the different views about renegotiations, we allow for a large variety of "investments" made by the private operator during the execution of contracts, from the completely inefficient investments (generating socio-economic losses for users that are superior to the benefits for the private operator), to the efficient cooperative ones. Finally, the issue of *ex ante* competition has been left aside by this theoretical framework so far and Chapter 4 seeks to contribute to fill this gap. In the end, Part II of this dissertation shows that the performance of public-private arrangements depends on multiple criteria such as the competitive pressure, the preferences of public authorities, the potential for innovations, the sensitivity of users to the level of price, their captivity, etc.

Some limitations to these chapters are discussed in the general conclusion, as well as extensions for future research. We also develop some public policy implications, since we believe that this dissertation deserves the credit

to establish some links between theory and what is observed in practice.

The following tables summarize the contributions of the different chapters of this dissertation, by describing the methodology and the main results that are obtained.

Table 1: Summary of Part I (*Research questions, methodology and main results*)

Chapter	Methodology and Originality	Main results
• **Chapter 1.** The Dark and Bright Sides of Renegotiations. • **Research Questions.** Does the observation of practices necessarily suit the general negative view about renegotiations?	• Review of the economic literature about renegotiations. • Two case studies made in 2009: A renegotiation of an airport concession contract in Cambodia and a renegotiation of a tunnel concession contract in France.	• Both case studies deal with unforeseen events (external shock and rise in the demand). In both cases, the outcome of the amendments is satisfactory for all the parties: the public authority, the private operator and users. • Suggested determinants of satisfactory amendments: perspective for future contracts and demand risk transfered to the operator. • There is room for further investigation about satisfactory renegotiations.
• **Chapter 2.** Renegotiations and Contract Renewals in Public Private Arrangements. • **Research Question.** What is the impact of renegotiations on the contractual renewals?	• Econometric analysis (probit estimations). • Public Private Arrangement contracts (Concessions and public procurement). • Data coming from the market leader of the French car park sector in France. • 666 contracts and all their respective amendments. • ***Source:*** original database gathered and constructed while I was a Ph.D. candidate.	• Renegotiating fast after the date of signature reduces the probability of contract renewal. • Depending on the dimensions they are concerned, renegotiations have a differentiated impact on contract renewal (positive, neutral or negative). • Existence of a non-linear effect concerning the frequency of renegotiations during the lifespan of the contract.

Table 2: Summary of Part II (*Research questions, methodology and main results*)

Chapter	Methodology and Originality	Main results
• **Chapter 3.** Concession Contracts: better satisfaction for users? • **Research Question.** Should public authorities prefer concession contracts with respect to availability contracts with the hope to better satisfy users?	• Theoretical model in an incomplete contract framework • Modelization of concession contracts and availability contracts. • Includes the possibility of *ex post* investments that have more adverse effect on quality than positive effect on cost reduction.	• Concession contracts lead to incentives to invest *ex post* that are preferable to the incentives in availability contracts. • However, concession contracts require the payment of a fee by users, which may have the consequence to exclude users. • There is no intrinsic better contractual solution. Trade-off between incentives to improve quality and affordability for users.
• **Chapter 4.** To allot or not to allot public services in Europe? • **Research Question.** What is the impact of allotment and thus of a rise in *ex ante* competition, both on prices and on innovations in public procurement contracts?	• Theoretical model in an incomplete contract framework • Modelization of Public Procurement contracts. • Analysis of the impact of imperfect price competition.	• Not to allot public services enables to reach higher levels of incentives to innovate. • In case of imperfect price competition, to allot public services enables the public authority to get a bigger share of total surplus than the case when allotment is not practiced.

Part I

Contract Renegotiations: the Evil for Public-Private Arrangements?

Chapter 1

The Dark and Bright Sides of Renegotiations: An Application to Transport Concession Contracts*

1.1 Introduction

Private participation in infrastructure has skyrocketed since 1990, at least until the 2008 credit crunch. In 2004, 205 national public-private partnership (PPP) contracts were signed worldwide, involving 52 billion USD in investments PricewaterhouseCoopers [2005]. This trend is not only the case of developed countries. Developing countries have also used it in order to finance, build and operate their infrastructures. However after nearly twenty years of experience, faulty designs and implementations, some observers have claimed that these contracts have had a significantly damaging impact on equity and efficiency for users of the facilities. They are accused of having led to otherwise unnecessary price increases, job losses, lack of transparency, corruption

*A version of this chapter has been published in *Utilities Policy*, 2010 (18), p. 77-85. I am grateful to Eshien Chong, Xeni Dassiou, Vincent Piron, Stéphane Saussier and Jon K. Stern for helpful discussions and comments, as well as participants to the 7th Conference on Applied Infrastructure Research, Berlin, October 2008 and participants to the CCRP workshop, London, January 2009.

and delays (Estache [2006]).
To a large extent, these negative sentiments are said to be initiated by the implications of renegotiation and the responses to it (Guasch [2004]). According to Guasch, 41.5% of PPP contracts (in a sample of around 1000 concession contracts concerning the electricity, transportation or water sectors, in Latin America and the Carribean region) are renegotiated (74.4% if we only look at water and sanitation contracts). Among them, 62% lead to tariff increase, 69% to delays on investment obligation targets and 62% reduction of investment obligations. More strikingly, contracts are renegotiated very soon after their award, with an average duration of 2.2 years between the signature and the first renegotiation.

Faced with these facts, both policy-making institutions and academic economic research have focused their attention on how to limit renegotiation. For instance, in the transport sector, the European Commission prohibited cross-financing that was previously used to finance new project element. In France, since 1999[1], each new section of a road project requires a call for tenders and must be self-profitable or subsidized. In this way, renegotiation with the original contractor is no longer available as a method to deal with a road expansion. To do so is accused by the European Commission of lacking transparency.
On the academic side, Engel et al. [1997, 2001] propose to draw up Least-Present-Value-of-Revenue auctions in order to avoid opportunistic renegotiations on prices from the private operator in case of negative evolution of the circumstances. This method consists in a flexible term of the contract, up to the moment where user fee revenue equals the bid. In Guasch et al. [2006], the probability to renegotiate a contract reflects the quality of institutions commitment and their capacity to enforce a contract. In this perspective, writing rigid contracts (including for instance a participation constraint defined *ex*

[1]Recommendation of the *Conseil d'Etat*, September 16th 1999.

ante or an investment in institutions) would close the door to opportunistic renegotiation, albeit at the potentially sizable cost of increased maladaptation costs.

This chapter questions the view according to which renegotiations of concession and similar infrastructure contracts systematically reveal the problem of parties' rent seeking, as implicitly suggested by most articles (Klein et al. [1978]; Gibbons [2005]; Williamson [1985]). In the literature on contract economics, the process of renegotiations is mostly described as being opportunistic, and the outcomes as being unbalanced between the parties. Instead, we show through two case studies that renegotiations can be addressed through the lens of long-term cooperation and can lead to satisfactory outcomes for all the parties at stake. We also try to understand why some renegotiations can be cooperative. The case studies allow to suggest two determinants of the parties degree of preference for a *collective benefit rather than for an individual benefit*.[2] These are (i) the perspective of future relationships, and (ii) the perspective that the contract adaptation will imply an immediate increased satisfaction of users, which has a direct impact on the revenue of the operator. Thus, we moderate the general perspective that denounces renegotiation as a "systematic lack of compliance with agreed-upon terms and departures from expected promises" (Guasch [2004]). Indeed, when parties are in repeated relationships, threats of sanctions or implicit promises on other contracts positively encourage contractors to take collective utility into account in deciding whether to renegotiate and, if so, how.

The paper is organised as follow. Section 1.2 deals with a literature review on renegotiations. We organize this section in the theoretical function of the origins of renegotiation. We identify three types of theoretical deter-

[2]"Preference for a collective result rather than an individual benefit" is Brousseau [1994]'s definition for "cooperation".

minants: contractual incompleteness, institutional instability and the combination of both. In all cases, the theory suggests that parties are looking for individual and short run benefits when they renegotiate, and in most of them, some surplus is lost by at least one party. We oppose this to the relational contracting view. Section 1.3 presents two case studies of renegotiations where all the parties were winners, largely thanks to cooperation. Thus they confirm the relevancy of addressing the question of renegotiation drivers through an alternative perspective from the hold up model. In the cases studied, the "spirit of the contract" prevailed over "the letter of the contract" (MacNeil [1974]). We try to identify the origins of such cooperation that increases total surplus. We conclude in section 1.4 by providing some implications of future research to be pursued in this area.

1.2 Rent seeking renegotiations described in the economic literature

This section aims at showing that the problems with renegotiations, as they are studied in the economic literature, come from the fact that, according to the models, the parties involved use them to seek to appropriate rents. Using a typology based on the origins of the renegotiations, - contractual incompleteness, institutional instability or both - we show that renegotiations often lead to hold up problems and decreases in economic surpluses.

1.2.1 Contractual incompleteness as a source of renegotiation

Uncertain environments and limited rationality make contracts necessarily incomplete. Indeed, as no probability can be assigned to unknown events, contracts cannot provide provisions for all possible future contingencies. As they are confronted with obstacles to which they cannot assign any probabilities, agents find it impossible to write complete contracts. Transaction cost theory

takes such contractual incompleteness as a starting point for renegotiations, with potential opportunism and rent seeking. Renegotiations may be due to difficulties during two strategic moments in the lifespan of contracts: the moment of the bid and the execution of the contract.[3] Basically, transaction cost theory argues that agents may try to capture a bigger part of the surplus already generated by the contract, so that contracts must not be written with credulity. In the end, whether opportunism occurs or not, renegotiations are zero-sum games.

1.2.1.1 The awarding of contracts problems

Public authorities are sometimes unable to specify the calls for tenders sufficiently to cover all potential contingencies. Indeed, public service contracts, such as infrastructure contracts, can be so complex that public parties cannot specify their expectations in great detail. This may be all the more of a problem if the public authority is small. Compared to large cities, not every single local government can be endowed with high expertise skills in such areas.

This lack of specification may lead to the so-called "winner's curse" phenomenon when the common value of the object submitted to an auction is not thoroughly known *ex ante* by the bidders (Hong and Shum [2002]): the most optimistic bidder is selected for the contract because of his under or overestimation of the works to be made and their cost, leading to faulty design of the contract. But once the parties learn the real state of nature, they renegotiate the contract, to ensure that the private operator does not go bankrupt. In these circumstances, although the renegotiation has become unavoidable, this situation is clearly sub-optimal because the parties can use renegotiation

[3]Williamson [1976]; Yvrande-Billon [2006] consider that difficulties may arise from a third strategic point in the lifespan of contracts, *i.e.* the moment of the reattribution of the contract, where the incumbent may benefit from a first mover advantage. We consider that this advantage increases the size of the quasi-rent parties may seek to appropriate, but this does not directly lead to renegotiations, which are the object of this chapter.

to engage in rent seeking, and because of the existence of transaction costs. Indeed, had the tender been well specified *ex ante*, there would have been no need for costly processes to correct such maladaptations.

Problems of tender specification often lead to a situation in which the winner of the bid was probably not the most efficient one to deliver the service. In the end, users or taxpayers support the delays or over-costs implied by renegotiations.

Guasch [2004] provides an example of this situation, for Mexico highways. The government hurriedly granted 52 highways tender projects to private operators in the early 1990s. In the submitted bids, the traffic forecasts were very optimistic and the conditions of the loan were not detailed enough. This led to a situation in 1997 where the Mexican government had to launch a program of 3.3 billion USD to restructure the financing of the highways. Private operators theoretically in charge of the highways may have appropriated a part of this sum, which, in the end, negatively affects the users' surplus.

In a close but different view, Guasch et al. [2000] and Bajari et al. [2007] also underline opportunism problems at the bidding stage. In order to win a contract, bidders may be intentionally prone to bid very aggressively even if the terms of their bids are not reasonably financially sustainable. The public party does not know that, because of her weaker expertise skills. In consequence, she may select the bidder who proposed the cheapest price for the service for instance. Then, renegotiation occurs because the private operator cannot commit to the terms of the contracts he has won, since the financial equilibrium of the contract may be unsustainable. At this stage, the government and the operator engage in a bilateral renegotiation, in a non-competitive atmosphere (Guasch et al. [2000]), since competition has been eliminated once the contract was signed. The public party is in a disadvantaged position. Due to political pressure for instance, the government cannot break up with the operator and select another one, since it would firstly be costly, and, secondly a confession

of failure (Williamson [1976]). Hence, this gives significant leverage to the private party to appropriate the quasi-rent.
Again, although renegotiation saves the operator from bankruptcy, it makes parties enter in a bilateral relationship in a sub-optimal way. Users and/or taxpayers end up bearing those additional costs. For example, Alcazar et al. [2002] describe how the winning bidder for a water concession in Buenos Aires was the one who was most confident in his capacities to renegotiate *ex post*. Indeed, in this case, the renegotiation appeared to have been anticipated by the operator, since he could not have paid off his loan otherwise.

1.2.1.2 The execution of contracts problems

Once the contract is signed, the operator generally engages in investments that are specific to the relationship with the public party. The risk that one of the parties tries to appropriate the resulting quasi-rents then becomes stronger. Thus, the public party or the private one (depending on who has incurred the idiosyncratic investments) can renegotiate the contract in his favour, by threatening to breach the contract. The opposite party will be constrained to accept if the request is credible, *i.e.* he will accept the change required by the party who initiates the renegotiation provided that the quasi-rent remains positive. In this perspective, the co-contractor can renegotiate as opportunistically as he wants, at least up to the limit where the contractor is indifferent between staying in the relationship and leaving it for another one.

Concerning renegotiations initiated by the private party, the risk is all the more serious if the threat of punishment by the public party is not plausible. Indeed, dealing with infrastructure contracts, which, typically, are long-term ones, because specific investments have to be secured, engaging in a process of resolving a conflict or changing a private partner seems so costly in terms of

time and reputation, that it can become prohibitive.
If contract abrogation is not a credible option, then there is additional vacuum which allows the private party's opportunism emergence. The public authority, representing the interests of taxpayers and of users is the loser in this situation. The social surplus decreases when the operator uses blackmail, threatening to breach the contractual relationship. The operator can hold up until he gains the totality of the quasi-rent.
In this perspective, Crocker and Reynolds [1993] analyse the optimal level of contractual incompleteness as a trade-off between the expected costs and benefits of the degree of precision in the contract. In their model, some of the expected costs relate to the possibility of unconstrained renegotiations. Anticipating these opportunistic behaviours, they show that the more complex the environment is, the more costly is contractual incompleteness in terms of the potential for opportunistic renegotiations.

Throughout in the transaction cost theory, renegotiations are due to contractual incompleteness, and opportunism sometimes occur: parties may have the temptation to renegotiate the contract in an individualistic way so as to capture a bigger share of the surplus. What one party gains thanks to renegotiations, is lost by the other party, and users of the facility always bear the costs associated with opportunism. In some cases, more than zero-sum games, renegotiations may also lead to decrease the surplus, which is the reason why there is a need of probity in "sovereign transaction" (Williamson [1999]).
In the transaction cost economics view, contractual and regulatory choices are made following a trade-off with maladaptation costs. Numerous articles follow this approach, *e.g.* Bajari and Tadelis [2001] which deal with regulation schemes. In their model, Price Cap and Cost Plus contracts offer different levels of incentives to the operator. They propose a model of trade-off between incentives provided to the operator to innovate in cost minimization and *ex post*

transaction costs due to renegotiation. They theoretically show that Cost Plus contracts better fit complex contracts, because they need more adaptations. Hence, they reduce the likelihood of opportunistic renegotiations.
In addition to contractual incompleteness, individualistic renegotiations may also arise from institutional deficiencies. We study this point directly below.

1.2.2 Institutional instability as a source of renegotiation

1.2.2.1 Government-led renegotiations and political agenda pursuing

Contrary to transaction cost theory, agency theory assumes that contracts are complete (Akerlof [1970]). In this theoretical framework, agents are perfectly rational and the environment is supposed to be risky, so that probabilities of occurrence are attributed to future events. Initially, this framework did not model the possibility of renegotiation. However, this proposition is no longer sustainable when the principal lacks credibility of commitment, *i.e.* if he is not able to commit not to renegotiate. In this way, judicial and institutional vacuums give incentives to the principal to behave opportunistically.

When dealing with government-led renegotiation, political and electoral goals are regularly cited as relevant determinants. Engel et al. [2006] offer a political economy explanation to renegotiation. Renegotiating enables governments to circumvent administrative and budgetary processes. When the government wants to get into debt, this must be approved by the Congress. Thus, the political opposition may criticize this increase. And, on the eve of an election, such a contestation may decrease the probability for the incumbent party to be reelected. By contrast, renegotiations are not subject to the regular budgetary process, and thus, they do not have to be approved by the Congress.

This rule allows the incumbents to spend more in infrastructure with no supervision, which will be paid with future income. The anticipation of infrastructure improvement is a good argument during an election period, so it increases the chances to be re-elected, while the franchise holder obtains better conditions. In the end, this process does not penalize the private operator, who is offered good conditions to accept the deal. However, it adversely affects social surplus and future administration because the political agenda is the only determinant that drives renegotiation, instead of socially improving investments.

Guasch et al. [2007] develop a model of government-led renegotiation dealing with electoral concerns also. They use a framework in which a new government has been elected, *i.e.* the incumbent has not been renewed. The new government may renegotiate to account for changes in agents preferences (and thus to ensure its approval rating), while keeping the same level of utility for the firm. Or, the new government may renegotiate to renege on the initial contract, and on extreme case, to expropriate the firm. This paper enhances the importance of an efficient regulatory body, to prevent from weak governance and political opportunism only aiming at claiming new positions.
The example of the water service provision in Limeira, Brazil (Guasch [2004]), may well illustrate this case: after the change in the municipality of Limeira, the new mayor argued that the concession was based on an unfair contract which did not take the municipality long-term interests into account. Among other things, the mayor then decided to prohibit the tariff adjustments, which allowed prices to rise in line with inflation, even though this was initially written into the contract. Taking this uncertainty into account, the operator stopped most new investments, continuing only with those that produced a rapid return.

Levy and Spiller [1994] also insist on the importance of appropriate gov-

ernance structures, as much as on incentive structures, to prevent political opportunism and private investment expropriation during periods of infrastructure reform. In their framework, the properties of infrastructure reforms are the fruit of political processes, rather than economic efficiency considerations. So, depending on the instability of the institutional environment, the public party is more or less prone to change the rules of the game, *i.e.* to political opportunism, leading to unfair renegotiation towards the private operator. In the worst cases, the operator goes bankrupt, which cancels the benefits of investing in a public-private partnership with high asset specificity.
For instance, in Venezuela, the so-called Nationalization Decree totally changed the rules of the game for the private operating oil companies. In May 2007, the Venezuelan public oil company took control over the projects of the sector. However, this happened after private companies had invested several billions of USD to develop their field, which led to the bankruptcy of private operators.

On the whole, limited commitment seems to make it impossible to rely on contracts, because parties are discouraged to enter in contractual relationships (Laffont [2005]; Estache and Wren-Lewis [2009]). In this way, renegotiations are an indicator of the lack of capacities for the government to commit not to renegotiate. Guasch et al. [2003] show that in Latin America, between 1985 and 2000, 40% of water and toll road contract concessions were renegotiated, with a majority at the request of the public party. In their view, it is the uncertainties about costs, about demand and macroeconomic instability that make an impediment to commitment. The consequences are crushing for less developed countries. They cause increases in the cost of capital and reductions in investment.

1.2.2.2 Third party opportunism

In a recent article, Spiller [2008] adds third party opportunism to governmental opportunism. Third parties are interest groups or political competitors. Indeed, they might be useful whenever the public party wanders from his announced political program, acting like "fire alarms" (McCubbins and Schwartz [1984]). However, the problem with such third parties is that they are interested in fulfilling their duty only when it is in their benefit to do so, even if it does not benefit the social surplus. Their influence may be negative for both the economic and the political spheres. Concerning economic issues, the operator may, at the extreme, be replaced by another one; alternatively, the terms of the contract may change in a way that satisfies the third party interests. Politically, it may also lead to the replacement of the public agent. Spiller [2008] focuses on the probability that the third party will try to challenge the contract implementation, through renegotiation. He argues that this probability increases with complex and flexible contracts. So, in general, more rigid and low powered incentive ones will be signed. In the end, to avoid the political and economic threats, it seems that operators have a strong incentive to be more reluctant to sign public contracts, and public agents will be of a lower "quality" (Dal Bo and Di Tella [2006]).

The example of Atlanta's water contract breakdown provided in Spiller [2008]'s article, illustrates the third party threat. To prevent from their rent seeking, the contract was highly inflexible. Due to problems of contract specification, and because of contract rigidity, adjustments would have been in neither parties' interest because it would have been too financially and politically costly. This is why they had to terminate the contract. In the end, the users of the facility have to foot the bill for the delay and malfunction costs, as well as all the costs associated to the granting process.[4]

[4]Other researchers have argued that more flexibility and less rigidity in contracts can be beneficial, at least provided that regulatory and other institutions can support ordered renegotiations. See, for instance, Dassiou and Stern [2008].

1.2.3 Contractual and institutional incompleteness as a source of renegotiation

A different conception of renegotiation emerges from the incomplete contract theory, which takes contractual incompleteness for granted. This time, contracts are incomplete because some elements of the contracts can be observed but they cannot be verified by third parties (Grossman and Hart [1986]) (institutional incompleteness). Then, when not all contingencies have been written in the contract *ex ante* (contractual incompleteness), and when the private operator finds an investment to adapt to contingencies, the operator renegotiates with the public authority (provided that the impact of the investment becomes verifiable *ex post*) to share the costs and benefits of the investment. The incomplete contract literature allows to compare different governance structures, characterized by different allocations of rights between the parties. Let us remind the reasons why parties renegotiate in this literature when the service or infrastructure is out-sourced.[5] Renegotiation occurs to give incentives to the private manager to implement investments increasing quality. The private operator and the public authority write amendments to the contract in order to share the surplus generated by this kind of investment (Hart et al. [1997]). If they do not renegotiate, the private operator does not have incentive to invest in quality - he only has incentives to invest in cost reduction -. According to their bargaining power, parties will manage to negotiate a more or less important share of the surplus generated by the investment in question in the amendment. A procedure of Nash bargaining without renegotiation cost is generally used in incomplete contract theory models to account for the renegotiation between the partners. This implies that each party looks for its own interests and maximizes its own payoff function during renegotiations. Consequently, renegotiations are an individualistic process, although they allow to increase surplus.

[5]The goal is not to recall why parties renegotiate in case of public provision.

So, as in the transaction cost theory, renegotiations emerge because of contractual incompleteness, but they are not supposed here to reflect mal-adaptations. On the contrary, they happen to adapt the contract in a way that better fits the situation - this approach is supported by the case studies which are discussed in Section 1.3 -. Moreover, in Hart et al. [1997], agents are individualist but not opportunistic during the stage of renegotiation, *i.e.* they will not try to put the co-contractor in a position of weakness, but neither do they behave cooperatively: the goal is still to get the biggest share of the surplus creation. This individualistic feature is also present in the private managers behaviour when he invests to reduce operating costs. As he has direct financial incentives to do so, there is no need of renegotiation. Hart et al. [1997] model suggests that such investments may have strong adverse effects on quality which may be dangerous for the social surplus. Later in Chapter 3, we investigate the direction according to which such negative investments are moderated by users' reactions, when the operator bears the demand risk.

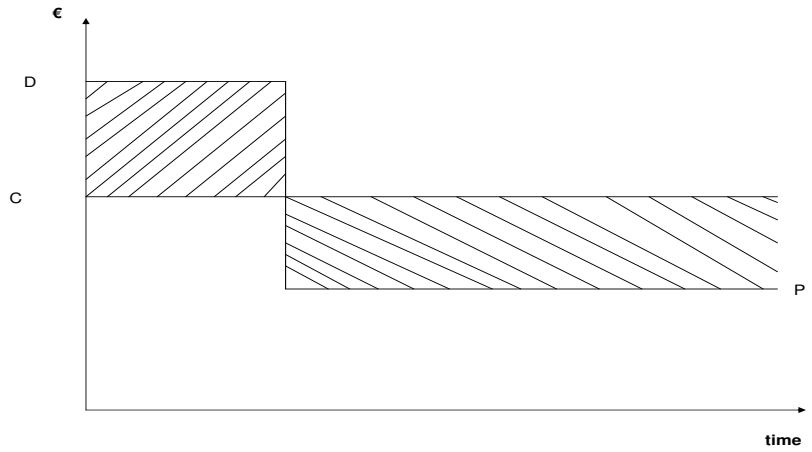
An extension for future research proposed in Hart et al. [1997] is to consider repeated interactions. Even when not all contingencies can be written in the contract, the threat of *ex post* punishment (through the non renewal of contracts for instance) would limit the incentives of the private operator to over-invest in cost reduction and enhance his incentives to cooperate during the life of the contract. In Baker et al. [2002] in particular, and in the game theory in general, there is no precise focus on renegotiation nor on public-private partnerships, but the emergence of repeated interactions is underlined as a factor promoting cooperation.

1.2.4 Relational contracts

In order to explain why firms may perform better than markets, Williamson [1975] opened the way to relational contracts in economics. The general idea was that markets rely on formal contracts, which are observable, verifiable and enforceable by courts. On the contrary, firms have recourse to the so-called relational contracts, *i.e.* informal dealings, to enforce their contracts. In other fields, the sociologist Macaulay [1963] insisted on the importance of such "non-contractual relations" in business. In law, MacNeil [1974] found that classical contracts are enforced to the letter by courts, whereas relational contracts are interpreted by the parties themselves.

In this trend, Gibbons has focused his attention on relational contracts, defined as informal agreements about observable but non-verifiable parameters sustained by the value of future relationships. Indeed, "relational contracts may allow the parties to utilize their detailed knowledge of their situation to adapt to new contingencies as they arise" (Gibbons [2002a]). Therefore, those contracts are self-enforcing. Since the parties are concerned by their own reputation in the long run, the temptation to renege, even once, on the relational contract is lower, because this might have a negative influence on the rest of the relationship. More precisely, for as long as the present value of the future stream of payoffs from cooperation overweighs the payoff from defection followed by lower payoffs because of punishment, then parties are prone to cooperate. This can be illustrated with the following Figure 1.1:

Figure 1.1: Payoff of cooperation vs. Payoff of defection and punishment



Source: Gibbons [2002a]

In Figure 1.1, the payoff of cooperation is represented by the area beyond the horizontal C line. This surface has to be compared to the defection area with striations down to the left (between C and D lines and which represents the gain from defection), followed by lesser payoff due to punishment: the payoff of cooperation minus the areas striped down to the right, which represents the amount of punishment (P line) . It comes back to compare the defection area to the punishment area.

In this way, the repeated game framework enables to let cooperation emerge: "when people interact over time, threats and promises concerning future behaviour may influence current behaviour" (Gibbons [2002b]). The following case studies seem to follow that logic. In both cases, the parties seem to consider their future relationships as important, conditioning their behaviour at the stage of renegotiation. Had they defected on the agreements or had they not tried to find a mutually efficient solution when confronted by unexpected problems, they would have lost the benefits that would have arisen from continuously cooperative behaviour.

This literature review is not exhaustive, but it enables us to show that in most of the existing theoretical literature, parties renegotiate public-private partnership contracts in order to appropriate rents. This may come from the opportunism of the public party or from the private operators: winning an election, changing the rules of the game to implement a reform that mainly relies on political concerns, disrespect of promises done during the competitive bidding, difficulties to enforce an incentive regulation, etc. And when renegotiations seem not to be a problem, it is in fact because they are not explicitely analysed. As previously reminded, the relational framework assumes that contracts are self-enforced. As a result, there is no need to write explicit amendments. To our knowledge, no explicit research exists concerning an alternative way to consider renegotiations: *i.e.* the willingness to reach a collective and cooperative result (including the private operator, the public party and users) rather than an individual benefit. This is the aim of the next two case studies.

1.3 Case studies and emergence of cooperative behaviours at the stage of renegotiation

This section aims at developing two case studies of renegotiation where the purchasing and supplying parties seem to have cooperated. After describing the context of each situation and the result of the renegotiation, we enhance some possible vectors of the parties cooperative behaviour.

1.3.1 Case study n°1: institutional problems and cooperation

1.3.1.1 The context: an exogenous shock coming from institutional and political instability

The first case study concerns a contract in the Kingdom of Cambodia. We show that it is possible that renegotiation does not necessarily reflect opportunism, even in a poor country with high levels of corruption. A brief description of the political, historical and institutional environment helps to understand the context and the reasons of this renegotiation.

To this day, the Kingdom of Cambodia has not recovered from the problems of the Cold War, and of the civil war initiated while the *Khmer Rouges* were at the power, with a peak in 1975, as well as the Vietnamese invasion and subsequent occupation from 1978 to the end of 1989. The result is that the Cambodian economy still widely relies on international financial help: Word Bank help, Asian Bank of Development help and help from several bilateral relations (In 2001, one-third of the budget was made of foreign grants and loans). Cambodia is classified in the group of low revenues by the World Bank[6], with a population around 14.000.000 inhabitants, of whom 51% are less than 18 years old.

Corruption is omnipresent.[7] In addition, the 2007 Doing Business report ranked Cambodia as the 145th country (in a set of 176 countries), which implies that it is a weak judicial system. The educational system is also very poor. The economy of the country is based on rice, fishing and cattle rising. During the wars, a significant fraction of the population was killed or decided to leave the country. As a result, during the early 90s, Cambodia suffered a massive depletion of its human and infrastructural resources. To illustrate the magnitude of this depletion, let us point out that Phnom-Penh and Siem Reap

[6]Source: Private Participation in Infrastructure Database. Information dating back to March 2009.

[7]In 2009, the Corruption Perception Index of Transparency International ranked Cambodia 162nd out of 179.

are two cities separated by a distance of 430 kilometres. However, in 1993, it took more than 13 hours to travel from one city to the other.[8]

In this context, Cambodia needed to concentrate its forces on development and growth. Transport is possibly a good place to start that development process. In the early 90s, the Cambodian government started to tackle this. It decided to organize an international competitive procurement process to allocate a concession for the only international airport of the country, in Phnom-Penh. Public funds were scarce and the airport was in a very bad state, failing to meet the requirements the International Civil Aviation Organisation (ICAO).[9] Calling for the skills of a private firm, which would bring private investment funding, was agreed by the Cambodian Government as the best way forward; but also a very risky challenge for the potential operator. Airline traffic flows to Cambodia were very low and had probably been falling for some years, because of the Khmer Rouge destructions and the Vietnamese invasion. Hence, in spite of the tourist attraction of Angkor temples, only 173,000 passengers flew to Phnom-Penh in 1995[10] (there are no data available before 1995, as such records were probably destroyed or burnt).

Phnom-Penh airport, which had been built in 1955 during the French colonial period, was in a very bad state, because the runway, of 2500 m long, had become a battlefield in the 80s. Only some Russian planes continued to use it. It was not adapted at all to international prevailing norms, so not only did the runway and the terminal have to be consolidated, extended and strengthened, but also another one had to be designed, built and operated, which implied for the operator to bear very high risks.

[8] Audit from the public party before launching the call for tenders.

[9] Source: www.icao.int.

[10] Source: interview with the Head of the Asian Region Business Development of the private company in charge of this contract, September 18th 2008. Confirmed by the study of *Sofrevia* concerning traffic forecasts at Phnom Penh airport.

In 1995, a call for tenders was launched. Five bidders answered the bid. A French group concluded an agreement with another Malaysian firm to form a consortium and their bid was accepted.[11] The contract was then signed. The concession duration was for 20 years. Considering the uncertainty prevailing over the environment, the lowest option was adopted for the traffic forecast. But the existing facilities were rapidly consolidated so that airport traffic levels started to grow in 1995 and 1996. The bank consortium was set up and ready for the financial closing, in the aim of building the new terminal. The terminal should have been consisted of several modules, each costing 38 million USD.

However, during the summer of 1997, two unpredictable events happened: the Asian economic and financial crisis started to spread over Cambodia with the depreciation of their currency; and a military insurrection erupted in the capital of the country. Those two elements had deplorable consequences for the concession: capital outflow in the whole region and a collapse of the traffic in the airport, from 350,000 to 0 during several months in 1997.[12] The turnover of the concessionaire went from 4 million USD before the crisis, to minus 40 million USD after it. Inevitably, the banks started one after another to cancel their loans. The concession was approaching bankruptcy and the airport was more and more damaged, day after day, with any valuable good being pillaged or used as a rocket.

[11] In fact the consortium was not the prefered bidder, but the second one. Finally, the prefered bidder pulled out, probably due to a too high risk aversion. Let us note that a report by the International Finance Corporation (belonging to the World Bank group) launched a report, later in 2004, to make sure that no corruption occured for the awarding of the contract. The report concludes that the contract is free of corruption. Source: www.ifc.org.

[12] Source: interview with the Head of the Asian Region Business Development of the private company in charge of this contract, September 18th 2008.

1.3.1.2 A triple-win renegotiation

It was written in the contract that, in case of *force majeure*, "either party may terminate the concession agreement". In that case, "the parties shall consult each other to reach a fair and equitable solution". The concession company could have used its COFACE[13] arrangement and move away from this very unstable and uncertain country. Indeed this is almost certainly what would have happened if the French delegate, responsible for this project in Cambodia, had not refused to accept this solution.

At that period, the French government wanted to forge closer ties with Cambodia, a former colony. By tightening their links, France could promote the Cambodian development and thus create a privileged commercial relationship. Abandoning the airport concession would have sent a negative signal for this mutual aid.

Although the Cambodian government first encouraged the concessionaire to resign because uncertainty was much too prevalent (only losses, no financing, no traffic), after long negotiations, it was decided that another solution had to be found. Note that no monetary transfer was made from the French to the Cambodian government to induce them to accept this solution. The "spirit of the contract" (a moral commitment, to both enhance development and succeed in the realisation of this concession contract) prevailed over the "letter of the contract" (some written clauses enable to leave the concession in such emergency cases) (MacNeil [1974]). This is how the first amendment of the first worldwide airport concession contract was born in July 6th 1997.

The content of the amendment is rather easy to analyse. It consists in a kind of compromise between (a) compensation for the concessionaire's losses, and (b) ensuring that Cambodia financial situation does not deteriorate fur-

[13]The Coface is a kind of insurance guaranteeing that the operator can leave the concession without losses in case of *force majeure*.

ther. The concession was extended for a period of 5 more years, to a total of 25 years and a compensation account was created, to make up for the 1,679,328 USD sustained in losses by the contractor because of the 1997 events. This account was credited with a portion of the revenue sharing that the Cambodian government was entitled to.
In that perspective, the financial model of the concession was modified to fit with the adjusted traffic forecasts (lower estimates than in the initial contract until 2001). Moreover the concessionaire was required to provide a monthly report to follow the status of achievement of actions defined in the contract and the amendment.

Hence, we may call this renegotiation a win-win-win game:

- The Cambodian government now has a running airport, and the traffic has increased steadily since the end of the Asian crisis, so that the revenue sharing rapidly went back to normal with no more transfer to the compensation account. This success might have helped in the re-election of the government (but no one can really assert it because of fraud presumption in the electoral process).

- The concessionaire could rapidly generate again positive profits, and now benefits from an important reputational gain. Not only have they been able to cope with the first airport concession worldwide (a major technical feat), but they also succeeded in over coming the institutional and political challenges, in a country with very high uncertainty.

- Finally, one should not forget users and citizens, who were also winners at the stake of this renegotiation. In such a devastated country, having an operational airport means growth. It is directly induced growth first, because the contract stipulated that "as far as possible, local staff and local sub-contractors had to be employed". Indirectly then, because

possessing an airport in good state enables the country to host more tourists in the city of Phnom-Penh and develop the tourism attraction of Angkor, which reinforces economic activity and development. In 2002, international tourism receipts accounted for USD379 millions, or nearly 10% of GDP.[14]

Thus, the first amendment of Phnom-Penh airport has been a triple-win game. Cooperation for development (both human development and business development) has prevailed over opportunism.

In addition to showing that cooperation is possible, it is also important to understand that renegotiating was absolutely necessary in this case. If this amendment had not been signed, both the public and the private parties would have been obliged to interrupt or cancel the contract. Indeed, considering the huge financial losses and the pull back of banks support, the airport could not have continued to run. For the operator there would have been two possible outcomes: use the COFACE or go bankrupt.
For the government, this concession would have been a dead-weight loss: organizing a complex call for tenders, and still having an unusable airport, would just have represented time and financial losses. All the sunk costs and cognitive costs for the acquisition of knowledge to concede an airport, and the specific assets developed to grow accustomed to the Cambodian institutional environment would have been no more than lost transaction costs.
Finally, had there been no renegotiation, the local population would have probably been the most adversely affected party.

[14]Source: www.world-tourism.org.

1.3.1.3 The possible vectors of cooperation

This case study underlines a lack in the economic literature which rarely takes macroeconomic shocks into account as an origin of renegotiation. The exception is Guasch et al. [2003], who presume that the importance of macroeconomic shocks determines whether governments will be able not to renegotiate. In their view, this leads to public party opportunism, and disincentives for private operators to contract in less developed countries (see Section 2.2.1.). In this case study however, we show that the shock was faced both by the government and the operator. In such a situation, it tightened their links. One possible explanation is that such cooperation is due to the positive externality of the political and commercial links between the two countries and the perspective of future transactions which acted as drivers for a cooperative renegotiation. Indeed, acting uncooperatively at the stage of renegotiation may represent a threat for other current agreements and future contracts. Put differently, one can say that if one party reneges at time t, on contract A during renegotiation, the other party will not only punish him at time $t+1$ on contract A, but also on contracts B and C. As applied to the case study, the private operator reneging on the airport contract would probably have meant the end of privileged commercial contracts in Cambodia, since reneging on one transaction would have implied potential sanctions on other transactions. For the public party, the Government of Cambodia, any unwillingness to work for a mutually beneficial agreement would have destroyed the confidence the parties had one in one another.

In practice, the threat and promise of other relationships worked like a hostage provision in the lead-up to and during the renegotiation process. In this way, individualism was at the service of cooperation both in the short and long run. Both parties maximised their own welfare and achieved a superior solution for the Cambodian citizens as well as actual and potential airport

users.

1.3.2 Case study n°2: unforeseen demand and cooperation

1.3.2.1 The context

The second case study deals with a concession contract that was signed in 1990. The object of the concession was to build, finance, operate, maintain (and then transfer) a tolled road tunnel during a period of 30 years in the French city of Marseille. The contractual time limit for construction was four years and the tunnel was built within that time period. The operator estimated the cost of the project at about one hundred and eighty million Euros (value 2008).
The life of the contract has been going on without any major problems. Eight amendments to the contract were mutually agreed and signed by the parties. The one we study here is the last one.

The eighth amendment was concluded in August 2005. It involved a new initiative in an area where congestion in the city was unexpectedly growing, namely in the perimeter of the principal train station of the city. Thus, the municipality wanted a connection between this congested area and the tunnel. Besides, the municipality wanted the previously used streets to be still accessible to car drivers, so that the car drivers would have the choice between alternative roads.

1.3.2.2 The content and outcome of renegotiations: a winner's game

The amendment states that the public party would make some preparatory works and build the concrete foundations of the new underground connection (the cost of these works is estimated to 2 millions Euros). It had to be done in

this way as otherwise, according to the French law, it would have changed the economic equilibrium of the contract and it would not have been an amendment but a new contract. The contract adaptation also mentions that the private operator would have to be in charge of all the works inside the new connection, such as the public road works (cost of this project for the operator: 17.3 millions Euros).

At first sight, what is striking is that there is no financial compensation to the private operator for this additional investment and the operator did not implement any additional toll collects for the new section. However, some questions to managers of the private company revealed that the connection had generated significant traffic growth in other tolled parts of the concession which were expected to cover the additional costs. The new section generated a traffic increase of 1,000 additional vehicles per day. Thanks to this increase, the cost of the additional works should be amortized by the end of the concession period.

The outcome of renegotiation for the different actors is the following:

- The public authority did not have to contribute to any funding for the works inside the connection beyond paying the cost of the new tunnel foundations. Moreover, as a call for tenders is estimated at about 2 millions of euros for the public side for this kind of project[15], deciding to write an amendment, and not a new contract (which necessarily implies a call for tenders) allowed to save this sum.

- The private operator benefited from the traffic increase, *i.e.* new revenues. Moreover, the fact that it did not seek a financial compensation for the additional investment probably contributed to its reputational gain.

[15]Interview led September 18th 2009, with the head of roads investment projects, at the French ministry of transports and sustainable development.

- Users of the city road and tunnel network saved time thanks to the fluidity improvement due to the new connection, which is 600 m long. They now need 1 minute to cover this distance at peak hours, whereas this ride used to last ten to fifteen minutes before the existence of the connection[16]. This improvement of quality standard is at no additional cost for users, since no new toll was put in place.

- The amendment studied here also took environmental concerns into consideration: less congestion, thanks to the connection, led to a fall in CO2 emissions. These environmental benefits can be estimated following the method proposed by Prud'homme et al. [2008][17]. Before the tunnel connection was built, the average speed was 3.2 kilometres per hour, which amounts to 0.4755 kilograms per ride. And with the connection, it falls to 0.096 kilograms per ride, assuming a road speed of 60 kilometres per hour. The improvement in CO2 emissions is then of 0.3795 kilograms per vehicle, which is equivalent to around 138.5 tonnes per year. Assuming that CO2 is valuated at 25 euros per tonne, this represents a value of 51,937 euros of environmental gain until the end of the concession if traffic remains constant.

1.3.2.3 The possible vectors of cooperation

This amendment is clearly the result of a cooperative renegotiation, leading to increased total surplus. The driver of this renegotiation was the additional need from the Municipality, which did not depend on changes to the core of the original contract. In accordance with Hart et al. [1997], the origin of the renegotiation is a need for new investments. However, something that does not appear in the incomplete contract literature is the fact that the operator

[16]Before the connection, vehicles had to cover 800 metres.

[17]Before the connection, vehicles had to cover 800 metres. For a basic car travelling at under 50 kilometres per hour, cars emit (0.624 0.00925 * speed) kilograms of CO2 per kilometre. And when they go between 50 and 100 kilometres per hour, they emit 0.16 kilograms per kilometre.

makes *ex post* investments with the hope to get more users. It is likely that the private operator proposed something new in order to attract new users and to get a higher revenue. In this case study, we see that the private operator was not trying to capture rents. In this way, the case study seems to illustrate how quality improving investments and potential adverse effects on quality from cost-reducing investments can be addressed by the possibility to sign contracts in which the operator is paid thanks to users' fees.
As a consequence, the amendment results from a simple and quick negotiation between the parties, where each party knew how to meet the requirements of the other. It also shows that a cooperative behaviour is both self-profitable and useful for the other party. We suppose that the consequences of this amendment on the revenue of the private operator and the perspective of future relationships had positive externalities on present behaviours and enabled the alignment of the parties' preferences.

1.4 Conclusion

This chapter has enabled us to confront different views about renegotiations. The theoretical literature enhances the "dark side of renegotiation", *i.e.* renegotiation driven by rent seeking of the parties, and usually leading to zero-sum games. By contrast, the two case studies presented here have shown renegotiations improving total surplus can exist when parties cooperate. That is the "bright side of renegotiation".

We have identified some potential determinants of cooperation that deserve to be studied in further details: first, the perspective of future relationships. Second, the power of reaction of users following *ex post* modifications, and their impact on the revenue of the private operator.
The first possible determinant is consistent with the literature on relational

contract (Baker et al. [2002, 2008]). When relationships are repeated, co-operation becomes potentially profitable for both parties, particularly in the longer-term. In such situations, parties are benevolent, but it does not mean that they are selfless. Implicit dealings, threats and promises encourage them to take the interest of others into account. The point on which we differ from classical works on relational contracts however, relates to self-enforcement. Most of the time, relational contracts are considered as a way to avoid renegotiations. By using repeated game models and considering that incentives and behaviours may change, they expect the underpinning informal dealings to become self-enforced. By extension, amendments do not have to be written since parties adapt themselves automatically and cooperatively to unexpected events. As applied to our cases, it would mean that parties would not have had to write an explicit contract amendment. This is not the case in our view. We emphasized that concerns for future business give incentives to parties to draw compromises when an adaptation is needed. But one cannot avoid renegotiations if changes are needed to maintain the viability of the contract. Self-enforcement in our view means that there is no need to negotiate too long to find a solution which fits everyone at the stage of the renegotiation.

The second element we propose deserves to go further in the comparison of contractual forms. In both case studies of this chapter, we analyse concession contracts, *i.e.* contracts where the private operator is paid thanks to users' fees. Thus, one can believe that the private operator has incentives to modify the contract in a way that satisfies users. Investigating other contractual forms where the operator is paid independantly of users' fees, would allow to understand whether the concession form is particularly likely to lead to cooperative *ex post* changes. It is likely that the operator knows that his efforts to satisfy users will be profitable for everyone in the long run, which gives him the incentive to do so.

This chapter is also a contribution to analyse the efficiency of public-private partnerships. The number of renegotiations of a contract is often said to be inversely proportionate to its efficiency. This chapter does not systematically support this view. On the contrary, renegotiating may enrich the contract and improve the relationship of the parties. Future empirical research should study the influence of renegotiations on the likelihood of having further contracts.

To sum up, our two case studies suggest several ways of considering renegotiations can be considered. This is why the next chapters investigate in greater details the different impacts of renegotiations. Chapter 2 analyses empirically the impact of different features of renegotiations on contract renewal. Chapter 3 attempts to compare concession contracts, where the operator is paid thanks to users' fees, to another contractual form. Although we will be in a static framework, we will use the incomplete contract theory that best allows to compare different contractual schemes that entail different allocation of rights and risks.

Chapter 2

Renegotiations and Contract Renewals in Public-Private Agreements.*

2.1 Introduction

While it is often postulated that public-private partnerships (PPPs) have the potential to achieve efficiency gains, it is also widely accepted that some room remains to improve PPPs and avoid failures. Among the reasons generally put forward to explain this mitigated situation, there is the fact that PPPs are routinely renegotiated (Engel et al. [2011]), very shortly after contracts are awarded, with renegotiations that generally seem to favor the private party (Guasch [2004], Engel et al. [2011]). On the one hand, renegotiations can mitigate the potential advantages of competitive auctions, since parties are in a bilateral dependency framework and the operator can extract rents (Guasch et al. [2000]). On the other hand, as analyzed in Part II of this dissertation, the states of nature change over the life of the contract in ways that are not always anticipated by contracting parties. Consequently, renegotiations of in-

*This chapter is derived from an ongoing working paper with Jean Beuve and Stephane Saussier. We are indebted to Ricard Gil, Steven Tadelis and participants of the 2011 International Conference "Contracts, Procurement, and Public-Private Arrangements" in Paris and the 2011 International School of New Institutional Economics held in Palo Alto for their comments and criticisms.

herently incomplete contracts are thus natural and do not necessarily imply opportunistic behaviors. As pointed out by Engel et al. [2011], considering transport PPP contracts signed in the United States between 1991 and 2010, six out of twenty projects have undergone a major change in the initial contractual agreement. Even higher renegotiation rates have been observed in France for similar projects (Athias and Nunez [2008]).

Although it has been the object of much attention in the economic literature, the matter of renegotiations in contractual agreements has not received any clear-cut answer. While most of the economists underline their negative outcome for at least one party, the previous chapter of this dissertation describes two cases where renegotiations were desirable for all the parties at stake. Hence, the question of their impact on social surplus is still left open: are renegotiations socially profitable or damageable? Do parties renegotiate because of a "lack of compliance with agreed-upon terms and departure from expected promises"? (Guasch [2004]). Do renegotiations imply losses associated with efforts to evade the contract terms, like it is suggested by the transaction cost economics view? (Williamson [1985], Masten and Saussier [2000], Bajari and Tadelis [2001]). Do renegotiations reduce the strength of incentives leading to a loss of global surplus (Guasch et al. [2006])? Are renegotiations a sign of discord between parties? Or are they simply the result of a need to adapt contractual agreements to a changing environment, without any loss as it is suggested by the incomplete contract theory (Grossman and Hart [1986])? In the end of the day, the issue of the impact of renegotiations looks like an resolved puzzle.

In this chapter we shed some lights on this issue. Using an original data-set of public-private contracts in the French car park sector, we investigate the link between renegotiations and contract renewals. Because it is nearly impossible

to assess the impact of renegotiations on contractual surplus we instead use contract renewal as a proxy. This permits us to assess indirectly the parties' perception about their previous relationship, and, *in fine*, their feeling of co-operative adaptations and surplus creation at renegotiation stages. Had all renegotiations a significantly negative outcome, parties would not be prone to contract again together.

Our database is made of 666 public-private arrangements, distinguished by their types, *i.e.* concession and public procurement contracts that differ mainly concerning the discretionary power of the public administration to choose a co-contractor. Among those 666 contracts, we focus on the 252 which have expired. We codified every renegotiation and we investigate their impact on the probability to see the contract renewed with the same partner (166 out of the 252 were renewed and the others 86 were not). In order to do that, we take several features of contractual renegotiations and also relevant control variables into account.

Our results can be summed-up as follows. In our concession contracts subsample, characterized by public authorities discretionary power, we find that there is a frequency threshold below which renegotiations are positive (whatever the object of the renegotiations). We interpret this as the fact that renegotiating *per se* should not be interpreted as a sign of failure of the relationship. This result is reinforced by the fact that the scope of renegotiations (*i.e.* the number of dimensions targeted by the renegotiations) also impacts on the probability to be renewed. Depending on the types of dimensions that are renegotiated, the impact on the probability to see the contract renewed is different. Indeed, our econometric results reveal that some renegotiations clearly increase the probability to see a contract renewed; others do not. Hence, our results suggest a positive, negative or neutral impact on the contractual surplus depending on the kind of renegotiation that is considered as soon as public authorities have a certain extent of discretionary power to decide to

renew a contract with their private partner, *i.e.* as soon as they can use the *intuitu personae* principle. Indeed, we find no significant evidence of a correlation between renegotiations and the probability to be renewed in our public procurement subsample in which the discretionary power is supposed to be much lower.

This chapter first contributes to the literature on contracts and renegotiations. Instead of studying the determinants of renegotiations as in previous studies (Guasch et al. [2008]), we focus on their consequences on contract renewal as an indirect measure of the impact of renegotiations on surplus. To our knowledge, this has never been done before and this sheds some lights on the consequences of renegotiations, not only on their sources. This chapter also contributes to the literature on contract renewal, which has been investigated, up to now, mainly as an incentive for investment strategies (Affuso and Newbery [2002], Gautier and Yvrande Billon [2009], Iossa and Rey [2009]). We aim to fill a gap identified by Oxley and Silverman [2008] when they call for studies that enable to determine whether renegotiation represents a jointly beneficial move toward greater efficiency or whether it represents an opportunistic behavior by one of the partners. According to the authors, this question should be informed by "*explicitly connecting renegotiation to (actual or perceived) performance effects, and to unpacking more disaggregated detail about which types of provisions are renegotiated in the presence of which triggering factor*" (p. 231). Here, we use contract renewal as a perceived measure, *i.e.* as a proxy to assess the parties' perception about their previous relationship. This allows to underline some evidence about the discretionary power of public authorities and the fact that they take into account information concerning previous experiences for concession contract.

Chapter 2 is organized as follows. Next section presents the related literature on the issue of renegotiations. Then, section 2.3 describes the car parking sector and the main contractual arrangements we focus on. In section 2.4, we present our original dataset and our empirical strategy. Results are presented and discussed in section 2.5. We conclude with some public policy implications

and some perspectives for future works.

2.2 What Are The Impacts of Renegotiations? The Puzzle

2.2.1 Literature Review on Renegotiations

Contract renegotiation has been the object of much attention in the economic literature, at least at the theoretical level. Few has been done at the empirical level, explaining that the matter of renegotiations in contractual agreements still has not received any clear-cut answer. However, for a long time now, some studies have pointed out the fact that contracts are often renegotiated (Macaulay [1963]; MacNeil [1978]; Goldberg and Erickson [1987] are good examples). Such empirical observations explain, to a certain extent, the evolution of theoretical developments.

On one side of the spectrum of the theoretical analysis, a large part of the contract theory is based on incentive issues in which initial developments insisted on the necessity of full commitment from contracting parties (Bolton and Dewatripont [2005]). In other words, in order to resolve efficiently adverse selection and moral hazard issues, the principal must be able to commit not to renegotiate and to accept *ex post* inefficiencies (*i.e.* once asymmetric information is resolved, the incentive compatible contract does not lead to the first-best anymore) or to frame contracts that are renegotiation proof (Dewatripont [1989]). However, in line with empirical observations, recent developments have focused on the impacts of limited commitment, due, for example, to imperfect institutions (Guasch et al. [2006, 2007, 2008]). On the other side of the spectrum, the incomplete contract theory suggests that renegotiations are unavoidable and useful as soon as the private operator needs compensation to develop investments that were non contractible *ex ante* and that become verifiable *ex post* (Grossman and Hart [1986]; Hart [1995]). Renegotiations

are then originally viewed as necessary adaptations to fill contractual blanks, explaining why contracting parties have better renegotiate and complete their contractual agreement once *ex post* contingencies arise.[1]

In between those two views, relies transaction cost economics that has recognized for long the fact that contracts are inefficient governance structures that have to be adapted to their evolving environment, mainly because of the complexity of the environment and bounded rationality of economic actors. Renegotiations are thus viewed as necessary because of contracts' maladaptations; but, at the same time, as a risky adaptation process that should accommodate with potential opportunistic behavior (Crocker and Masten [1991], Crocker and Reynolds [1993], Saussier [2000]). Nonetheless, this literature provides very few insights concerning the overall effect of renegotiations on contractual surplus. And it is of no help when it turns to the precise question of the effects that should be expected depending on the scope and the kind of renegotiations that occur during the contract. Because contracts are incomplete and economic actors potentially opportunistic, contractual adjustment might reflect the necessity to adapt to new circumstances or the parties' actions to appropriate surplus.

One way to circumvent opportunistic behavior associated with renegotiations is provided by repeated interactions. As underlined by the relational contract theory, reputational concerns enhance cooperative behavior during the sequence of the relationship. Indeed, the fact that contracting parties interact repeatedly makes possible to enforce informal agreements reducing opportunistic behavior because of the loss of future businesses such behavior would entail (Baker et al. [2002], Gil and Marion [2009]). The relational view thus suggests that renegotiation might not be an issue (*i.e.* cooperation relies on self-enforced informal contracts that are supposed to avoid opportunistic behavior) as soon

[1]However, although the renegotiation process, which is costless, enables to reach higher *ex post* payoffs, the level of incentives to invest *ex post* (leading to renegotiations, depending on the verifiability of *ex post* investments) is not necessarily optimal.

as parties anticipate they will be renewed if they respect the *spirit* of the contract (MacNeil [1978]). It also suggests that contracting parties renew their relationships as long as they are satisfied with their previous relationship.
To sum up, this literature review does not enable to highlight a one-track approach concerning renegotiations and their effects. The empirical literature on renegotiations in public-private partnerships offers another view of this issue.

2.2.2 Renegotiations in Public-Private Contracts

Because they deal with services of general interest, public-private arrangements and their renegotiations are especially under the scrutiny of regulation bodies. However, this does not prevent the occurrence of renegotiations. The literature on empirical contracting is sparse because private firms rarely share information on their agreements and even less frequently on their renegotiation decisions (Gil [2011]). However, several case studies of renegotiations in public-private arrangements are given by Guasch [2004]. Studying more than 1000 concession contracts signed in Latin American countries, he finds that 54.7% of transportation contracts and 74.4% of water and sanitation contracts were renegotiated between the mid 1980s and 2000. Renegotiations occur shortly after the award (on average 2.2 years after the award), and often, at first glance, favor the private party. The most common outcomes of renegotiations are delays, tariff increases and reduction in investment obligations. This leads the author to consider renegotiations as having mainly negative impacts, reflecting opportunistic behavior from private partners and cancelling the potential advantages of competitive auctions. In other words, renegotiations are viewed as the consequence of aggressive bids in a context of *ex ante* lack of commitment from the government (Bajari et al. [2009]; Guasch [2004]). Because the government is unable to commit not to renegotiate and because firms learn their type only after they propose a bid, if a firm wins a call for tenders and discovers she is inefficient (*i.e.* negative profits), she will be prone to ask for renegotiation

(Guasch and Straub [2006], Guasch et al. [2008]). Other researches deal with government-led renegotiations (Guasch et al. [2007]) and renegotiations that enable incumbent governments to circumvent budgetary rules before elections (Engel et al. [2006]).

Whoever is at the origin of the renegotiation process, the very few empirical literature and case studies on renegotiations have underlined very contrasted outcomes: most of the time, they are viewed as a game in which there are losers and winners (Estache [2006]) or, more scarcely, as a win-win game (De Brux [2010]) depending on contracting parties' behavior and the reason why renegotiations occur.

However, to the extent of our knowledge, no econometric study collected data in order to assess the impact of renegotiations. The only one we are aware of is Bajari et al. [2007], but they focus on the impact of the anticipated cost of renegotiations on the bids proposed by competitors. The authors find that the level of the bids differs with the expected difficulty to renegotiate (*i.e.* signing a rigid or a flexible contract). We depart from their approach since our goal is to look at the impact of renegotiations on contractual surplus. Nevertheless, because it is very difficult, not to say impossible, to assess the general impact of renegotiations on the contractual surplus, we analyze this impact on the willingness of the parties to pursue their relationship. Indeed, for a given contract that is ending, we can reasonably believe that if parties are satisfied, the probability to renew their contract is higher compared to the case where they would feel prejudiced.

Undoubtedly, choosing to renew a contract with the same partner can be dictated by the bilateral dependency and/or by the absence of other competitors. In other words, the probability for a public authority to renew depends on those credible alternative options that are related to the asset specificity at stake in the relationship and also to the competitive pressure on the market. However, as it will be discussed in the next section describing the French car park sector, we focus on a sector characterized by a standardized service and by a high level of competition. Consequently, it allows, without taking too

much risk, to use contract renewal as a proxy of satisficing contractual surplus in the end of the contract.
The next section describes the sector and the data we collected in order to conduct our analysis.

2.3 The French car park sector

2.3.1 The main characteristics of the sector

In most European countries, many on-street and off-street car parks are public, so that municipalities have the responsibility of their provision. The positive externalities and social benefits (environmental concerns, intermodality, urban development, etc.) derived from a high quality of construction and efficient management of car parks are the reasons why they are considered as public services and why they are in the bosom of public authorities. However, although public authorities keep ownership and have to control and monitor car parks, they can outsource the provision of such infrastructure and services through public-private arrangements. Concerning French car parks, public authorities have experienced public-private arrangements for long. Indeed, the first concession of car park was awarded in France in 1962 to the firm "*Grands Travaux de Marseille*" (GTM). Since, the use of such outsourcing to a private operator has become widespread. According to the French Ministry of Sustainable development [2009], the market of car parks is dominated by private operators, by 73%. 27% are provided in-house, through public provision.
The history of the car park sector is characterized by a growing level of competitive pressure, between french firms (local operators as well as bigger companies); and more recently between national and foreign operators. This trend of the competitive pressure was also confirmed by interviews we had with different managers of the sector. Consequently, when public authorities decide to use a public-private arrangement for the provision of their car parks, they

have to select among several national[2] and international companies as well as local firms. Even if centralized data does not exist, we know that there can be up to ten competitors and, on the contrary, calls for tenders with only one bidder are extremely rare. In addition to this fierce competition, it is always possible for a municipality to go back to in-house public provision when the contract is over. This is notably made possible by the nature of the provided service. Indeed, car parks management is a highly standardized service and parties are not locked-in together through a bilateral dependency, *i.e.* there is no asset specificity subject to quasi-rent appropriation.

Prior to selecting their partner, public authorities also have to choose between concession and public procurement when they decide to outsource. Next subsections describe each of these public-private contractual arrangements and the main differences between them.

2.3.1.1 Concession

One way to address the difference between concession and public procurement is to describe the way those two kinds of contractual arrangements are awarded. We start with the award procedure of concession contracts. The first phase is a prequalification stage that enables private firms to become candidates. The opening is publicly advertised and everyone can apply. Then, candidates are prequalified on the basis of their previous experience and on their financial robustness. Second, the public authority has to write the call for tenders that specifies the objectives to be reached by the operator and the selection criteria. Those latters generally consist in the acceptability of the level of prices the bidders intend to charge users, the rent the private operator is willing to pay to the public authority in counterpart for the use of the public ground, the technical quality of the bid (as calls for tenders are output oriented, the bidders must precise their means to reach the specified goals), and the "general

[2]Vinci Park, Q-Park, Epolia, Efia, Interparking, Parking de France, UrbisPark, AutoCité and SAGS are the most frequent bidders in France.

quality of the bid". Finally, there is generally a third and last step, when the second one enables to determine a short-list of two or three bidders. This third step is a direct negotiation between the public authority and each of the remaining bidders. Thus, although the selection procedure of concession contracts appears rather formal, we can observe that for each step, there is room for discretionary power from the public authority. The award procedure refers to vague terms and the interpretation is left to the discretion of public authorities. Consequently, public decision makers are allowed not to consider the financial criteria only and they can also take their previous experiences, the quality of the bid as well as the quality of negotiation into account. As soon as past common experiences is a possible criterion of selection, it is relevant to presume that contract renewals are all the more likely to occur than previous experience between parties went well. In other words, the public authority can use the *intuitu personae* principle[3] to select a partner.

In addition to the *intuitu personae*, another main feature of these concession contracts is that the private operator bears the demand risk, so that he is remunerated with users fees. These contracts are generally long-term ones, so that private operators can invest to build or renovate the infrastructure, and have time to pay it off. The direct consequence of long duration is that these contracts are subject to political, economic, social and technical changes that may occur during the execution of the contract. Changes that occur during the execution of the contract may be exogenous to the contract (developments in technology, economic shocks, changes in legislation or legal interpretation) or may directly result from internal drivers (evolving business requirements) or contract maladaptations (inappropriate initial contractual design). Such changes may involve adaptations of the service.[4]

[3]This principle was ratified with the Ruling from the *Conseil d'Etat*, dating back to October 30th 1936. Meantime, the *Sapin* Law, January 29th 1993 was signed in order to promote transparency in public contracts. However, the *intuitu personae* principle still applies in France.

[4]Besides, the French legislation takes the necessity of renegotiations into account, through the "mutability principle", since 1910. The first judicial decision concerned urban public transport but the principle was generalized to all public services.

2.3.1.2 Public procurement contracts

Compared to concession contracts, the award procedure of public procurement contracts is more strict. It only includes one stage, with standard criteria (the price is generally the most important one) and well defined tasks delegated to the private operator. Thus, although the full neutrality of public authorities in such procedures cannot be proved, still, it is relevant to argue that they have less discretionary power than in concession procedures. Public procurement contracts are not global contracts so that they do not include both construction and management. In the car park sector, they mainly concern the provision of the service, instead of the construction of the infrastructure and their duration is shorter than concession contracts.

As they are short-term, less complex and more complete[5], one could expect that renegotiations are less likely to occur, than in concession. Nevertheless, in public procurement contracts, residual control rights stay in the hands of public authorities (Bennett and Iossa [2006]), so that any single verifiable change requires the approval of the public authority to be implemented, and thus a renegotiation. So, relatively to concession contracts, one could also expect renegotiations to be more systematic.

Nonetheless, whatever the frequency of renegotiations, they should have no impact on the probability of contract renewal, since the public authority must base his decision to award a contract on the price criteria (*i.e.* no discretionary power[6]). Indeed, previous experiences should not be taken into account in the decision to renew or not a contract, as illustrated by a recent statement from the Administrative Court of Paris. In 2009, a public authority in charge of public procurement contracts in the field of social housing was sanctioned for disqualifying a candidate because of a bad past experience with him. Hence,

[5]The operator is in charge of few tasks. Moreover, a specification booklet was established by State administration in collaboration with representatives of private operators and of association of local councilors in order to propose a contract framework, that public authorities are free to use.

[6]Moreover, we can find no track of an *intuitu personae* principle in the French *Code des Marchés Publics*, which gathers all the legal rules for public procurement contracts.

the court condemned the public authority to re-organize the call for tenders and to evaluate the candidacy of each operators, including the complainant.[7]

2.3.2 Scope of the database

In the French car park sector, there is no regulation authority, so that the data are not centralized and very hard to bring together. In order to access to data, we seized the opportunity we have been given to have access to the contracts of the French leading company (30.6% of the market share among private operators (CERTU [2000]). Thus we collected all the contracts signed between 1963 and 2008 with 135 different public authorities, *i.e.* a total of 666 contracts. For most of the contracts, we accessed to the entire document and for the eldest ones (those signed before 1995), we obtained fact-files redrawing the history of contracts and their respectives renegotiations.

As explained in the introduction, renegotiations are all the modifications brought to the contracts during their execution.[8] For instance, changes in tariffs, duration, additional investments or conditions of the financial equilibrium are coded as contract renegotiations. Calls for renegotiations can be led by the municipality, by the private operator or by both. In the database, we were able to identify who was the originator of the renegotiation just for a tiny number of cases. As a consequence, we do not take into account this aspect of renegotiations.

Among the 666 contracts, we pay particular attention to the expired contracts to explore whether the sequence of renegotiations may have an impact on contract renewal. Thus we are looking into 252 expired contracts and the 782 renegotiations out of them. Among those 262 expired contracts, we note that 131 of the expired contracts have never been renegotiated (52%). It indicates that if contractual amendments are not the rule, they nevertheless are usual, as they occur in 48% of cases. This data corresponds more or less to the

[7] Administrative order n°0907878, Administrative Court of Paris, June 2009.

[8] We use the words "amendment" and "renegotiation" indifferently.

percentage of renegotiated contracts annonced in Guasch [2004] concerning concessions in Latin America, which is 41.5%. Furthermore, we observe that 78.4% of expired public procurement contracts we study are renewed and that this percentage falls down to 44.7% for concession contracts. Those rates of contract renewal confirm, as previously argued, that public authorities have credible alternative options when contracts turn to the end.

Table 2.1 highlights some stylized facts that provide intuitions concerning the potential link between renegotiations and renewals in each type of contractual agreement.

Table 2.1: Contractual arrangements, renegotiations and renewal

	All Contracts	Concession Contracts	Public Procurement
Number of expired contracts	252	94	158
Number of contract renewals	166	42	124
Rate of contract renewals	65.9	44.7	78.4
Average number of renegotiations per year, all expired contracts included	0.420	0.381	0.453
Average number of renegotiations per year, in expired contracts leading to renewal	0.443	0.402	0.458
Average number of renegotiations per year, in expired contracts not leading to renewal	0.391	0.364	0.433

Interestingly, we notice that contracts which are renewed are the ones that were previously most renegotiated. This is not in line with the view according to which renegotiations would be a sign of parties' disagreement. Student t-tests confirm the difference of means of renegotiations between concession and public procurement. However, t-tests do not allow to conclude that the means of renegotiations between renewed and non-renewed contracts are statistically different from each other, neither for concession contracts nor for public procurement ones. Nevertheless, it reinforces our thinking that the relationship between renegotiations and contract renewals requires deeper refinements. To summarize, the car park sector seems a relevant application to study how renegotiations affect the turn of a relationship, since it is a mature and competitive

market, characterized by a standardized service, by frequent renegotiations and by the possibility to observe contract renewals. This is precisely the object of our empirical investigation presented in the next section.

2.4 Propositions and Used Variables

Given the characteristics of the car park sector, and the extent of our original database, we built several variables to understand the impact of the different aspects and features of renegotiations on the likelihood of renewal. In what follows, we describe these variables (summary statistics are provided in Table 2.5 - Appendix), and we formulate some propositions on the expected signs when it is possible. We recall that there is no one-track approach concerning renegotiations in PPPs and their effects. Consequently, we do not test any specific model, but instead we provide exploratory empirical results of direct relevance to several of the key ideas put forth by previous studies about renegotiations.

2.4.1 Dependent variable

The dependent variable $Renewed_i$ takes the value 1 if the expired contract was followed by a renewal with the same operator after a new call for tenders, and 0 otherwise. In the database, the renewal rates of concession and public procurement contracts are respectively equal to 44.7% and 78.4%. In practice, there are three ways to interpret the fact that a contract is not renewed: the choice of the public authority to select another operator, the choice of the public authority to go back to public provision, or the choice of the private operator not to bid again for the contract. Whatever the case, a common explanation may be that parties are not willing to contract again together because of dissatisfaction concerning their previous contractual relationship. Nevertheless, the information we collect from interviews with expert of the sector

uncover that, in accordance with a high level of competition, cases where the private operator is not candidate to its own succession are extremely scarce. Thus we can reasonably argue that the renewal decision is mostly the municipalities' responsibility. Obviously, one can argue that another explanation of non-renewal can be the existence of a cheaper offer made by a competitor and we unfortunately do not have such information. Nevertheless, in line with the high level of competition in the sector, it is possible to assume that the likelihood of cheaper offers can be considered as identically distributed among our observations. Hence we believe that this missing information is not really penalizing.

2.4.2 Some Propositions and Main Independant Variables

As previously said, this paper looks at the impact of renegotiations on contract renewal. This potential impact might exist through different channels suggesting that several features of renegotiations deserve to be taken into account for our analysis.

2.4.2.1 Renegotiation or no renegotiation

The first obvious way to assess the impact of renegotiating a contract on the renewal probability is to distinguish between contracts that have been renegotiated and others. Thus we created a dummy variable $NoReneg_i$ that takes value 1 if the contract i is not renegotiated at all during its execution and 0 otherwise. In our sample more than 73% of our concession contracts have been renegotiated and only 32.9% in our public procurement sample.[9] This difference is mainly due to the fact that, as previously said, public procurement concerns generally more simple unbundled tasks, and give rise to shorter

[9]In spite of a lower percentage of renegotiated public procurement contracts, table 2.1 shows that when they are renegotiated, they are renegotiated at a higher frequence than concession contracts.

contract duration compared to concession contracts. This observation is in line with Guasch et al. [2008] pointing out the importance of the uncertainty characterizing a contract to explain the probability to renegotiate.
Because looking at the occurrence or not of renegotiations is only a very crude measure of renegotiations in a contract (measuring only the existence, but giving no information on the frequency of renegotiations or their type) we do not expect this variable to play a central role in the explanation of contract renewals.

2.4.2.2 Frequency of renegotiations.

In addition to the fact that a contract is renegotiated or not, the frequency of renegotiations might impact on the contractual surplus and *in fine* on the willingness of the parties to renew the relationship. On the one hand, a high frequency of renegotiations may lead to higher transaction costs (and to potential opportunism) that have a negative impact on contract renewal. On the other hand, if renegotiation are pursuing the adaptation of contractual terms to their environments, hence increasing efficiency, the net effect might be positive. We capture the frequency of renegotiations by using the variable $AverageReneg_i$. This variable is the number of renegotiations per year in each contract i. The ratio measure (number of renegotiations / duration of the contract) appears the most relevant since renegotiating four times a two-year contract is not the same as a twenty-year contract. We also include a squared term of our variable $AverageReneg_i$ in our regression in order to identify a potential non-linear effect. This intuition relies on the argument that contracts are governance mechanisms that should be rigid enough to reflect real commitment from contracting parties and flexible enough to permit adaptation as environment evolves. We expect this variable to play a role in the decision to renew contracts or not.
Nevertheless, we push the analysis further. First, we focus on the date when

renegotiations occur. Second, although the variable $AverageReneg_i$ points us on a way toward a noticeably finer measure of what renegotiations are, we believe it is not sufficient. That is why, in line with Oxley and Silverman [2008]'s suggestion, we also differentiate renegotiations according to their type. Indeed, that might have different effects on the willingness of contracting parties to renew the contractual relationship.

2.4.2.3 Celerity of the first renegotiation

In order to investigate more in depth the relationship between renegotiations and contract renewals, we pay attention to the celerity of the first renegotiation. Indeed, this celerity can be used as a proxy of opportunism in the contractual relationship as suggested by Guasch [2004]. Fast contract renegotiations after the signature can reflect an aggressive bidding giving rise to effort to evade from contractual obligations (*i.e.* the candidate voluntarily underestimates the costs of the service being confident on his ability to renegotiate contractual terms). They can also emerge because of winner's curse effect (*i.e.* the too much optimistic winner is unable to keep its promises and calls for a revision of contractual terms). In any case, we expect that the faster the first renegotiation, the lower the probability of contract renewal. In our sample, renegotiating fast seems to be quite scarce. In fact, only 5.21% of concession contracts and 7.7% of public procurement contracts are renegotiated during their first year of execution. Those percentages respectively reach 52.1% and 39.3% if we focus on the three first years of the contract. Nevertheless, renegotiating during the first year is different if the contract lasts two or twenty years. Thus, in order to obtain a more relevant measure of the celerity of the first renegotiation, we built the following variable:

$$Celerity_i = \frac{1}{x} \quad \text{where} \quad x = \frac{[\text{Date of the first renegotiation} - \text{Date of Signature}] + 1}{\text{Duration}}$$

We divide the time laps between the signature and the first renegotiation by

the total duration of each contract i. As a result, the lower x, the faster the renegotiation. Afterwards, we use the inverse of x. In this way, contracts that are never renegotiated are coded 0 and, for all the renegotiated contracts, the higher $1/x$, the faster the first renegotiation.[10] As a consequence, if the celerity of the first renegotiation is a sign of opportunism in the contractual relationship (Guasch [2004]) making the parties less prone to contract again together, we should observe a negative coefficient associated with our variable $Celerity_i$.

2.4.2.4 Close-to-the-end last renegotiation

Symmetrically, we also pay attention to the proximity of the last renegotiation to the expiration of the contract. Because several studies suggest that public authorities give more attention to recent behavior compared to older ones, due to bounded rationality issues or obsolescence effect of older information (Iossa and Rey [2009]), we expect renegotiations that are close to the expiration of the contract to play a role on the decision to renew a contract or not. If public authorities pay more attention to their latest interactions with their interlocutor and have a short-term memory, it is likely that renegotiations that are close to the end of the contract will have a strong influence on the turn of the relationship.

Compared to our celerity variable, renegotiating during the last year of the contract is much more common. Indeed, 38.5% of concession contracts and 16.7% of public procurement contracts are renegotiated during the last year. Our variable $Last_i$, embodying the proximity of the last renegotiation to the expiration, is built similarly to the variable $Celerity_i$:

$$Last_i = \frac{1}{y} \quad \text{where} \quad y = \frac{[\text{Date of expiration} - \text{Date of the last renegotiation}] + 1}{\text{Duration}}$$

[10] The fact that expired contracts that were not renegotiated ($Celerity_i$=0) are, in a way, assimilated to contracts that are very lately renegotiated ($Celerity_i \to 0$) is controlled by the presence of our variable $NoReneg_i$ in our regressions.

As a result, the lower y, the closer to the expiration date the renegotiation. Using the inverse ratio, contracts never renegotiated are coded 0 and, for all the renegotiated contracts, the higher $1/y$, the closer to the expiration the last renegotiation is.[11]

2.4.2.5 Renegotiation Types

To disentangle the effect of the frequency of renegotiation depending on their types, we detail more precisely the object of renegotiations by codifying their types, *i.e.* the contractual dimensions they are concerned by the renegotiation. Then, we extract the frequency of renegotiations according to those types.
The variable $RenegTariff_i$ is the average number of renegotiations per year in each contract i dealing with a change in tariffs charged to users of the service. Renegotiations on tariffs can take the form of an increase in tariffs and/or the implementation of specific tariffs for regular users (in this latter case we also codified the renegotiation as $RenegQuality_i$.) They only occur in concession contracts. Indeed, in public procurement, tariffs are not even contractualized between the operator and the authority, since tariffs are decided by the public authority and the private operator has no payoff rights on these tariffs.
The variable $RenegInvestment_i$ stands for the average number of renegotiations per year in each contract i about an additional investment that had not been foreseen in the contract. This additional investment may come from the requirement of the public authority, or from a miss-anticipated spending from the private operator. In the former case, the compliance of the operator might lead to higher probability of contract renewal; while in the latter case, the miss-anticipated spending by the operator might require to increase tariffs or to revise the financial provision and can make the public authority reluctant to contract again with the same operator. Thus, we cannot formulate expec-

[11] Here again, the fact that expired contracts that were not renegotiated ($Last_i$=0) are, in a way, assimilated to contracts that are very early renegotiated ($Last_i \to 0$) is controlled by the presence of our variable $NoReneg_i$ in our regressions.

tations about the impact of this variable.

The variable $RenegQuality_i$ is the average number of renegotiations per year in each contract i improving the quality of service. Most of the time, the literature considers quality as a harldy contractible dimension. Even if it the case in the car parks sector, we are able to identify *ex post* adaptations aiming at improving the quality of the service. This process of improvement might be accompanied with an additional investment ($RenegInvestment_i$ here above), as it is the case for example when a new elevator is implemented to facilitate the access to disabled persons, or when free bike rentals are proposed to users so as to promote green cities. Or it might just consist in the implementation of specific tickets, for regular users. In this latter case, we also codified the renegotiation as $RenegTariff_i$.

The variable $RenegFinanEq_i$ stands for the average number of renegotiations per year in each contract i about changes of the financial equilibrium of the contract. Those changes might have different sources: an error of anticipation, an *ex post* shock, an additional investment that cannot be offset by an increase of tariffs for instance. In concession, these renegotiations often lead to a decrease in the rent private operators pay to the public authority in counterpart for the use of the public ground or asset. In public procurement, these renegotiations lead to a increase in the payment for the private operator. Finally, the variable $RenegDuration_i$ represents the average number of renegotiations per year in each contract i about an extension of the contract duration. Nevertheless, since 1993 *Loi Sapin*, it is forbidden to significantly extend the duration of the contract. Most of the time, the renegotiations on contract duration we observe are concerned with very short extension (less than one year). It corresponds to the (frequent) situation where the public authority needs more time to organize the call for tenders for the expired contract (re)awarding.

We also introduce a last type of renegotiation, $RenegIndex_i$, which stands for the average number of renegotiations per year in each contract i about a change in the indexation clause to which several aspects of the contract may be attached. Such indexation clauses are a function of different indexes, such as

the price index of workforce in building trade and the price index of different materials (cement, concrete, etc.). It is generally foreseen in the original contracts that renegotiations will take place if prices indexes disappear or if they have no more sense for the contract. We expect this variable to be absolutely not significant since these renegotiations are foreseen in the initial contracts, and the contrary should cast doubt on the reliability of our data-set.
In our database, the more common renegotiations are related with duration, while the less frequent ones deal with the financial equilibrium. We expect more conflicting renegotiation types, such as renegotiation on tariff or financial equilibrium, to decrease the probability to renew a contract. Renegotiations concerning quality are less conflicting, usually at the initiative of the private operator with the possibility for the public authority to accept or refuse the implementation of higher quality levels. Hence, such type of renegotiation is supposed to be less contentious and more likely to increase the probability of renewal.
Finally, it is important to note that one amendment might concern several features of the contract. Hence, our variable $AverageReneg_i$ is not the simple addition of our variables accounting for the average number of renegotiations for each renegotiation type.

2.4.2.6 Scope of renegotiations.

Lastly, we believe that the question of the scope of renegotiation is also relevant. In fact, in addition to the frequency of renegotiations, it is important to focus on the number of contractual dimensions that are concerned by *ex post* modifications during the contract lifespan. The reason of this major interest is intuitive: as public authorities and private operators might have contradictory objectives, it is probably easier for the diverging interests to meet if several dimensions are renegotiated. What one party looses on one dimension can be recovered on another dimension avoiding a zero sum game. That is why we

expect that the larger the scope of renegotiations, the higher the probability for a contract to be renewed. To take this into account, we built the variable $Scope_i$ which corresponds to the number of renegotiated dimensions of each contract i during its lifetime. Each type of renegotiation described here above is a dimension. As a result, the variable $Scope_i$ is an ordinal variable equal to 0 when there is no renegotiation and equal to 5 if the contract i is concerned by all the previously cited types of renegotiations (excluding *RenegIndex* that is expected to have a neutral impact on contract renewals).
Obviously, the different features of renegotiations mentioned above are not the only relevant factors influencing contract renewal. In order to tackle this issue and to obtain a robust analysis of the impact of renegotiations on contract renewal, we also introduce a set of control variables that could potentially play a role. As described hereafter, those variables aim to take past experiences, perspective of future business and political influence (among others) into account.

2.4.3 Control variables

2.4.3.1 Past experiences

As emphasized previously, discretionary power of public authorities allows them to take past experiences into account. However, past experiences cannot be restrained to the renegotiations of the scrutinized contract. The municipality can share an older past history with the private operator. Thus, we include the variable $PastExperiences_i$ which stands for the number of other expired contracts the private operator and the municipality shared in the past. On average, the private operator had more than two past contracts with each municipalities. Nevertheless, we can also underline that more than 30% of the expired contracts were first contracts. Because this variable may reflect mainly the skills developed by contracting partners in order to interact efficiently to-

gether, with low transaction costs, we expect this variable to impact positively on the probability for a contract to be renewed.

2.4.3.2 Future business and reputational concerns.

As emphasized by the relational contract theory, perspectives of future business allow to deter opportunism and to encourage cooperative behavior. Thus, we also take into account the impact of future business and reputational concerns by including two other variables. The first one, $MultiContract_i$, is the number of other ongoing car park contracts the co-contractors have together at the date of expiration of each contract i. This variable enables to capture businesses in which the parties are already engaged and that are still running for a certain period of time. It also provides a measure of the severity of the punishment the local authority might apply to an opportunistic partner by not renewing several contracts instead of one (Desrieux et al. [2010]). In our database, the private operator and the municipalities share on average 1.6 contracts in addition to the the scrutinized contract. Nevertheless, we also observe that 43% of the cases correspond to the situation where the private operator and the municipalities share the only studied contract.

The second one, $SameArea_i$, stands for the number of other contracts the operator has with other public authorities belonging to the same region at the date of expiration of each contract i. Indeed, the reputation effect can also be effective in a broader area than the only concerned city. This geographic reputation effect, if any, is likely to play in a way that benefits the operator. Indeed, in a perspective to have future contracts with the same authority, and with other authorities as well, the private operator is prone to refine his reputation and to act in a way that satisfies the authority. This makes him more likely to be eligible to contract renewal under concession when he has ongoing contracts with neighbors municipalities.[12] In general, both for

[12]For the construction of these two variables, our observations are based on the 666 contracts, *i.e.* also on the ongoing contracts.

concession and public procurement contracts, the private operator has almost five other ongoing contracts in the same region. We expect those two variables to play a positive role on the probability to renew a contract.

2.4.3.3 Political dimensions.

Several articles have already pointed out the role of the political dimensions in the decision to privatize public services.[13] One could also think that the choice of contract renewal could be influenced by political issue as well. That is why, we introduce the variable $ChangeOfMayor_i$ which is a dummy variable accounting for a change of mayor in the last year preceding the contract expiration. With this variable, we depart from previous works which take into account the influence of politics by focusing on the political color of the public authority.

If it might be relevant to take into account the political color when we analyze the choice of the governance structure, two reasons make us believe that the change of mayor is a better proxy of political influence in our settings. First, in small municipalities, it is frequent to find apolitical mayors who do not officially belong to a particular party. Second but of primary importance, we think that more than the change of ideology (left-wing *vs* right-wing), the most important element is the change of the interlocutor, as it can represent a breach in the dialog between the operator and the municipality. Furthermore, a change of political color is necessarily a change of mayor while the change of mayor can occur without change of political color. In our dataset, the situation of a change of mayor during the year preceding the re-auctioning of the contract occurs 20 times in the case of concession contract (21.8%) and 17 times in the case of public procurement case (10.7%). We expect a breach in the dialog between the interlocutors, due to a change of mayor to have a negative impact on the likelihood of contract renewal.

[13] See for example the theoretical analysis provided by Boycko et al. [1996] and the empirical analysis of local public services in the US done by Lopez-De-Silanes and Chong [2004]

2.4.3.4 Size and competition

As previously pointed out, the level of competitive pressure might impact on the probability to be renewed. However, as also previously mentioned, there is no centralized data about the number of candidates and their respective bids in each call for tenders. We thus have to find a way to approximate the potential competition. We tackle this by controlling our estimates with our variable $Size_i$ which stands for the number of inhabitants at the date of expiration. As illustrated by Coletto-Labatte [2008] in his study of competition in the car park sector in France, the means of the number car parks and of the number of present operators is an increasing function of the size of the cities. Thus, the risk for the incumbent to face a fierce competition for the field can be assumed to be higher in big municipalities than in small ones. Consequently, even if it is an imperfect measure, it is possible to capture the level of competitive pressure through this variable $Size_i$.

2.4.3.5 Other variables

As we investigate the impact of the frequency of renegotiations, we have to control our estimations by including a variable that stands for the duration of each contract ($Duration_i$). In this way, we are able to interpret the marginal effect of our variable $AverageReneg_i$. The coefficient of this latter really captures the impact of the frequency of renegotiations and cannot be imputed to the duration of the contract.

We also control for the different tasks the operator is in charge of by including the variable *Build* which is a dummy variable that takes the value 1 if the private operator was in charge of the construction of the car park, and 0 otherwise. As there is no construction in public procurement contracts, we only observe the impact of this variable in the case of concession. In our data, the operator has to build the car park in addition to the operation in 16 cases

among the 94 expired contracts we study.
Finally, as the estimation results could be driven by unobserved characteristics of the municipalities and/or of the sector, we control for those potential biases by introducing the variable $Year_i$ that stands for the year of expiration of contract i and by clustering our data on the municipality level.

2.5 Method and Results

2.5.1 Econometric specifications

Our goal is to explore the impact of the different features of renegotiations that may influence the cooperative adaptations over the contractual relationship and thus the likelihood of contract renewal. We estimate the following model:

$$Z_{it}^{*} = X_{it}^{'}\alpha + Y_{it}^{'}\beta + \epsilon_i$$

Where Z_{it}^{*} is the feeling of satisfaction concerning contract i at renewal date t, that is a latent variable that we cannot observe. What we can observe is the fact that the contract is renewed or not at its renewal time. We consider the renewal decision as an indicator for whether our latent variable Z_{it}^{*} is positive:

$$Renewed = \mathbf{1}_{\{Z^{*}>0\}} \Leftrightarrow \begin{cases} 1 \texttt{ if } Z^{*} > 0 \\ 0 \text{ otherwise} \end{cases}$$

Hence our problem boils down to a probit estimation of the following model:

$$Renewed_{it} = a.X_{it} + b.Y_{it} + e_i$$

Where $Renewed_{it}$ is the binary variable that indicates whether contract i is renewed or not at time t; X_{it} is a vector of variables that groups the different

features of renegotiations we want to estimate (*NoReneg, Celerity, Last, AverageReneg, RenegTypes, Scope*); Y_{it} is a vector of control variables that may also influence contract renewal (*PastExperiences, MultiContract, SameArea, ChangeOfMayor, Size, Duration, Year*) and e_i is the error term (we assume that $e_{it} \rightsquigarrow (0, \Sigma)$). Our main interest is on the coefficient a that captures the impact of the different renegotiation features.

2.5.2 Results

2.5.2.1 The impacts of renegotiations (concession contracts)

Table 2.2 provides the results of our probit estimates concerning concession contracts. Model 1 is the simplest model we can imagine. It only includes our set of control variables and the dummy variable indicating whether the contract was renegotiated or not (*NoReneg*). Models 2 to 5 take into account the different features of renegotiations separately (with control variables). Finally, Model 6 gathers all our independent variables and Model 7 proposes a finer analysis of our variable *Scope*. This latter fully specified model allow us to reach a satisfying McFadden r^2 and a high predictive power (80.8% of correctly specified predictions).[14].

First of all, the results suggest that the fact to renegotiate or not a contract is not strongly and significantly correlated with the decision to renew or not a contract. The coefficients associated with our variable $NoReneg_i$ is negative but not always significant across estimates. This first result invalidates the literature describing renegotiations in general as being a negative event in the life of a contract and confirms our objective to investigate in further details the relationship between renegotiations and contract renewals. Indeed, this result does not disqualify analysis pointing out the role of renegotiations in

[14]A naive prediction would allow to obtain a rate of 56.3% at most. The predictive power of the fully specified model is also confirmed by the Pearson and Hosmer-Lemeshow goodness-of-fit tests.

contractual agreement. But it suggests that it might be useful to go a step further by distinguishing renegotiations by their types, frequency and celerity. This is what we do in the following estimates.

Our results about the celerity of the first renegotiation seem to confirm what is push forward by Guasch [2004] and Estache [2006]. Indeed, our variable *Celerity* is negatively and significantly correlated with our dependant variable *Renewed*, meaning that renegotiating quickly adversely impacts the pursuit of the relationship. This result is consistent with the idea that renegotiating fast can be a matter of aggressive bid or of winner's curse effect in the French car park sector. At the opposite, we find a positive and significant coefficient associated with our variable *Last* embodying the proximity to the expiration of the last renegotiation on the probability of contract renewal. As there exist information decay through time, parties tend to over-evaluate recent renegotiations. The fact that this variable is positive and significant leads, at least, to one interesting finding: to renegotiate the contract is here interpreted as a positive event; or at least that the private operator is prone to renegotiate in a way that is satisfying the public authority in order to improve his likelihood of renewal.

Results concerning the impact of the frequency of renegotiations suggest that there exist an impact of the frequency of renegotiation during the execution of a contract on its probability to be renewed with the same partner. We find that *AverageReneg* is significantly and positively correlated with the probability to renew the contract with the same operator. As for our variable $AverageReneg^2$, we observe a significant and negative correlation with our dependant variable. This non linear effect of the variable *AverageReneg* suggests that there might exist an optimal frequency of renegotiations. This result is not at odds with previous findings. It reflects the fact that contract are governance mechanisms that should be rigid enough to reflect real commitment from contracting parties but that also should to be flexible enough to permit adaptation as environment evolves.

Turning now into the renegotiation types and their impact on the probability

to renew a contract, we find that the types of objects that are renegotiated are crucial. As expected, we observe different correlations depending on the dimensions concerned with contractual amendments. The coefficient associated with the variable *RenegQuality* is positive and significant across estimates. As those renegotiations enable to improve the quality of the service offered to users, they make public authorities more prone to contract again with the same operator. The positive and significant correlation we observe is, hence, not surprising. On the contrary, the coefficient associated with the variable *RenegFinanEq* is negative and significant across estimates. As previously emphasized, those renegotiations come, most of the time, from an error of anticipation, an *ex post* shock or an additional investment that cannot be compensated with an increase of tariffs. Furthermore, these renegotiations generally lead to a decrease in the rent private operators pay to the public authority in counterpart for the use of the public ground or asset. For this reason, they seem to make public authorities less prone to contract again with the same operator.

We also find a negative impact of renegotiations dealing with additional investment as suggested by the negative and significant coefficient of the variable *RenegInvestment* in model 5, suggesting that parties can feel prejudiced when they renegotiate on this aspect. Indeed, as previously emphasized, additional investments can be the consequence of a direct requirement of the public authority (and in this case the compliance of the operator might lead to higher probability of contract renewal) or of a miss-anticipated spending by the operator requiring to increase tariffs or to revise the financial provision (and in this case the public authority might be reluctant to contract again with the same operator). In our data, the second possibility seems to overcome the first one. Our variable *RenegTariff* does not appear significantly stable across estimates. However, the negative sign associated with this variable is consistent with the argument that increasing tariffs is negatively perceived by public authorities in their decision to re-award the contract with the same operator, even if those raises are due to quality improvements.

Throughout, our results about the several types of renegotiations suggest that

they impact differently on the relationship during the contract lifespan, conditioning the probability of contract renewal.

Our results also highlight that the scope of renegotiations matters in the case of concession. Indeed, the positive and significant sign associated with our variable *Scope* seems to indicate that contracts have greater chance to be renewed when renegotiated dimensions are numerous. This effect is investigated in greater details in model 7 where we put a dummy for each possible "scope configuration" (*i.e.* number of different dimensions renegotiated during the contract lifetime). It appears that the probability of contract renewal is higher when contract are renegotiated on two, three or four dimensions rather than zero. Interestingly, we also find that contracts have lower chance to be renewed when they are renegotiated on one dimension rather than zero. The results about the scope of renegotiations seem to suit the story according to which parties would prefer to contract again together when the renegotiations of the previous contract were a win-win game, rather that a zero-sum game.

Table 2.2: Probit analysis of concession contracts renewals

	Model 1 Probit	Model 2 Probit	Model 3 Probit	Model 4 Probit	Model 5 Probit	Model 6 Probit	Model 7 Probit
	Dependant variable : ***Renewed***						
NoReneg	-0.445**	-0.299	-0.180	-0.516**	-0.128	0.403	-0.535
	(0.226)	(0.291)	(0.277)	(0.225)	(0.245)	(0.293)	(0.705)
Celerity		-0.044*				-0.121***	-0.268***
		(0.024)				(0.025)	(0.058)
Last		0.059***				0.061***	0.085***
		(0.017)				(0.019)	(0.028)
AverageReneg			2.129***			3.292***	6.121***
			(0.812)			(0.778)	(0.974)
*AverageReneg*2			-1.526**			-2.365***	-5.226***
			(0.664)			(0.704)	(0.615)
Type of Renegotiations							
RenegTariffs				-3.844*		-3.851	-1.891
				(2.062)		(2.779)	(1.841)
RenegInvestment				-1.796+		-3.853***	-4.738***
				(1.147)		(1.378)	(1.664)
RenegQuality				10.510**		9.437***	11.272**
				(4.354)		(3.188)	(5.340)
RenegFinanEq				-12.275***		-16.307***	-23.132***
				(2.555)		(2.843)	(3.512)
RenegDuration				0.001		-0.544	0.816
				(0.396)		(0.907)	(0.873)
RenegIndex				-1.794		-2.164	-3.872
				(5.572)		(5.303)	(4.160)
Scope of Renegotiations							
Scope					0.143	0.455***	
					(0.100)	(0.149)	
OneDimension							-1.528**
							(0.761)
TwoDimensions							0.923
							(0.750)
ThreeDimensions							1.396*
							(0.771)
FourDimensions							2.407***
							(0.828)
FiveDimensions							0.020
							(0.508)
Control Variables							
PastExperiences	-0.275***	-0.290***	-0.305***	-0.160*	-0.254***	-0.208	-0.359***
	(0.090)	(0.094)	(0.080)	(0.094)	(0.077)	(0.145)	(0.112)
MultiContract	0.390***	0.398***	0.401***	0.291*	0.378***	0.311*	0.435***
	(0.140)	(0.131)	(0.129)	(0.154)	(0.142)	(0.187)	(0.161)
SameArea	0.097***	0.102***	0.106***	0.122***	0.097***	0.131***	0.157***
	(0.022)	(0.021)	(0.023)	(0.029)	(0.022)	(0.025)	(0.021)
ChangeOfMayor	-0.561**	-0.494***	-0.433	-0.473*	-0.527*	-0.523***	-0.792***
	(0.282)	(0.185)	(0.357)	(0.255)	(0.287)	(0.165)	(0.190)
Year	0.115	0.093	0.129	0.072	0.113	0.039	0.149
	(0.091)	(0.084)	(0.099)	(0.113)	(0.092)	(0.115)	(0.123)
Size	1.258	1.212	1.669	0.503	1.169	0.899	0.822
	(2.419)	(1.943)	(2.750)	(2.001)	(2.355)	(1.589)	(1.791)
Build	-0.368	-0.622	-0.327	-0.469	-0.298	-0.773**	-0.964**
	(0.529)	(0.512)	(0.498)	(0.534)	(0.519)	(0.394)	(0.407)
Duration	-0.007	-0.026	-0.002	-0.003	-0.011	-0.016	-0.009
	(0.020)	(0.026)	(0.019)	(0.018)	(0.020)	(0.023)	(0.030)
Cluster	yes	yes	yes	yes	yes	yes	yes
Intercept	-230.273	-187.135	-259.711	-145.296	-227.396	-80.427	-299.037
	(182.013)	(167.424)	(197.619)	(225.879)	(184.364)	(229.674)	(245.218)
$r2$	0.14	0.21	0.17	0.25	0.15	0.39	0.47
Predict	66	68.1	66	70	66	81.9	80.8
N	94	94	94	94	94	94	94

Level of significance: $^{+}$:15%, *:10%, **:5%, ***:1%.

2.5.2.2 Other relevant variables (concession contracts)

The variable *PastExperiences* impacts negatively on the likelihood of contract renewal. This result comes as a surprise since it lies in opposition with the argument of learning and mutual understandings developed through time. A possible explanation could be that public authorities are not willing to stay for too long with a same operator, in order to benefit from the advantage of competition and to avoid potential routines. Results concerning our variable *Built* come as a surprise as well. Contrary to one would have expected, the construction of the infrastructure does not seem to provide a competitive advantage to the incumbent (contrary to previous results such as the study of Zupan [1989]).[15]

On the contrary, our variables linked to future business and reputational concerns are more consistent with reasonable expectations. We observe that the variables *MultiContract* and *SameArea* have a positive and significant impact on the probability of contract renewal. Such findings can be analyzed through the lens of relational contracting. Indeed, it is legitimate to assume that a higher number of other on-going contracts with the same municipality as well as with neighbor municipalities makes the threat of ending relationships more penalizing. Cooperation and compliance to public authorities' expectations are more likely to occur in such a context. Hence, it is understandable to observe that those two variables are positively and significantly correlated with contract renewal.

As previously emphasized, we do not focus on political influence properly but we rather focus on the existence of a potential breach of the dialog between the public authority and the operator. Such a breach is more likely to occur when the mayor of the city changes. Indeed, we find that a change of mayor during the last year of the contract reduces the probability of its renewal as

[15]This result may be driven by the small number of cases in the database. The majority of contracts including construction are still running, so they are not yet concerned about our study of renewals.

illustrated by the negative and significant coefficient associated with our variable *ChangeOfMayor*. This result could also be interpreted as an illustration of a relational dimension of contractual relationship.

Finally, concerning the variable *Size* which aims to capture the level of competition, the results are not significant, meaning that competition (or at least this measure of competition) is not the main factor explaining concession contracts renewals.

All those control variables allow us to check the robustness of our results. Nevertheless, other variables concerning specific effects of cities or general evolution of the sector might be missing. As a consequence, the main variables of our models could be correlated with those unobserved characteristics and mistakenly appear to have an explanatory power. We take this bias into account in two different ways. First, to deal with general evolution in the car park sector that might influence the probability to be renewed (such as an increase of the competitive pressure), we include the variable *Year*. Second, in order to tackle the issue of municipalities' fixed effects, we cluster our dataset at the city level. As observed in table 2.2, the variables *Year* is not significant. As for data clustering, the regressions we ran without cities clustering lead to same results with a slight loss of significance.

We also check for our results' robustness by running a Principal Factor Analysis on the frequency of renegotiations and their types. The primary purpose is to group objects based on the characteristics they possess with respect to some predetermined selection criteria. Once the PFA is performed, the resulting groups should exhibit high internal (within-cluster) homogeneity and high external (between-cluster) heterogeneity. In our empirical settings, as contracts are subject to different types and different frequency of renegotiations, we identify groups of contract according to their renegotiations types and frequency. The PFA drives us to the identification of three classes of contract, classified according to the frequency of renegotiations they are concerned with. The first class contains the no or few renegotiated contracts, the third class brings together the most renegotiated contract and the second class regroups

intermediary levels of renegotiations. When we include those classes in our probit estimates, we find that contracts which belong to the second class are more likely to be renewed than less renegotiated contracts and than most renegotiated contracts as well. Here again, such a result suggests that an optimal level of renegotiation frequency is required during the contract execution to generate the willingness of the parties to renew the contract. We do not make those additional estimates appear in Table 2.2 in order to avoid redundant findings.

As in the literature in business law, we could also have assigned some values to the different types of renegotiations, or to some other features of renegotiations, in order to weight them (Halvey and Melby [1996]; Deffains and Kirat [2001]). Doing this would have reinforced the role of some features of renegotiations. But without doing this, it is already clear that some of them have a very significant impact, while others have not. Moreover, we did not run many interviews with different actors in the car park sector, so that we had no clear pre-conceived idea about which variable should be attributed a more important weight. In future works about endogeneity, it is planed that this weighted measure method will be used to assess the importance of several contractual clauses on the likelihood of renegotiations.

2.5.3 Discretionary Power and Contractual Arrangements

The two previous subsections described how, through the spectrum of renegotiations, the quality of previous interactions can be taken into account to decide whether to renew a contract or not in concession. Thus, one could expect such an analysis to be duplicated to all public-private arrangements, and notably public procurement contracts that have been codified in our database as well. This is what we do in Table 2.3. Results do not hold anymore.

Nevertheless, as previously mentioned, one of the main differences between concession and public procurement is about the discretionary power the pub-

lic authority has. This discretionary power is mostly expressed at the stage of the award procedure we detailed in subsection 2.3.1. In concession procedures, there is room for negotiation and previous experiences considerations, whereas public procurement procedures are much more rigid. Thus, unsurprisingly, the results that we reach regarding the frequency, the type and the scope of renegotiations in concession disappear by and large under public procurement. This is consistent with the statement of the Administrative Court of Paris, that sanctioned a public authority for disqualifying a competitor in the name of a bad past experience, and perfectly illustrates the fact that public authorities have very few discretionary power.

Nonetheless, the decisions taken by public authorities to renew a contract or not do not seem to be totally impervious to relational aspects and previous experiences. Indeed, some aspects play a role in the decision to re-award a contract to the same operator: the variable *Celerity* is significant and is negatively correlated with the probability to be renewed; the same effect is found for *RenegFinanEq* and for the control variable *ChangeOfMayor*.[16] The explanations we find to understand why it is those three variables that have an explanatory power are the following. *Celerity* and *RenegFinanEq* rely on the same kind of possible explanation: as mentioned previously, public procurement contract are shorter term and more rigid contracts than concession. The tasks the private operator is in charge of are less complex and can generally be well defined, thus the bidders are predominantly selected on the basis of the price they propose to be awarded the market.[17] Consequently, proposing a low price can be a strategy from the operator to be awarded the contract, being confident in his capacity to renegotiate *ex post*. It is thus easy for the public authority to detect such an aggressive bidding strategy, which may explain the

[16]Note that in the models associated with public procurement contracts, the variable *RenegTariff* disappeared. Indeed, in such contracts, the evolution of tariffs does not impact the revenue of the operator who is paid by the public authority a predetermined price. Thus, if tariffs change under public procurement, it is the decision of the public party, who does not have to write it in the contract, as it is a unilateral decision. So, there are no *RenegTariff* in our public procurement sub-sample. The variable *Built* disappears as well since there is no construction in the case of public procurement.

[17]This price has not to be confused with the fees charged to users.

unwillingness to contract again with the same partner. As for *ChangeOfMayor*, which is not highly significant, it can rather be related to a strategy from the public authority. We remind that this variable is equal to 1 if there was a municipal election in year before the end of the expired contract, leading to a change of mayor. Thus, in order to differentiate himself from the incumbent, and to make his opposition visible, the new mayor may be prone to change the operator, whatever the quality of the new bid. This seems to indicate that discretionary power is not completely absent from public procurement procedures.

A negative and significant correlation between contract renewal and the size of the municipality also appears in Table 2.3. It indicates that the level of competition seems to impact on the probability to be renewed. In the case of public procurement contracts, which are shorter and less complex contractual agreements than concessions, the size of the city matters and the way parties adapt through renegotiations appears as a less important factor to focus on. Thus it is not surprising to observe that the competitive pressure plays a stronger role on contract renewals.

Table 2.3: Probit analysis of Public Procurement contracts renewals

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
	Probit	Probit	Probit	Probit	Probit	Probit	Probit
				Dependant variable : ***Renewed***			
NoReneg	0.171	0.145	0.147	0.431	-0.147	0.450	1.219
	(0.393)	(0.368)	(0.462)	(0.515)	(0.493)	(0.753)	(1.845)
Celerity		-0.167***				-0.221***	-0.250***
		(0.051)				(0.080)	(0.075)
Last		0.033				0.074	0.105
		(0.104)				(0.113)	(0.130)
AverageReneg			-0.121			-0.105	-0.106
			(0.359)			(0.298)	(0.349)
$AverageReneg^2$			0.040			0.055**	0.050*
			(0.039)			(0.027)	(0.026)
Type of Renegotiations							
RenegInvestment				-0.301		-0.241	0.151
				(0.480)		(0.783)	(0.923)
RenegQuality				-0.043		-0.135	-0.100
				(0.566)		(0.464)	(0.536)
RenegFinanEq				-3.278***		-3.519***	-3.131***
				(0.614)		(0.573)	(0.531)
RenegDuration				-0.012		-0.212	-0.150
				(0.087)		(0.265)	(0.326)
Scope of Renegotiations							
Scope					-0.241+	0.107	
					(0.152)	(0.416)	
OneDimension							0.730
							(1.628)
TwoDimensions							0.398
							(1.843)
ThreeDimensions							.
							.
FourDimensions							.
							.
Control Variables							
PastExperiences	-0.220***	-0.243***	-0.220***	-0.281***	-0.240***	-0.314***	-0.317***
	(0.077)	(0.078)	(0.074)	(0.097)	(0.073)	(0.114)	(0.113)
MultiContract	0.254**	0.264***	0.252***	0.334**	0.262***	0.352***	0.356***
	(0.099)	(0.098)	(0.093)	(0.130)	(0.092)	(0.134)	(0.132)
SameArea	0.038**	0.042***	0.039**	0.061***	0.042**	0.069***	0.070***
	(0.017)	(0.016)	(0.017)	(0.021)	(0.018)	(0.021)	(0.020)
ChangeOfMayor	-0.592+	-0.599+	-0.599+	-0.485	-0.564	-0.542*	-0.576
	(0.411)	(0.376)	(0.381)	(0.349)	(0.408)	(0.321)	(0.402)
Year	0.136*	0.160**	0.141*	0.099	0.143**	0.139	0.167+
	(0.070)	(0.070)	(0.082)	(0.095)	(0.068)	(0.121)	(0.109)
Size	-4.147*	-3.633	-4.041*	-4.119+	-3.715+	-3.654	-4.460+
	(2.388)	(2.533)	(2.321)	(2.523)	(2.527)	(2.710)	(2.850)
Duration	-0.071+	-0.035	-0.068*	-0.089*	-0.058	-0.078	-0.058
	(0.047)	(0.056)	(0.041)	(0.049)	(0.047)	(0.089)	(0.093)
Cluster	yes	yes	yes	yes	yes	yes	yes
Intercept	-271.507*	-320.233**	-282.402*	-198.571	-284.605**	-276.890	-335.167+
	(139.972)	(140.316)	(164.799)	(190.148)	(136.342)	(241.799)	(217.351)
r^2	0.11	0.12	0.12	0.17	0.12	0.2	0.21
Predict	80.4	77.8	79.7	81.9	80.4	79	80.1
N	158	158	158	158	158	158	158

Level of significance: $^{+}$:15%, *:10%, **:5%, ***:1%.

2.5.4 Alternative stories

One question that is not directly addressed in the paper is whether the willingness of the contracting parties to renew a contract is the result of the contractual surplus generated by the relationship or is driven by something else. For example, one might think that it might reflect corruption effect or collusion effect. These two phenomena correspond to situations where the public and the private partners benefit from a situation, but users loose. Thus, these two possibilities should be excluded to conclude that contract adaptations in the car park sector benefit to all the parties at stake (the public authority, the private partner and users). Such possibilities deserve discussions, since we indeed do not have any performance measure of the contract nor any users' satisfactory index. The public authorities are implicitly assumed to be benevolent and this is one limit of our paper.

If it was corruption or collusion, instead of legitimate discretionary power valorizing cooperative renegotiations that explained contract renewals, we would observe several elements: first, we would expect public authorities to be indifferent to tariff increases. Then, more frequent renegotiations concerning tariffs should not prevent from contract renewals. Second, we would observe a high rate of renewal. Third, there would be strong discrepancies between the municipalities: some of them would systematically renew their contracts, while others would not. Finally, the high rate of renewal should be facilitated by a concentrated and stable number of competitiors in order to enable an easier implementation of collusive arrangements.

However, our results go the other side. Notably, although the variable *RenegTariff* is not always significant, the negative correlation between tariffs renegotiations and the variable *Renewed* suggests that contracts with renego-

tiations dealing with price evolution have lower probability of renewal, which seems to suit the assumption of the benevolence of the public authority. Second, concerning the rate of renewal of the private operator in this study, it is relatively low (less than 50% for concession contracts), compared to other sectors, and typically in urban public transport where the rate of incumbent renewal is around 90% in France (Amaral et al. [2008]), as well as in the water sector (Guérin-Schneider and Lorrain [2003]). Moreover, the negative and significant sign associated to the variable *PastExperiences* suggests that the public authorities have the willingness not to stay for too long with the same operator. Third, as regards to the discrepancies between municipalities, although we could not impose a fixed effect per municipality, due to a too high number of municipalities, we ran a cluster, which suggests that there is not a specific class of municipalities that automatically and systematically renew their contract with the same partner. This seems to uncover that there are no fully corrupted public authorities who would renew all their car park contracts. Finally, concerning the concentration and the stability of the number of operators on the car park market, even if we unfortunately do not have the number of bidders per call for tenders, we know that the number of national operators present on the car park market has increased for the past ten years. Local operators are also more and more numerous (Baffray and Gattet [2009]). This increasing number of actors must make the possibility of collusive agreements more hardly sustainable. Moreover, we learn from interviews with managers[18] in this sector that there are on average 5 bidders per call for tenders, which is very high compared to other sectors.[19].

These empirical evidence seem to allow to conclude that users do not suffer from corruption or collusive behaviors. Although these potential alter-

[18]Notably, interview led with Stéphane de Barros, May 12th 2010

[19]For instance, the average number of bidders in the French urban public transport sector is 1.4, and in 65% of cases, there is only one bidder (GART [2005]), and in the French water sector, there are on average 2.2 bidders per call for tenders (Guérin-Schneider and Lorrain [2003])

native stories concerning corruption and/or collusion deserve to be studied in further details in some future works, these preliminary results provide support for the intuition according to which discretionary power and contract renewals differ from corruption and collusion at least in this dataset. Future investigations should address the conditions under which they differ.

2.6 Conclusion and Public Policy Implications

In this chapter, we tried to provide some new insights on the issue of renegotiations that have been generally analyzed through the lens of opportunism. Having constructed an original data-set of 252 expired contracts in the car park sector, we assess the impact of renegotiation on the pursuit or not of contractual relationships. Indeed, renewing a contract can reasonably be interpreted as the fact that the previous contract was satisfying for both partners. In the concession sample, we find it is necessary to distinguish the types of renegotiations to evaluate their impact on renewal. In addition, we find a non-linear effect concerning the frequency of renegotiations on the probability to renew a contract. This effect also seems to be confirmed by the scope of renegotiations. These are very innovative results, since we went over the step of looking only at the occurrence of renegotiations or not, and we paid particular attention to the effects of targeted features of renegotiations on the likelihood of contractual renewal.

To the best of our knowledge, the only results that existed up to now come from summary statistics (Guasch [2004]), but with no econometric treatment. In some way however, we approve Guasch's work concerning the celerity of renegotiations: the quicker the renegotiation after the signature, the lower the probability to renew the contract, which could be interpreted as a sign of aggressive bidding. But we go further by investigating the types of renegotiations and their scope along the contract lifespan.

However, in spite of the originality of our empirical study, a main concern about this chapter is the potential presence of reverse causality. One could easily argue that the parties have already decided to renew the contractor and this drives some of the renegotiations that we observe and not others. Although this timing does not correspond to what is legally foreseen by the law, it cannot be completely excluded. Consequently, most of the coefficients must be interpreted as correlation. Further extensions have to be made in order to try to find *ad hoc* instruments in order to tackle the endogeneity issue of renegotiation frequency (an attempt of assessing this endogeneity issue is provided in appendix).

Nonetheless, there is not much evidence out there on the issue of renegotiations and contract renewals in PPPs and we believe this work is a first step in an under-investigated field of research. Some future work could also insist on the origin of the renegotiation. In our case, detecting for certain who asked for the renegotiation, between the public authority and the private operator, was impossible to do when reading the contracts and the amendments. Knowing if the same party is always at the origin of the renegotiation would enable to better understand why a party would feel prejudiced during the contract execution.

Ultimately, more than providing empirical results to a theoretically unclosed debate about the opportunity of renegotiation, some public policy implications could be derived from this chapter. In fact, most of the results do not hold anymore when we investigate public procurement contracts that involve more rigid procedures. As we are able to identify distinctions between discretionary power and corruption, this chapter highlights the importance of the role of the discretionary power of public authorities and the use of *intuitu personae*. In order to overstep our simple deductions about the absence of corruption and collusion, some future investigation should be launched to access the content of the alternative bids which did not win the call for tenders. This would help to understand the choice of public authorities. Unfortunately, this information was not available for this dataset. Nevertheless, at a period where the Euro-

pean Union tries to set up a legal framework for concession contracts in the Member States, we could recommend not to categorically reject the possibility for public authorities to use their discretionary power. This chapter also conducts to accept renegotiations as necessary adaptation processes that are punished when they lead to unbalanced results between the parties. As a consequence, next chapters in Part II, that is more theoretical, must account both for satisfactory and un-satisfactory (as described in the previous literature) renegotiations in particular and *ex post* changes in general.

2.7 Appendix

2.7.1 Endogeneity issue: a first attempt

As previously said, although we argued that some features of renegotiations have an impact on the probability for the municipality to renew the same operator, it is impossible to completely exclude the existence of a reverse causality (*i.e.* the decision to renew has an influence on the way contracts are renegotiated). Moreover, endogeneity may come from non-observed, omitted characteristics of the sector and/or the municipalities. Thus, in this section, we attempt to mitigate econometric problems caused by endogeneity. As well known by now, the textbook solution to endogeneity is to implement some type of instrumental variables (IV) estimation procedure. Once potential endogenous variables are identified, the standard procedure requires to find, in addition to the variables already used in the previous estimations, some appropriate instrumental variables that are correlated with the endogenous regressor but uncorrelated with the error in the structural equation. In this paper, as a first attempt, we will only try to endogenize the average number of renegotiations (*AverageReneg*).

2.7.1.1 Instrumental Variables

To instrument our variable *AverageReneg*, we use two variables accounting for reasons that can initially motivate the renegotiations during the contract lifetime but not the renewal decision of the public authority.

The first instrumental variable we propose is the political color of the municipality at the date of signature (*PoliticalColor*). We argued in Section 2.5.2.2 that the political color of the public authority at the date of expiration was not suitable to explain contract renewals, and we proposed a relational variable instead (*ChangeOfMayor*). However, we consider as relevant to use the political

color of the mayor at the date of signature of each contract i as a proxy of the confidence or mistrust toward private participation for the delivery of a public service. Indeed, left-hand wing politicians may have a higher mistrust towards private participation than right-hand wing mayors. At least in France, right-hand wing politicians are more liberal than left-hand wing, so they are more prone to have recourse to a public-private arrangement, instead of public provision. Hence, the political color can explain a preference for more or less flexible contractual specification and, *de facto*, it can explain the average number of renegotiations (Bajari et al. [2007]; Guasch et al. [2006]; Athias and Saussier [2007]; Spiller [2008]). Our variable *PoliticalColor* is ordered from 1 to 5, encompassing the extrem left (1) until the extrem right (5).[20] We expect to right-wing inclined municipalities to be more prone to renegotiate and, hence, to observe a positive coefficient associated with the variable *PoliticalColor*.
The second variable we use is the experience of the municipality in terms of outsourcing of public services. For each city, we calculate the difference between the date of signature of each contract i and the date of signature of their first outsourcing of car park services. Hence, our variable *ContractExperience* claims to be a proxy of the municipalities' know-how in crafting more sophisticated contractual agreements, less prone to renegotiations. In our sample, there are novice as well as highly experimented municipalities.[21] Associated with this variable, we expect that more experimented public authorities are less prone to renegotiate their contracts.

2.7.1.2 Results

Table 2.4 provides the results of our IV probit estimates. In the case of concession contracts, we observe that our variable *ContractExperience* is a good instrument. In fact, there is a negative and significant correlation between

[20] 1=extrem left-wing ; 2 = left-wing ; 3 = centre ; 4 = right-wing ; 5 = extrem right-wing. Apolitical municipalities are coded as centre.

[21] *ContractExperience* is distributed from 0 to 39, the mean is equal to 14.1 years and the standard deviation is equal to 11.3 years.

this variable and the average number of renegotiations meaning that more experimented municipalities are less likely to appeal for renegotiations. On the contrary, the political color at the date of signature does not directly impact on the number of renegotiations (the coefficient associated with the variable *PoliticalColor* is not significant). The other results of the first stage estimates of concession contracts suggest that the duration (*Duration*), the fact that the operator had to build the car park (*Build*) and the scope of the renegotiations (*Scope*) have a significant impact on the average number of renegotiations. More precisely, the average number of renegotiations is all the higher than the tasks outsourced to the operator include the construction of the park and than the contract is renegotiated in several dimensions. On the contrary, this average number of renegotiations is lower when the duration of the contract is long. Moreover, all the control variables we use for the estimates of contract renewal are not influencing the average number of renegotiations (*PastExperiences*, *MultiContract*, *SameArea*, *ChangeOfMayor*, *Year*, *Size*). Turning now to the second stage of the estimates, we obtain a positive and significant correlation between our variable *Renewed* and our instrumented variable *AverageReneg*. Such a result is consistent with what we find previously (section 2.5.2.1). We also observe that, in spite of a slight loss in significance, other independent variables have the same effect as in probit estimates that make no correction for endogeneity. *PaxtEsperiences* and *ChangeOfMayor* negatively impact on contract renewal while *SameArea* and *MultiContract* positively do.

Concerning public procurement contracts, we fail to identify good instruments. Neither our variable *PoliticalColor* nor our variable *ContractExperience* have an impact on the average number of renegotiations of public procurement contracts. The second stage of the estimates reveals a negative and significant sign associated with the instrumented variable *AverageReneg*. This result can be interpreted as follows: public procurements contracts, which are less complex, are less likely to appeal for renegotiations. Hence, contract renegotiations can be analyzed through opportunism and, *de facto*, implies a lower probability to be renewed for the private operator. Nonetheless, we cannot draw

any conclusions from this second stage estimations since we poorly instrument the variable *AverageReneg* in the case of public procurement contracts. The only result that seems to fit with what we find previously is the negative and significant impact of the variable *Size* (our proxy for the competition level) on both the average number of renegotiations and the probability of contract renewal. It confirms, in a way, that the competitive pressure plays a role of first importance in public procurement. Further researches need to deeply investigate the differentiate role played by competition between concession and public procurement contracts.

Table 2.4: IV-probit Analysis

	First Stage		**Second Stage**	
	Dependant variable = *AverageReneg*		Dependant variable = *Renewed*	
	Concession	Public Procurement	Concession	Public Procurement
AverageReneg	-	-	2.411***	-1.272***
	-	-	(0.675)	(0.213)
Scope	0.135***	0.540***	-0.184	0.664***
	(0.019)	(0.107)	(0.153)	(0.084)
PastExperiences	-0.000	-0.061*	-0.128+	-0.102+
	(0.011)	(0.032)	(0.087)	(0.065)
MultiContract	0.010	0.111*	0.219**	0.183**
	(0.014)	(0.059)	(0.093)	(0.086)
SameArea	-0.007	-0.007	0.063**	-0.006
	(0.005)	(0.012)	(0.027)	(0.016)
ChangeOfMayor	0.021	0.202	-0.363**	0.242
	(0.076)	(0.175)	(0.173)	(0.224)
Year	-0.018	-0.064**	0.102	-0.062
	(0.013)	(0.032)	(0.083)	(0.048)
Size	0.299	-1.968*	0.669	-2.403*
	(0.365)	(1.099)	(1.474)	(1.377)
Build	0.194*	-	-0.513	-
	(0.107)	-	(0.436)	-
Duration	-0.019***	-0.133***	0.045+	-0.171***
	(0.005)	(0.041)	(0.030)	(0.035)
Instrument				
ContractExperience	-0.012***	0.005	-	-
	(0.004)	(0.009)	-	-
PoliticalColor	0.002	0.004	-	-
	(0.020)	(0.008)	-	-
Intercept	36.508	128.880**	-205.333	124.738
	(26.964)	(64.411)	(165.819)	(95.659)
Athrho	-	-	-1.204**	3.043+
	-	-	(0.526)	(2.011)
Lnsigma	-	-	-1.241***	-0.254+
	-	-	(0.120)	(0.163)
r^2	0.51	0.29	-	-
Predict	-	-	59.6	61.1
N	94	158	94	158

Level of significance: $^{+}$:15%, *:10%, **:5%, ***:1%.

2.7.2 Figures and tables

Figure 2.1: Optimal level of Renegotiations

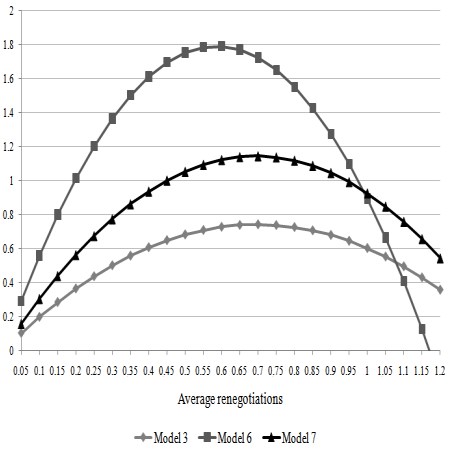


Table 2.5: Variables : descriptives statistics

		Concession					Public Procurement			
Variables	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Renewed	94	0.44	0.50	0	1	158	0.78	0.41	0	1
NoReneg	94	0.26	0.44	0	1	158	0.67	0.47	0	1
Celerity	94	3.83	4.95	0	30	158	0.61	1.31	0	12
Last	94	8.20	8.69	0	34	158	0.75	1.69	0	13
AverageReneg	94	0.38	0.41	0	2.50	158	0.45	0.91	0	8
$AverageReneg^2$	9	0.31	0.74	0	6.25	158	1.05	5.39	0	64
RenegTariff	94	0.05	0.15	0	1	.	.	.	.	.
RenegInvestment	94	0.08	0.20	0	1	158	0.05	0.21	0	2
RenegQuality	94	0.04	0.09	0	0.40	158	0.05	0.25	0	2
RenegFinanEq	94	0.01	0.04	0	0.22	158	0.02	0.11	0	1
RenegDuration	94	0.14	0.23	0	1.33	158	0.20	0.78	0	8
RenegIndex	94	0.02	0.05	0	0.20	.	.	.	.	.
Scope	94	1.54	1.54	0	5	158	0.45	0.87	0	4
OneDimension	94	0.29	0.46	0	1	158	0.20	0.40	0	1
TwoDimensions	94	0.16	0.36	0	1	158	0.04	0.19	0	1
ThreeDimensions	94	0.07	0.26	0	1	158	0.04	0.19	0	1
FourDimensions	94	0.09	0.29	0	1	158	0.02	0.13	0	1
FiveDimensions	94	0.06	0.24	0	1	158	0	0	0	0
PastRenewal	94	0.05	0.22	0	1	158	0	0	0	0
PastExperiences	94	2.02	2.26	0	11	158	2.66	3.28	0	14
MultiContract	94	1.67	1.91	0	10	158	1.65	2.43	0	10
SameArea	94	4.97	5.57	0	19	158	4.98	5.25	0	19
ChangeOfMayor	94	0.21	0.41	0	1	158	0.11	0.31	0	1
Year	94	2004.26	2.40	1996	2008	158	2005.26	2.05	1999	2008
Size	94	95797	119490	3387	845420	158	51839	52561	516	283288
Build	94	0.17	0.37	0	1	.	.	.	.	.
Duration	94	15	10.87	0.50	40	158	2.30	2.17	0.08	13
ContractExperience	94	18.55	10.51	0	37	158	12.40	11.05	0	39
PoliticalColor	94	3.2	1.10	1	4	158	3.22	1	1	5

Table 2.6: Correlations

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. *Renewed*											
2. *NoReneg*	0.135										
3. *Celerity*	-0.269	-0.308									
4. *Last*	-0.131	-0.328	0.311								
5. *AverageReneg*	0.029	-0.444	-0.014	-0.063							
6. **AverageReneg**^{2}	0.047	-0.171	-0.052	-0.063	0.837						
7. *RenegTariffs*	-0.019	-0.212	0.068	0.014	0.316	0.146					
8. *RenegInvestment*	-0.061	-0.316	0.057	0.036	0.326	0.103	0.566				
9. *RenegQuality*	0.021	-0.252	0.046	-0.013	0.351	0.163	0.595	0.433			
10. *RenegFinanEq*	-0.097	-0.160	0.062	-0.002	0.060	-0.006	-0.007	0.061	0.019		
11. *RenegDuration*	-0.002	-0.292	-0.068	-0.070	0.728	0.812	0.150	0.128	0.099	0.058	
12. *RenegIndex*	0.130	-0.266	-0.056	-0.070	0.274	0.082	-0.035	0.088	-0.016	0.005	-0.018
13. *Scope*	-0.119	-0.692	0.484	0.313	0.302	0.086	0.386	0.510	0.348	0.218	0.145
14. *PastExperiences*	-0.043	0.053	-0.098	0.002	-0.078	-0.052	-0.086	-0.084	-0.065	-0.039	-0.061
15. *MultiContract*	-0.035	-0.027	0.010	0.085	0.004	0.006	-0.063	-0.037	-0.034	-0.029	-0.009
16. *SameArea*	0.145	0.096	-0.086	-0.103	-0.015	-0.013	0.126	0.008	0.016	0.121	0.014
17. *ChangeOfMayor*	-0.188	-0.128	0.167	0.051	0.060	0.033	0.068	0.080	-0.032	-0.037	0.000
18. *Year*	0.143	0.016	-0.070	-0.016	-0.116	-0.107	-0.159	-0.099	-0.062	0.015	-0.082
19. *Size*	-0.152	-0.139	0.164	0.235	-0.044	-0.054	-0.049	-0.007	-0.019	-0.025	-0.023
20. *Build*	-0.192	-0.075	0.199	0.510	-0.104	-0.046	-0.047	-0.039	-0.049	-0.025	-0.065
21. *Duration*	-0.325	-0.219	0.568	0.752	-0.163	-0.102	-0.021	-0.018	-0.054	0.003	-0.136
22. *ContractExperience*	-0.305	-0.186	0.229	0.306	-0.057	-0.041	-0.009	0.004	-0.037	-0.001	-0.057
23. *PoliticalColor*	0.016	-0.026	0.045	-0.085	-0.002	0.017	0.044	0.041	-0.043	0.065	0.071

	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.
13. *Scope*	-0.015										
14. *PastExperiences*	0.013	-0.138									
15. *MultiContract*	-0.012	-0.043	0.872								
16. *SameArea*	-0.108	-0.072	-0.041	-0.175							
17. *ChangeOfMayor*	-0.035	0.126	-0.094	-0.076	0.051						
18. *Year*	0.134	-0.072	0.202	0.035	-0.084	-0.147					
19. *Size*	-0.032	0.111	0.420	0.498	-0.210	0.082	-0.034				
20. *Build*	-0.064	0.106	0.032	0.055	-0.038	0.079	0.021	0.235			
21. *Duration*	-0.119	0.311	-0.046	0.044	-0.122	0.199	-0.034	0.271	0.671		
22. *ContractExperience*	-0.043	0.204	0.615	0.689	-0.245	0.079	0.065	0.615	0.320	0.385	
23. *PoliticalColor*	-0.057	0.059	0.094	0.090	0.130	-0.094	-0.037	-0.022	-0.006	-0.050	0.084

Table 2.7: Variables : definitions

Variables	**Definitions**
Renewed	dummy variable equal to 1 if the expired contract was followed by a renewal
NoReneg	dummy variable equal to 1 if the expired contract was not renegotiated
Celerity	time lag between the signature of the contract and the first renegotiation, divided by the duration
Last	time lag between the expiration of the contract and the last renegotiation, divided by the duration
AverageReneg	number of renegotiations per year
$AverageReneg^2$	square of the number of renegotiations per year
RenegTariff	number of renegotiations per year dealing with a change in tariffs
RenegInvestment	number of renegotiations per year dealing with a new investment
RenegQuality	number of renegotiations per year dealing with a quality improvement
RenegFinanEq	number of renegotiations per year dealing with a change in the financial equilibrium
RenegDuration	number of renegotiations per year dealing with a change in the contract duration
RenegIndex	number of renegotiations per year dealing with a change in the indexation clause
Scope	number of dimensions renegotiated during the contract
OneDimension	dummy equal to 1 if the contract was renegotiated in one dimension
TwoDimensions	dummy equal to 1 if the contract was renegotiated in two dimensions
ThreeDimensions	dummy equal to 1 if the contract was renegotiated in three dimensions
FourDimensions	dummy equal to 1 if the contract was renegotiated in four dimensions
FiveDimensions	dummy equal to 1 if the contract was renegotiated in five dimensions
PastExperiences	number of other expired contracts the private operator and the public authority had together at the date of expiration
MultiContract	number of other contracts the private operator and the public authority currently have together at the date of expiration
SameArea	number of other public authorities in the same region with wich the operator has contracts at the date of expiration
ChangeOfMayor	dummy variable equal to 1 if there was a change of mayor during the last year before the end of the contract
Year	year of expiration of the contract
Size	number of inhabitants of the municipality at the date of expiration
Build	dummy variable equal to 1 if the construction of the infrastructure was included in the contract
Duration	duration of the contract
ContractExperience	difference between the date of signature of each contract i and the date of the first outsourcing of car park services by the municipality
PoliticalColor	political color of the mayor at the date of signature

Part II

Public-Private Arrangements Efficiency in an Incomplete Contract Framework

Chapter 3

Concession contracts: better satisfaction for users?*

3.1 Introduction

While public-private arrangements have been widely studied in the economic literature, the emphasis has been generally put on the relationship between the public authority and the private operator. This is legitimate since in practice, users do not have a say in the matter: indeed, except when voting for or against the public authority, they have no influence in selecting the private partner, and they are absent from the table of negotiations, and of renegotiations.[1] Yet, as beneficiaries of the public infrastructures and services provided, one should not forget that users are also involved in the PPP relationship, and

*This chapter is derived from an ongoing working paper. A simplified version written with Claudine Desrieux has been published in *Transports*, 2011 n°465. I am grateful to Claudine Desrieux, Eshien Chong, Patrick Schmitz, Eva Hoppe and Vincent Piron for their comments and suggestions. I also benefited from comments on an earlier version from participants to the 58th annual congress of the French Association for Economic Sciences (AFSE), September 10th-11th 2009, Paris, France, to the 36th annual conference of the European Association for Research in Industrial Economics (EARIE), September 3rd-5th 2009, Ljubljana, Slovenia, and to the 14th annual conference of the International Society of New Institutional Economics (ISNIE), June 17th-19th 2010, Stirling, Scotland.

[1]This is not the view defended by Spiller [2008], but at least in most European countries, users are not yet well organized into class actions , so that the impact of their voice is limited.

thus emerge as the "third" party of this relationship.

Nonetheless, among the different types of public private arrangements, all of them do not consider this third party the same way. Indeed, in concession contracts, one can expect that the private operator is implicitly forced to take users and quality into account since the revenue of the operator depends on fees paid by users, *i.e.* the operator bears the demand risk.

Alternatively, PFI contracts in the United Kingdom and *contrats de partenariat* in France are availability risk contracts, so that the demand risk is not transfered to the private operator (Commission [2004]). He is remunerated by a fixed payment by the public authority, provided that some basic verifiable criteria that are decided *ex ante* are fulfiled. This should intuitively provide less incentives to consider users' satisfaction. However a striking fact is that there is an increasing number of examples going the opposite way from the previously explained intuitions that suggest a link between the contractual arrangement and the incentives to take users and quality into account. In 2010 for instance, *ERDF*, an operator of electricity distribution that has concession contracts with French municipalities, and that has several local competitors[2] was blamed by the French energy regulation authority for important quality decreases due to power cuts (CRE [2010]). Another example is given by a survey made in 2005 based on 900 users of the A77 concession highway that shows that one third of users have an unfavorable or very unfavorable opinion about the quality of service on this highway.[3] Moreover, although operators do not bear the demand risk in availability contracts, this does not seem to inhibit their incentives to consider quality, as underlined by Office [2003] who highlights high quality performances in the management of prisons delivered under PFI contracts.

Let us note that while availability contracts initially had the goal to be used for projects for which payment by users is not possible, we observe an increasing

[2]Source: www.cre.fr/reseaux/reseaux-publics-d-electricite/description-generale

[3]www.appr.com/fr/amenagement-reseau/Bilan-LOTI-A77-LOTI-2-Synthèse.pdf?FileID=pdf%2FBilan-loti-a77-loti-2-synthèse.pdf

number of similar projects that are delivered under concession or availability contracts indifferently.

Therefore, when the type of activity considered allows to use both a concession or an availability contract, we wonder in this chapter whether not to entrust the private operator with the demand risk has a negative impact on the incentives to take care of the quality of service. Symetrically, we wonder whether entrusting the operator with the demand risk necessarily enables to reach a better quality of service and thus a higher consideration for users' satisfaction. Put differently, there is a need to understand whether public authorities should necessarily transfer the demand risk to the private operator, with the hope to provide the private operator with better incentives to take users satisfaction into account.

To reach this goal, we use an incomplete contract framework. The assumption of contractual incompleteness is often used to study contracts signed between public and private partners (Hart et al. [1997]; Hart [2003]; Bennett and Iossa [2006]; Hoppe and Schmitz [2010]), mainly because the quality of service often cannot be fully specified by public authorities, nor can they write verifiable objectives for all possible contingencies. Following Hart [2003], we propose a stylized setting in which there are two stages to a project: the building of an infrastructure and the management of the public service linked to the infrastructure.[4] The public authority delegates these two functions to a private firm, through a concession or through an availability contract, *i.e.* with or without making the operator bear the demand risk. During the building and the management stages, the private firm may undertake some efforts that have an impact on the quality of the infrastructure or service and on its costs.[5] For example, the private operator can find a way to train his maintenance teams more rapidly, which might have a negative effect on safety for users. Or he

[4] As in Hart [2003] and Bennett and Iossa [2006], we disregard entirely the source of finance for the project. See Engel et al. [2010] for a study on the basic finance in public-private partnerships, and Dupas et al. [2010] for the evolution of structured finance mechanisms after the 2008 crisis.

[5] As in Hart [2003], we assume such such efforts have an *ex post* unverifiable impact on quality. We justify this assumption in Section 3.2.3.

can make some efforts to improve his internal processes so as to provide better quality services. The outcomes of these efforts[6] are assumed to have an observable but unverifiable effect on quality. Then, in the light of users' satisfaction and quality issues, we determine the incentives the private party gets to make such unverifiable investments, under each type of contractual agreement: availability contracts and concession contracts.

We depart from Hart [2003] in three ways. First, we consider a good or service that can be excludable. In other words, the infrastructure may be refunded by users payment, as in concession contracts, or it may be refunded thanks to payments by the public authority (and *in fine* by taxpayers), as in availability contracts. Second, we introduce an aggregated social benefit function, so that the number of users determines the total social benefit generated by the public service. Third, in accordance with the literature that underlines unsatisfactory *ex post* changes, we introduce the possibility that the private operator makes *ex post* investments for which the adverse effect on quality for users is higher than the gains for the private operator.

Our results show that when quality is hardly contractible, availability contracts entail under-optimal incentives to improve quality, and over-incentives to make unsatisfactory *ex post* investments. Alternatively, in concession contracts, private operators have higher incentives to attract users through *ex post* investments that protect or improve quality, provided that users are sensitive to quality variations, and that the demand constraint does not bind, *i.e.* provided that all the potential users do not already use the infrastructure. In spite of these arguments, we show that concession contracts may not always be the most efficient contractual choice. Indeed, not only should public authorities pay attention to the incentives to improve quality, but they also have to take care of the level of the fees charged to users in concession contracts. Indeed, the fee we consider is the one that emerges from an *ex ante* perfect price competition between bidders. However, such a price (fee) may also be too high for

[6] In the incomplete contract theory, the outcome of an effort is indifferently called "investment" or "innovation".

a certain category of users who cannot afford it. As a consequence, in some cases, the concession solution may not be the one that maximizes surplus: availability contracts may be preferable when the negative impact of the fee on the quantity of users who cannot afford the service outsets the impact of the incentives to improve quality.

This chapter contributes to the literature on public-private arrangements. Many papers (Hart [2003]; Bennett and Iossa [2006]; Martimort and Pouyet [2008]; Hoppe et al. [2011]) have explored the question of bundling or unbundling, and they implicitly focus on the case when payment bu users is not possible: the public authority pays a fixed price to one or two private operator(s) to have a facility built and operated. They show that the main interest to bundle tasks is to exploit synergies between the different stages of a project, inducing more innovative and cost-effective designs (Treasury [2003]). In this chapter, bundling of construction and operation stages is taken for granted, and the originality is to analyze the effect of the demand risk transfer to the operator on the consideration for users.

Although concession contracts are frequently observed in energy, water, and transport sectors[7], they have not widely been studied by the economic literature. The most prolific strand of the literature that has analyzed public-private partnerships in general, put an emphasis on moral hazard issues in project financing and on firms' operations (Rosenau [2000]; Dewatripont and Legros [2005]; Guasch et al. [2006]; Engel et al. [2010]). Auriol and Picard [2011] compare the specific concession solution to the public solution, and they highlight a trade-off between the cost of public funds due to government's financial pressure, and allocative inefficiencies due to private information on costs and leading to excessive usage prices. In this chapter, we depart from this analytical framework in order to focus on the quality aspect. Indeed, the quality of public services and goods has strong consequences on the economic growth

[7]Source: World Bank, PPIAF, PPI Project Database and EPEC Market update 2010.

(Barro [1990]). However, quality requirements cannot be extensively described in the contracts because they are difficult to verify, which explains the fear of public authorities that private operators could sacrifice the quality of service, in the name of profitability. The goal of this chapter is to wonder whether concession contracts, compared to availability contracts, lead to different choices concerning the level of quality chosen by the private operator. The incomplete contract framework is particularly well adapted to study the trade-off between costs and quality.

Engel et al. [1997, 2009] propose another approach to analyze the relevancy of concession contracts. Indeed, the authors pose that demand forecasts are hard to make, and, more importantly, that the demand risk is beyond the firm's control, so that the operator cannot have any influence on the level of demand. Thus, they propose a way to circumvent the demand risk issue without disadvantaging neither the private operator nor the public authority. The solution they develop is the Least Present Value of Revenue auction, which implies a flexible term of the contract, up to the moment where user fee revenue equals the bid. Alternatively, in this chapter, we assume that the operator can make some efforts that boost or undermine the demand. This assumption may not suit the empirical field of developing countries that is studied by Engel et al. [1997], where users' willingness to pay is low, but it is in line with developed countries situation. The incomplete contract framework is the one that enables to modelize such uncontracted-for investments that can have an effect on the social benefit.

Athias [2009] also proposes to modelize concession contracts in an incomplete contract framework, but she rather focuses on the role of public authorities in the adaptation of contracts. In this chapter, we put the emphasis on the parameters concerning users' satisfaction, that should be taken into account to make an efficient contractual choice, and we highlight two dimensions: the incentives to improve quality on the one hand, and the willingness not to exclude users on the other hand.

The chapter is organized as follows: next section describes the two typical bundled contractual public-private arrangements, concessions and availability contracts, and describes the types of *ex post* investments the private operator may undertake. Section 3.3 describes the framework of the model, while section 3.4 is an exploratory theoretical part that derives and analyzes the incentives of private operators to implement investments that have an impact on quality, for each type of contractual arrangement. In section 3.5, we discuss the appropriateness to use availability contracts or concession contracts. Finally, section 3.6 concludes and provides some public policy recommendations.

3.2 Bundled public-private arrangements

Before studying theoretically the conditions under which private operators have incentives to take the quality of service into account in concession and availability contracts, this section aims at describing some legal characteristics of these public-private partnerships. This naturally leads to compare concessions with availability contracts such as PFIs in the U.K. and *contrats de partenariat* in France, that follow a different logic concerning the payment scheme of the private operator.

3.2.1 Concessions and availability contracts: some elements of description

Concession contracts and availability contracts belong to the generic family of public-private partnerships. This section provides a brief recall of these two main bundled types of public-private partnerships, *i.e.* for which both the construction and the management of the infrastructure are in the hand of one operator, in a single contract.

Under concession contracts, the main characteristic is that the private firm is

remunerated through the fees paid by users: the operator holds the right to the cash-flow of the users' receipts from the service. As a consequence, profits "depend on the utility's sales and costs, which typically gives the operator incentive to improve operating efficiency and increase sales" (Bank [2006]). Thus, under such types of agreements, commercial risk is transferred to the private partner, as his ability to derive a profit is linked with its ability to reduce operating costs and attract users, while still meeting designated service levels (Commission [2003]). The public party relinquishes its control on important phases of the life-cycle of the assets (Parliament [2006]), even if at the end of the contracts, the assets go back to the public authority. The advent of concession contracts started in the 17^{th} century in Europe, especially for road, canal and railways construction. During the execution of contracts, increases in the fee cannot be decided unilaterally by the private operator, so that the leverage of action for the private operator to increase his revenue is to search for some ways to decrease his costs or to attract more users.

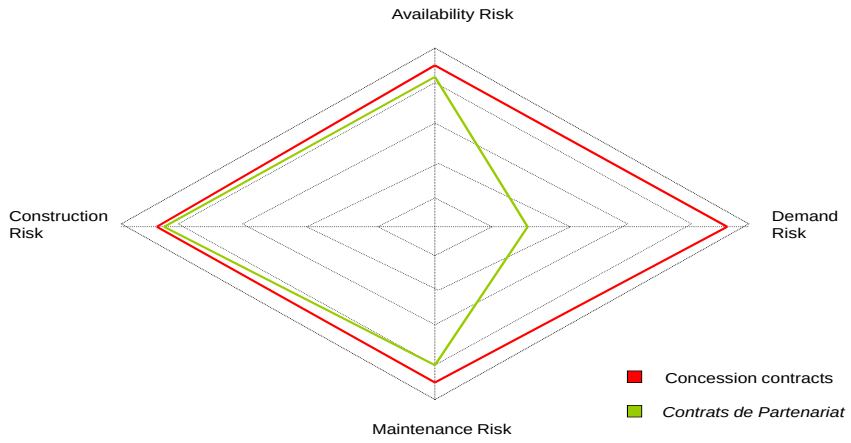
Following the Private Finance Initiative (PFI) initiated in 1992[8] in the U.K., many countries have adopted availability contracts that are a new type of contractual agreement allowing to contract out the design, finance, building, operation and maintenance of an infrastructure. As in concessions, all tasks are bundled and contracted-out to one private operator. But the difference with concession contracts is that the payment of the private operator is made through a fixed price paid by the public authority, and users have no fee to pay.[9] In concessions, the revenue of the operator depends on users' demand and their willingness to pay, whereas in availability contracts, the operator gets

[8]The PFI denomination dates back to 1992, but the contract for the construction and maintenance of the Elizabeth II Bridge in 1987 could be qualified as a PFI.

[9]Some mixed solutions where there is a payment by users in availability contracts exist. This payment may be collected by the private operator and transfered to the public authority (Article 1 of the Law n°2008-735, July 28th 2008 in France). Another solution consists in implementing a "shadow toll": users do not pay any fee, but the payment of the operator by the public authority depends on the frequenting of the infrastructure. We disregard these intermediary solution, but we are aware of their existence. This is why we proposed in the general introduction of this dissertation, to talk about a continuum of contracts. However, as the object of this chapter is to study the advisability of transfering the demand risk or not, we are compelled to do some simplifications, in order to distinguish clearly the two polar cases. Future works could consist in studying further contractual refinements.

his revenue, whatever the frequenting of the infrastructure and users do not pay for the use of the infrastructure (Tessier [2004]). In this way, the operator does not bear the demand risk, he is only exposed to the construction, availability and maintenance risks, as shown by Figure 3.1. The public authority specifies *ex ante* the required objectives, *i.e.* a basic service standard, and the payment of the fixed price depends on the satisfaction of the contractible objectives. Let us note that the firm has control rights over how to reach the objectives.

Figure 3.1: Representation of the risks transfered to the private operator in concession and in availability contracts



Source: Institut de la Gestion Déléguée, 2006

Let us note that the adoption of the availability contracts in France dates back to 2004, with the creation of "*contracts de partenariat*", following the Ordinance of June 17th 2004.

Marty and Voisin [2006] highlight that *contrats de partenariat* are not the real translation of the widespread UK PFIs. Indeed, *contrats de partenariat* can be signed only in case of special dispensation. This dispensation is approved if the public authority that wants to sign a *contrat de partenariat*, succeeds in

showing that her project is complex or urgent. Since the law of July 28th 2008, the dispensation is also given if the *contrat de partenariat* enables to reach a better economic efficiency. However, the argument emphasized to assess the better economic efficiency consists in showing that *contrats de partenariat* allow to avoid time delays compared to public procurement contracts. There is no tool to asses the economic efficiency of availability contracts in comparison to concession contracts.[10]

3.2.2 Concessions and availability contracts: some stylized facts

In many cases, concession contracts and availability contracts are used for distinct types of projects. Examples are provided in the U.S. by the building and management of Southern Indiana Toll Inter-state 69 and Trans-Texas road Corridor into 75-year and 50-year BOT concession contract (Office [2008]). In France, concessions contracts in force in 2010 represented an amount of 100 billions Euros of turnover.[11] Concession contracts are mostly used in transports (roads, tunnels, railway, airports, urban transports).
Availability contracts first appeared through PFIs in the United Kingdom. In 2011-2012, about 595 millions of pounds are expected to be spent through PFI in Education, about 420 for environment, food and rural affairs (Treasury [2011]). In the health sector, 64 PFI had been launched in June 2009 in the UK, representing a total amount of 16 billions of euros. In France, an increasing number of projects are supported by the recently created *contrat de partenariat*. Since they have been launched in 2004, 91 *contrats de partenariat*[12] have been signed both by the State and by local collectivities, mostly for projects such as urban lighting, renovation of public buildings with their

[10]Source:http://www.economie.gouv.fr/files/directions-services/ppp/fiche-urgence-complexite.pdf.
[11]Source: *Institut de la Gestion Déléguée*
[12]Source: *MAPPP*, the French availability contracts institute, June 2011.

energetic optimization[13] and the equipment and maintenance of information and communication technologies.

However, it appears that concession and availability contracts are not always used for such distinct types of projects, so that there is an increasing number of cases of very similar projects that can follow different contractual arrangements. Here are two examples.

For instance, an interview with Coux [2011][14], highlights that whereas the high speed railway line signed in 2011 to join Tours and Bordeaux is a concession, the highspeed railway line, with its forthcoming financial close, that will join Le Mans and Rennes, will be a *contrat de partenariat*. Coux underlines that "priority is given to *contrats de partenariats* when the receipts from users are not dynamic enough." Nonetheless, the four cities belong all to the first thirty urban areas in France. The population in Tours and Bordeaux is quite equivalent to Le Mans and Rennes.[15] And the length of the rail projects are of a similar scale: 302 kilometres for Tours-Bordeaux and 214 kilometres for Le Mans-Rennes.

Another French example is given by stadium projects: Le Mans stadium is a concession, whereas Nice stadium is a *contrat de partenariat*.[16] Yet, the population is twice as much important in Nice as in Le Mans, which should lead to more potential frequenting of Nice stadium, and thus to a lower risk of frequenting (demand risk). Both football teams played in the same first division when the contracts were signed. Both stadiums will be used as arenas for other cultural events. So, each of this project is unique, with some different features, however they belong to the same category of projects, with size of an

[13]For instance, a program for a total value of 5 billions of euros has been launched in 2008 to renovate universities.

[14]Pierre Denis Coux is the Head of high speed rail projects in RFF, that is the public owner and manager of the French railway network. RFF increasingly uses PPPs, in their various forms.

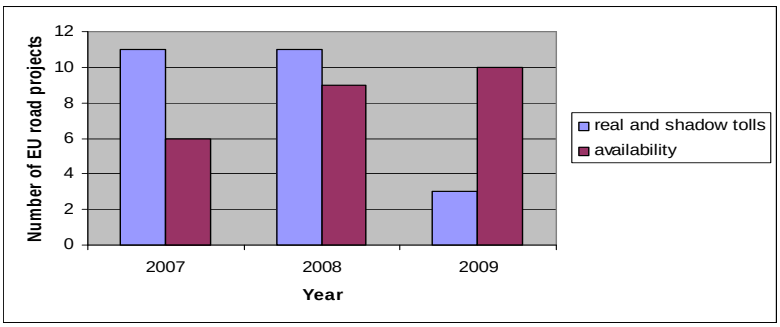
[15]The 2008 census report states that there are 135 000 inhabitants in Tours; 235 000 in Bordeaux; 143 000 in Le Mans; and 207 000 in Rennes.

[16]These two stadiums were signed with a two-year difference: MMArena in Le Mans was inaugurated in January 2011, and Nice stadium is under construction.

equivalent scale, in similar environments.

Kappeler and Nemoz [2010] collected some data about the 50 EU road projects (including bridges and tunnels) signed between 2007 and 2009. We observe in Figure 3.2 that there seems to be a trend towards less demand risk borne by private operators (since there are fewer contracts with real or shadow toll), and more availability contracts.

Figure 3.2: The evolution of private operators remuneration schemes in EU road contracts between 2007 and 2009



Source: European Investment Bank

As a consequence, we can wonder why different types of contractual arrangements can be used for similar projects, since at first sight, different contractual arrangements should lead to a different consideration for quality aspects. In this chapter, our focus is on how users' satisfaction is taken into account by private operators depending on the contractual arrangement.

3.2.3 The quality issue in public-private partnerships

Let us first recall how the incomplete contract framework allows to analyze the issue of quality. Then, we provide some examples. In the incomplete contract framework, there are three types of quality aspects:

First, there are some quality aspects that can be contracted-on *ex ante*, in the initial contract. This is due to the fact that a third party can verify these features.

Second, there are some other quality aspects that cannot be written *ex ante* (because they would not be verifiable), but the impact of *ex post* investments on such quality aspects becomes verifiable, so that it is frequent that parties renegotiate the contract to implement investments aiming at improving quality. Hart et al. [1997] and Bennett and Iossa [2006], as well as Chapter 4 focus on these investments that are noncontractible *ex ante* but verifiable *ex post*. Then renegotiations may occur to get the approval of the owner of the facility.

Finally, some other quality aspects cannot be written *ex ante* (because they would not be verifiable), and they are still not verifiable *ex post*. Hence, the private operator can decide alone to implement or not investments that have an unverifiable impact on quality. These latter are the most worrisome since the public authority cannot monitor their implementation through a renegotiation process. As in Hart [2003], our focus in this chapter is on these unverifiable investments that have an impact on cost and quality.[17] Depending on the incentive structure the operator has, he may be willing to leave aside the issue of quality, and users may suffer from this lack. Let us describe examples of such unverifiable investments. We observe that they do not have the same effect on quality and on the cost for the private operator.

- As in Hart [2003] [page C72], we can think of investments by the operator

[17] The unverifiability feature of *ex post* investments on quality is peculiar to the incomplete contract framework, and in particular to Hart [2003]. However, the Agency theory framework also uses the unverifiability assumption very often, notably as regards to the unverifiability of costs (Laffont [2005]; Estache and Wren-Lewis [2009]; Iossa and Martimort [2011]).

in the prison sector to install an electric fence that reduces the likelihood of escapes. This reduces the operating costs of the prison, since fewer guards have to be hired, but this may not have the expected safety effect. In the health sector as well as in the education sector, this may have terrible effects.

- Fortunately, seeking for lower costs does not necessarily have negative impacts on quality: for instance, in the firm *VINCI* whose project portfolio has increased for the past decade, some managers deplored how much time and money were spent due to low information circulation about internal processes and engineering. This resulted in inefficiencies. In 2010, they decided to solve this problem by writing a handbook called *APMO* with the guidelines and best practices in *VINCI* programme management and to update it through a web platform where the different employees could exchange their experience. In addition to decreasing the costs, which was permitted by the fact that there was no more need to start all over again for each new project, *APMO* enabled to increase the diffusion of work experience and the rapidity to deliver the projects. Thus, unverifiable investments may have the effect **to decrease cost as well as to increase quality**.

- There are also some efforts whose **first goal is to increase quality**. An innovation that appeared in 2010 in the car park sector related to unpleasant smells. *VINCI Park* created a diffuser of liquid and antisceptic smell destruction that automatically detects the presence of bad smells. This innovation improves quality **but it also increases costs**.

- Other efforts **aiming at increasing quality may also enable to reduce costs**, as it is the case with the innovation developed by the *Stade de France*, which is a company in charge of maintaining the French largest sport facility and of organizing events. Next to such major distribution networks as *FNAC* or *Ticketnet*, the events organized by *Stade de France* had a low visibility. *Stade de France*, which is run under a concession,

had to rethink its customer relationship. In this way, an online ticket booth was implemented, which enables users to buy their tickets directly, instead of using a major distribution network. Users can now also choose between printing their tickets at home, and the dematerialization solution (99% of tickets are not sent by Post anymore): machines in Stade de France can "read" the reservations directly from smartphones. Moreover, the online reservation platform is equiped with a Customer Relationship Management system, which allows the concessionaire to know better the users' needs. Thus, in addition to providing a better quality of service to users, the company *Stade de France* succeeded in saving 100 000 euros of postal sending and management expenses.[18]

These examples of uncontracted-for and unverifiable qualitative features show that quality is a major concern for long-term public-private contracts. In next sections, we investigate the incentives private operators have to improve quality or reduce their costs, depending on the contract that is signed. We highlight the conditions under which concessions are a better solution, and when availability risk contracts dominate. This enables to understand why projects that look similar may be delivered under different types of contractual agreements. We first start by describing the general framework of the model

3.3 The framework of the model

3.3.1 The basic assumptions

Our theoretical framework is based on Hart [2003]. Let us note G, a benevolent public authority (whom we refer to as "she"), in charge of delivering and

[18]Interview with the sales manager of the company *Stade de France*, Damien Rajot, March 23rd, 2011

managing a public infrastructure. We consider a setting where G delegates to a private firm the building and management of an infrastructure which is used to supply a public service. The facility construction and its operation are bundled. This implies that G contracts with a single private party[19] to build and run the facility. In this case, the private party can either be paid by G through a fixed price (availability contracts), or can directly collect fees from users (concession contracts). We assume that all parties are risk-neutral. As usual in the literature on bundling, there is no discounting. Moreover, we assume that the public authority is able to write contracts, specifying some aspects of the facility to be delivered or the basic service to be provided.
In addition, our assumption is that in each case the contract is incomplete in the sense that the operator can implement *ex post* investments that lead to modify the service, without violating the contract. The operator can make two types of investments which are not contracted upon and that have an impact on quality: e and i. They have consequences for the costs and benefits of running the facility.

- i is a non-verifiable investment that increases the quality of service for users, but it also impacts on costs to run the facility: i may increase or decrease the operation costs.

- e is the non-verifiable investment that enables to decrease the costs, but may also have the consequence to improve or undermine the quality of service.

Throughout the chapter, we speak of e and i interchangeably as "innovation" or "investments". As in Hart [2003], these investments are never verifiable, which does not allow for *ex post* renegotiations between the parties.

[19]When tasks are bundled, the private party is often a consortium of two firms or more, in PFI as well as in concession contracts. But what matters is that, although the operator may have several sub-entities, the private operator is the single interlocutor of the public authority.

Then, the total cost function for the building and operation stage is:

$$C = K^0 + C^0 - c(e) - \gamma.v(i) + e + i$$

where K^0 is the contractible cost of construction of the infrastructure, and C^0 is a positive constant representing the contractible cost to run the service.[20]
$\gamma = \{-1; +1\}$. When $\gamma = -1$, there is a negative impact of the quality enhancing innovation on costs: the investment i increases the social benefit (the quality) of the service, which entails greater operation costs. The example of *VINCI Park* liquid diffusor of smell destruction described in Section 3.2 corresponds to that case.
When $\gamma = 1$, the externality is positive: the quality enhancing investment i reduces operation costs. The innovation found by *Stade de France* to attract more users while saving 100,000 euros suits this situation.
We assume that $v(0) = 0$, $v'(i) > 0$, $v''(i) \leq 0$, if $\gamma = 1$; and $v(0) = 0$, $v'(0) = 0$, $v''(i) \geq 0$ if $\gamma = -1$.
As for e, it represents the non-contractible investment the operator may make and $c(e)$ is the operation cost reduction implied by this effort; $c'(e) > 0$, $c''(e) \leq 0$.

We assume here that the cost to operate the service does not depend on the numbers of users: for instance, whether an additional driver uses the highway or not does not change the cost to maintain the highway. In the same way, the operational cost of a stadium does not vary a lot whether an additional spectator is present or not.[21]

[20] In the literature that analyzes the question of bundling vs. unbundling, there are generally two cost functions (Hart [2003]; Bennett and Iossa [2006]): one for the construction, and one for the operation. Describing two functions enables to highlight the externalities between the two stages. For instance an effort during the construction stage may have effects during the operation stage. This leads to emphasize the interest of having the two stages in one single contract, as in PFI or concessions, by contrast with public procurement contracts. In this chapter, one single cost function is defined, since the externalities between stages is taken for granted. Moreover, it is not unrealistic to assume that the investments can be made during both stages and may have some effects rapidly.

[21] This does not mean that there is no threshold in the cost function as regards to the number of users: a highway used by thousands of drivers may be more expensive to maintain

We depart from Hart [2003] by introducing an aggregated social benefit function. The (unverifiable) social benefit of the service (expressed in money) is:

$$B = D \times [b_0 + \beta(i) + \phi b(e)]$$

where $D \geq 0$ is the demand (in quantity) for the service, b_0 is a postive constant, representing the (contractible) social benefit (as described in the initial contract) for each user of the service.

The quality increase due to investment i is represented by $\beta(i)$. We assume that $\beta'(i) > 0$, $\beta''(i) \leq 0$, which implies that an increase in quality of the facility increases the social benefits from the provision of the service.

The impact of investment e (*i.e.* the investment that reduces costs) on the quality is determined by the value of ϕ, since $\phi = \{-1; +1\}$. When $\phi = +1$, this means that the investment to reduce costs during the management stage also allows to increase the social benefits of the service. This is the example of the *APMO* internal process improvement. In this case, $b'(e) > 0$, $b''(e) \leq 0$. The investment is a "productive" investment that makes the service cheaper and easier to run or more attractive.

Alternatively, when $\phi = -1$, the cost reduction creates an adverse effect on the quality. In such a situation, we assume that $b'(e) > 0$, $b''(e) \geq 0$. Such a situation occurs for instance when the cheaper maintenance of a highway increases the risks of car crash.

Whatever the investments e and i, $b_0 + \beta(i) - b(e) > 0$: the service still procures a minimal social benefit to the citizens. However, we allow here for inefficient investments: the investment i creates some social benefits $\beta(i)$ but

than a highway used by few drivers. However, costs vary by levels and not for each additional user. In other words, the marginal cost to maintain a public service is zero. This is not the case of the social benefit function as described below: each new user enjoys some benefits by using the service.

also generates costs $v(i)$ if the cost externality is negative. This cost increase may be lower than the social benefits ($\beta(i) \geq v(i)$) or higher ($\beta(i) \leq v(i)$). In the same way, when the cost reduction innovation creates some adverse effects ($\phi = -1$), this adverse effect may be lower($b(e) \leq c(e)$) or higher ($b(e) \geq c(e)$) than the cost reduction.

3.3.2 The demand for the public service

We assume that the maximum potential demand for the service is $\bar{D}$, with $\bar{D} \geq 1$. Then, $\bar{D}$ represents the number of potential users of the facility.[22] However, whether the citizens decide to use or not the service depends on both the fee they have to pay and on the quality of the service. For instance, a well-constructed and maintained highway may attract more users than a bad-quality highway, or a high-quality stadium may attract more sport events and then more users than a bad-quality infrastructure.

We denote D^f the realized demand for a fee f the users have to pay to access the service. Then, $D^f = D_0(f) + D_i^f(i) - D_e^f(e)$, where:

- $D_0(f)$ is a positive function that represents the "basic" demand for a service that costs f and procures an individual benefit b_0. Then, $D_0(f)$ represents the quantity of users that are ready to pay f to get b_0. This function is decreasing in f ($D_0'(f) < 0$): the higher the fee is, the fewer citizens are ready to pay f to get a constant benefit b_0. The function $D_0(f)$ must be understood as the initial quantity of users who access the service or infrastructure. Then, the higher the price, the lower the required quantity.

- $D_i^f(.)$ a positive and concave function representing the additional demand

[22] When $\bar{D}$ is reached, it is not extensible.

(for a fee f) when quality is increased thanks to effort i.

- $D_e^f(.)$ is a positive and concave function representing the loss in demand (for a fee f) because of quality-shading innovation e, when the externality is negative, *i.e.* when $\phi = -1$.

In other words, the users make a cost/benefit analysis to decide whether they use the service or not. The individual cost for users is f (the fee required to use the service) and the individual benefit (as described in the contract) is b_0. Because of innovations e and i this individual benefit may vary from an amount $\beta(i) + \phi(b(e))$ when $\phi = -1$. Then, this change in benefit leads to a change in the cost/benefit analysis of each user, and influences their decision to use or not the service.

To make things simpler, we assume that $D_i^f(.)$ is a linear function, so that $D_i^f(i) = d^f \times \beta(i)$. In the same way, $D_e^f(.) = d^f \times \phi b(e)$. Then, $d^f \in (0, 1)$ represents the elasticity, or more precisely, the coefficient of sensitivity of the demand (for a fee f) to the quality of the service.[23] If $d^f = 0$, the demand does not depend on the variations in quality of the service. On the opposite, if $d^f = 1$, the demand is highly sensitive to the quality.[24]

Last, we assume that when users have no fee to pay, as it is the case under availability contracts, the demand is at its maximum, *i.e.* $D_0(0) = \bar{D}$. Each user makes a cost/benefit analysis to decide to use the service. Since the payment of the private operator is made through a fixed price that is paid through taxes by all citizens, whether they use the service or not, the cost to use the service is a sunk cost. Moreover, this service still brings a benefit (since we assume that $\forall(e, i),\ b_0 + \beta(i) - b(e) > 0$), then all citizens that have an

[23] There is no over-reaction so that $d^f \leq 1$.
[24] $d^{f\prime} = 0$ because it is a coefficient.

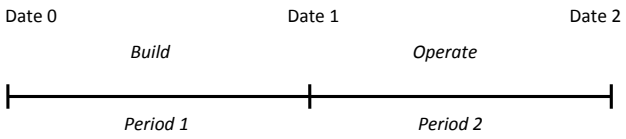
interest for the service use it. For instance, if a highway allows the drivers to reach a geographical location more rapidly than alternative roads, the drivers will use it if this highway is free. However, if they need to pay a toll, they will compare the benefit to drive more rapidly to the cost of the toll.

3.3.3 The timing of the game

The timing of the game is as follows:

- The public authority and the operator contract at date 0 and the facility is built between dates 0 and 1.
- The facility is operated between dates 1 and 2 (to provide the public service).

Figure 3.3: Timing of the game



- At **date 0**, the type of contractual agreement is chosen, and the public authority specifies the basic standards of the service to be provided. These basic standards are observable and verifiable. The parties also write in the contract the prices that will be applied during the whole contract lifespan: under availability contract, the price P that will be paid to the operator by the public authority, provided that the verifiable objectives are reached; under concession contracts, f that is the fee to apply to the users of the service. P and f are determined by the *ex ante* competition.

- In **period 1**, between date 0 and date 1, *i.e.* during the building stage, the operator can implement investments that will have an impact on the cost to run the facility and on its quality.
- In **period 2**, between date 1 and date 2, the facility is operated, and citizens may use it. During this period, the operator may also implement some unverifiable investments.

3.3.4 The first-best level of investments

Let us first determine the optimal levels of investment that maximize the total surplus of all the potential demand $\bar{D}$. The first-best incentives to invest are those maximising the benefits minus all the costs if the contract was complete, *i.e.* if the investments e and i were contractible:

$$max_{e,i}\bar{D}(b_0 + \beta(i) + \phi b(e)) - K^0 - C^0 + c(e) + \gamma v(i) - e - i$$

In first-best, we consider that the whole demand is satisfied.
Thus, the optimal levels of investments i^{FB} and e^{FB}, are the following:

$$\bar{D}\beta'(i^{FB}) + \gamma v'(i^{FB}) = 1 \tag{3.1}$$

$$c'(e^{FB}) + \bar{D}\phi b'(e^{FB}) = 1 \tag{3.2}$$

The first-best total surplus is :

$$S^{FB} = \bar{D} \times (b_0 + \beta(i^{FB}) + \phi b(e^{FB})) - C^0 - K^0 + c(e^{FB}) + \gamma v(i^{FB}) - e^{FB} - i^{FB}$$

3.4 Efficiency of contractual agreements concerning the incentives to consider quality

3.4.1 Availability contracts

As reminded previously, the building and the management of the facility are bundled. The contract that is signed at date 0 specifies the basic service to deliver between date 1 and date 2, at a price P. We assume that a perfect price competition allows to select the private operator and to determine this price. The operator chooses the investments levels e and i that maximize his payoffs. As the operator is not constrained by users' behaviour (he will be paid his fixed price as soon as the required contractible quality standards are verified, and whatever the frequenting of the infrastructure), he only takes into account the effects on costs in his uncontractible investment strategy. As a consequence, the operator maximizes the fixed price he receives minus his costs:

$$\max_{i,e} P - C^0 - K^0 + \gamma v(i) + c(e) - e - i$$

Therefore, the incentives under availability contracts are e^A and i^A such as:

$$c'(e^A) = 1 \tag{3.3}$$

$$\gamma v'(i^A) = 1 \tag{3.4}$$

Note that if there is a negative cost externality ($\gamma = -1$) of investment i, there is a corner solution, so that $i^A = 0$. By extension, inefficient innovations i that entail more costs than benefits are never implemented.
The private party only invests in i^A when it can reduce his operation cost ($\gamma = +1$). Moreover, the social impacts of innovations are never integrated, since the control rights are private and the innovations can be implemented without the approval of the public authority.

Thus, the operator does not take into account the adverse effect on quality when he invests to reduce the operation cost. As a consequence, he may implement inefficient innovations e that create more adverse effect ($\phi b(e)$ when $\phi = -1$) than cost reduction ($c(e)$) because he does not suffer from this adverse effect and only benefits from the cost reduction.

Result 1. *In availability contracts, the operator under-invests in quality improving efforts i^A since he does not internalize the positive social effect of his investment, but only the effect on costs. When $\gamma = -1$, $i^A = 0$. As regards investment e, the operator over-invests e^A when $\phi = -1$, since he does not internalize the adverse effect on quality. Finally, he under-invests in e^A when $\phi = +1$ since he does not inernalize the positive effect of his investment on quality. This can be summed up as follows:*

- $\forall \gamma = \{-1; 1\}$, $i^A < i^{FB}$
- *When* $\phi = -1$, $e^A > e^{FB}$
- *When* $\phi = +1$, $e^A < e^{FB}$

Furthermore, there is no access fee so that the initial demand is at its maximum, and $d^f = 0$, so $D^A = \bar{D}$. Thus, the payoff of the public authority is $UG = \bar{D}(b_0 + \beta(i^A) + \phi b(e^A)) - P(1 + z)$; where z is the marginal cost of public funds.
The surplus reached under availability contracts is:

$$S^A = \bar{D}(b_0 + \beta(i^A) + \phi b(e^A)) - C^0 - K^0 + c(e^A) + \gamma v(i^A) - e^A - i^A - zP$$

Our results are similar to Hart [2003], but we allow for a larger variety of investments. We find that the operator over-invests in unsatisfactory investment e^A under availability contracts when there is a negative externality on

quality, but he under-invests in e^A when the externality is positive. He also under-invests in innovations that enable to improve quality when $\gamma = 1$. When $\gamma = -1$, no investment i^A is implemented. Then, availability contracts should be avoided when the potential unverifiable investments are likely to lead to too many adverse effects on quality and when the marginal cost of public funds is high.

3.4.2 Concession contracts

Under concession contracts, the private operator still holds the residual control rights but he is paid through the fees he collects on users. We assume that the fee is the result of a perfect price competition, and that this fee does not evolve during the lifespan of contracts.[25] Making the infrastructure being refunded by users allows to save on the cost to raise public funds (Auriol and Picard [2011]). Before determining the levels of incentives the private operator has to invest in quality and in cost savings, let us first analyze his revenue function. In concession contracts, the global revenue of the private operator depends on the demand for the service, since each user pays the operator this fee f. During the execution of the contract, the total demand for the service is then:

$$D^f = D_0(f) + d^f\beta(i) + d^f\phi b(e) \text{ subject to } D^f \leq \bar{D}$$

The revenue of the operator becomes:

$$f \times [D_0(f) + d^f\beta(i) + d^f\phi b(e)]$$

Then, variations in quality lead to variations in the revenue of the operator. Let us detail these variations:

[25] This assumption of fixed fee is consistant with what is observed in the French transport sector: some "*contrats de plan*" are signed every 5 years between the State and the concessionaire to establish the evolution of the fee for the 5 coming years. This evolution takes inflation and other price indexes into account and aims at covering the eventual cost of the additional investments required by the State.

- $f \times d^f \times \beta(i)$ represents the additional revenue due to an increase in the number of users, thanks to a better quality ($\beta(i)$), with $d^f \geq 0$. The higher the quality increase of the service, the more numerous users are, and the higher the additional revenue is. We add another assumption: $0 \leq f \times d^f \times \beta(i) \leq \beta(i)$: remember that $\beta(i)$ is the quality increase of the service. The additional revenue $f \times d^f \times \beta(i)$ is the increase of revenue caused by the new users of the service, but it does not necessarily cover the whole quality increase ($\beta(i)$). For instance, a better smell and less bacteries in a cark park may not be valorized by all users, so that it does not always induce more using of the car park, hence the additional revenue may be lower than the social value of the quality increase.

- $f \times d^f \times \phi b(e)$ represents the amount of revenue that can be lost (gained) because of an investment e to reduce costs that has a negative (positive) impact on quality, and that induces less (more) using of the service. The higher the damage on quality, the higher the loss of revenue is. As in the previous case, we assume that the loss of revenue (it is the case when $\gamma = -1$) can be as high, but not higher than the total damage, $0 \leq f \times d^f \times \phi b(e) \leq b(e)$. A loss of revenue that is inferior to the quality damage means that all users have not valued the loss of quality identically, so that the revenue loss does not reflect the whole quality damage.

Let us now analyze the incentives of the operator to consider the impact of quality. The operator implements investments so as to maximize his payoff function, which contrary to availability contracts, includes the social effect of the uncontracted-for investments since they can have an impact on his revenue, until the demand reaches its maximum level $\bar{D}$. As a consequence, the levels

of incentives to innovate maximize:

$$\max_{i,e} \quad f \times [D_0(f) + d^f \times \beta(i) + d^f \times \phi b(e)] - K^0 - C^0 + c(e) + \gamma v(i) - i - e$$
$$s.t.\ D_0(f) + d^f \times \beta(i) + d^f \times \phi b(e) \leq \bar{D}$$

The lagrangian function of this maximization program is:

$$L = \quad f \times [D_0(f) + d^f \times \beta(i) + d^f \times \phi b(e)] - K^0 - C^0 + c(e) + \gamma v(i) - i - e$$
$$+\lambda(\bar{D} - D_0(f) - d^f \times \beta(i) - d^f \times \phi b(e)])$$

where $\lambda \geq 0$ is the lagrangien multiplier.
The levels of investments i^C and e^C under concession contract are implicitly given by:

$$d^f \times \beta'(i^C)(f - \lambda) + \gamma v'(i^C) = 1 \tag{3.5}$$
$$c'(e^C) + d^f \times \phi b'(e^C)(f - \lambda) = 1 \tag{3.6}$$

Then, the incentives of the private operator to invest depend on f, d^f and λ:

- d^f represents the coefficient of sensitivity of users to the quality of the service for a fee f.
- f represents the amount of the fee charged per user on the total revenue of the operator. Let us remind that the operator cannot decide fees variations alone.
- λ is the lagrangian multiplier that can be interpreted as the influence of the demand constraint on the incentives to invest. If the constraint does not bind ($\bar{D} - D^f > 0$), then $\lambda = 0$: any variation in quality leads to a variation in the number of users, and then in the revenue of the operator. Then, the operator internalizes the consequences of the innovations on quality up to the impact on his own revenue, *i.e.* up to

$f \times d^f$: the marginal revenue that can be gained (lost) thanks to an increase (decrease) in quality.

If the constraint binds ($\bar{D} - D^f = 0$), the demand is at its maximum level and $\lambda > 0$. In this situation, the operator has fewer incentives to increase quality through innovation i (except if $\gamma = +1$) because the demand is already at its maximum level, so no additional user can be attracted by an increase in quality.[26] However, the operator cares about the adverse effect caused by cost reduction (*i.e.* if $\gamma = -1$) when the constraint binds, since any decrease in quality entails a decrease in the number of users. In other words, the demand will no longer be at the maximum level if the innovation due to effort e^C creates a damage on quality.

In a way, d^f and λ are two dimensions of the degree of captivity of users.

Result 2. *Contrary to availability contracts, in concession contracts, the private operator has incentives to take quality into account when the demand constraint does not bind and when users are sensitive to quality variations.*

Moreover, thanks to the implicit function theorem and equations (3.5) and (3.6), we observe that the incentives i^C and e^C are increasing in the level of the fee:

$$\frac{d(i^C)}{df} = \frac{-[d^f]}{d^f \beta''(i^C)(f-\lambda) + \gamma v''(i^C)} \geq 0 \tag{3.7}$$

$$\frac{d(e^C)}{df} = \frac{-[d^f]}{c''(e^C) + d^f \phi b''(e^C)(f-\lambda)} \geq 0 \tag{3.8}$$

[26] We consider that f is big enough so that for all λ, $f - \lambda \geq 0$. If $(f - \lambda) < 0$, this would imply that the operator has negative incentives to increase quality, and would try to decrease it (even if it generates no monetary profit through cost reduction). Then, $(f - \lambda) < 0$ is a theoretical result, but has no convincing interpretation in our case, so that we rule out this possibility.

Then, for any $f > 0$, the surplus under concession contract becomes:

$$S_f^C = D^f \times (b_0 + \beta(i^C) + \phi b(e^C)) - C^0 - K^0 + c(e^C) + \gamma v(i^C) - e^C - i^C$$
$$S_f^C = [D_0(f) + d^f \beta(i^C) + d^f \phi b(e^C)] \times (b_0 + \beta(i^C) + \phi b(e^C)) - C^0 - K^0 + c(e^C) + \gamma v(i^C) - e^C - i^C$$

3.4.3 Comparison of the incentives under each type of contractual arrangement

In order to rank the contractual arrangements in the light of the incentives given to the operator to take care of quality, we remind in the following table the incentives that are reached:

Table 3.1: Levels of incentives to make investments e and i

	First Best	**Availability Contract**	**Concession**
Invt. i	$\bar{D}\beta'(i^{FB}) + \gamma v'(i^{FB}) = 1$	$\gamma v'(i^A) = 1$ if $\gamma = 1$ & $i^A = 0$ if $\gamma = -1$	$d^f \times \beta'(i^C)(f-\lambda) + \gamma v'(i^C) = 1$
Invt. e	$c'(e^{FB}) + \bar{D}\phi b'(e^{FB}) = 1$	$c'(e^A) = 1$	$c'(e^C) + d^f \times \phi b'(e^C)(f-\lambda) = 1$

From the first-order conditions and forms of the functions[27], we can establish the following ranking for the investments e and i, to compare first-best levels to availability contract levels and availability contract levels to concession levels:

- When $\gamma = +1$, $i^A < i^{FB}$ and $i^A < i^C$
- When $\gamma = -1$, $i^A < i^{FB}$ and $i^A < i^C$
- When $\phi = +1$, $e^A < e^{FB}$ and $e^A < e^C$

[27] As precised in Section 3.3.1., the concavity and convexity of functions v and b vary with the sign γ and ϕ. Notably, b is concave when $\phi = 1$ and b is convex when $\phi = -1$. v is concave when $\gamma = 1$ and v is convex when $\gamma = -1$.

- When $\phi = -1$, $e^A > e^{FB}$ and $e^A > e^C$

Let us show that the incentives under concession contracts are under-optimal.
Concerning effort i, we remind from Section 3.4.2. that:

$$\begin{gathered} f \times d^f \beta(i) \leq \beta(i) \Rightarrow \text{f} \times d^f \leq 1, \text{ and } \beta'(i) \geq 0 \\ \Rightarrow \text{f} \times d^f \beta'(i) \leq \beta'(i) \\ \Rightarrow (\text{f - } \lambda) \times d^f \beta'(i) \leq \beta'(i) \text{ for all } \lambda \geq 0 \\ \Rightarrow (\text{f - } \lambda) \times d^f \beta'(i) \leq \bar{D}\beta'(i), \text{ since } \bar{D} \geq 1 \end{gathered}$$

This leads to conclude that: $\forall \gamma = \{-1; +1\}$, $i^C < i^{FB}$.

Concerning investment e, the ranking depends on the type of externality. First, when $\phi = 1$

$$\begin{gathered} f \times d^f \phi b(e) \leq \phi b(e) \Rightarrow \text{f} \times d^f \leq 1 \text{ and } \phi b'(e) > 0 \\ \Rightarrow \text{f} \times d^f \phi b'(e) \leq \phi b'(e) \\ \Rightarrow (\text{f - } \lambda) \times d^f \phi b'(e)) \leq \phi b'(e) \text{ for all } \lambda \geq 0 \\ \Rightarrow (\text{f - } \lambda) \times d^f \phi b'(e)) \leq \bar{D}\phi b'(e)) \end{gathered}$$

This indicates that when $\phi = +1$, $e^C < e^{FB}$.

Second, when $\phi = -1$

$$\begin{gathered} f \times d^f b(e) \leq b(e) \Rightarrow \text{f} \times d^f \leq 1 \text{ and } b'(e) > 0 \\ \Rightarrow \text{f} \times d^f b'(e) \leq b'(e) \\ \Rightarrow (\text{f - } \lambda) \times d^f b'(e)) \leq b'(e) \text{ for all } \lambda \geq 0 \end{gathered}$$

$$\Rightarrow(\text{f - } \lambda) \times d^f b'(e)) \leq \bar{D}b'(e))$$
$$\Rightarrow \text{ c'(e) - (f -}\lambda) \times d^f b'(e)) \geq c'(e) - \bar{D}b'(e))$$

This indicates that when $\phi = -1$, $e^C \geq e^{FB}$.

Proposition 1. *Both the concession and the availability contract arrangements lead to sub-optimal levels of incentives to increase quality. However, the concession arrangement entails better incentives than availability contracts, since the private operator internalizes the effect of his investments on users' reaction. This leads to the following ranking of the efforts levels:*

- *When* $\gamma = +1$, $i^A < i^C < i^{FB}$
- *When* $\gamma = -1$, $i^A < i^C < i^{FB}$
- *When* $\phi = +1$, $e^A < e^C < e^{FB}$
- *When* $\phi = -1$, $e^A > e^C > e^{FB}$

In this section, we have determined the incentives of the private operator to make investments that have an impact on quality, under each type of agreement. At this stage, the intuition according to which concession contracts lead to better incentives than availability contracts is verified. So we now have to understand whether the choice of public authorities should only rely on this incentives issue.

3.5 Concession or Availability contract: what choice?

Let us now analyze wonder which contractual arrangement leads to a higher global efficiency. As developed previously, the surplus depends on the level of

incentives of the operator to consider quality, as well as on the fees that are paid by users. In this section, we discuss the issue of the fee, and we compare the surplus reached under each type of contractual arrangement.

3.5.1 What is the matter with the fee?

In concession contracts, the fee is determined by *ex ante* competition.[28] The competition fee is such that:

$$UM^C = f \times (D_0(f) + d^f\beta(i) + d^f\phi b(e)) - C^0 - K^0 + c(e) + \gamma v(i) - e^C - i^C = 0$$

In the end the concession surplus is impacted by the level of the fee in a double way:

- The higher the fee, the more vigilant the private operator is in his innovation strategy (as shown by equations 3.7 and 3.8), since these innovations may have a high incidence on the frequenting and on the revenue of the private operator, if users are sensitive to quality variations.
- However, a high fee also means that the initial demand $D_0(f)$ is low since users need to pay a high price to access the service: $D_0'(f) \leq 0$. This might not be socially well accepted (Kessides et al. [2009]).

There is not such a double impact of the fee in availability contracts, for which there are no fees to be paid by users. Thus the demand is at its maximum $\bar{D}$, and the incentive strategy of the operator only results from perspectives

[28] Let us note that this competition fee is not necessarily the one that maximizes surplus of the concession contract. The fee that would maximize the concession surplus is given by:

$$max_f S^C \Leftrightarrow$$

$$\max_f[(D_0(f)+d^f\beta(i^C)+d^f\phi b(e^C))\times(b_0+\beta(i^C)+\phi b(e^C))-C^0-K^0+c(e^C)+\gamma v(i^C)-e^C-i^C]$$

to decrease operation costs. His revenue does not depend on any additional demand.
Then, public authorities have to compare the levels of surplus in the two contractual arrangements.

3.5.2 Comparison of the surplus

Even if the fee that is reached thanks to competition differs from the fee that maximizes the concession surplus, the concession solution can remain the prefered contractual arrangement, if it leads to a higher surplus than the availability contract solution. However, the concession surplus is not necessarily higher than the availability contract surplus, since the level of the fee may have a strong negative impact on the level of the initial demand.

As a consequence, the concession surplus is higher than the availability contract surplus if and only if:

$$D^f \times (b_0 + \beta(i^C) + \phi b(e^C)) - C^0 - K^0 + c(e^C) + \gamma v(i^C) - e^C - i^C > \bar{D}(b_0 + \beta(i^A) + \phi b(e^A)) - C^0 - K^0 + c(e^A) + \gamma v(i^A) - e^A - i^A - zP$$

$$\Leftrightarrow c(e^C) - c(e^A) + \gamma v(i^C) - \gamma v(i^A) - e^C - i^C + e^A + i^A > \quad (3.9)$$

$$\bar{D}(b_0 + \beta(i^A) + \phi b(e^A)) - D^f \times (b_0 + \beta(i^C) + \phi b(e^C)) - zP \quad (3.10)$$

The term (3.9) of the previous inequation represents the positive impact of the fee on the incentives to make *ex post* investments, while the term (3.10) is the negative impact of the fee on the quantity of initial demand, *i.e.* on the level of exclusion of users. Taken as a whole, this inequation represents the difference in terms of social welfare that emerges from the two contractual schemes. There is a quality *vs.* quantity trade-off that can be summed-up as follows: From Proposition 1, we know that $\forall \gamma \in \{-1; +1\}$, a better quality is

always reached under concession contracts. Concerning quantity, it depends on the difference between $\bar{D}$ and D^f:

$$\bar{D} \geq D^f$$
$$\bar{D} \geq D_0(f) + d^f \beta(i) + d^f \phi b(e)$$

The higher the difference between $\bar{D}$ and D^f (which depends on the initial demand $D_0(f)$ and on the sensitivity of users to quality variations d^f), the less preferable concessions are. The higher d^f, *i.e.* the more sensitive users are to the variations of quality, the closer $D^f to \bar{D}$. Moreover, the lower $D_0(f)$ the higher the difference in terms of quantity of demand between concession and availability contracts. Thus public authorities have to pay particular attention to $D_0(f)$ to determine their contractual choice:

- If $D_0(f)$ is not very sensitive to the level of the fee, then it is likely that the concession arrangement leads to a higher surplus than the availability contract arrangement and thus, this is preferable.
- If $D_0(f)$ is very sensitive to the level of the fee, then it is likely that the availability contract arrangement is preferable, since it may lead to a higher surplus. In this case, the incentive effect of concession contracts does not outweigh the impact on the initial demand.

The sensitivity of the initial demand $D_0(f)$ to the level of the fee may be different from one country or region to another due to cultural or economic reasons (poverty of the population, political acceptability of the fee). One cannot conclude that the concession arrangement is intrinsically a better solution than the availability contract arrangement, since there is a trade-off between affordability for users, leading to a certain quantity of demand, and incentives to improve or protect quality: the choice must depend on the local conditions. Indeed, the populations can be more or less sensitive to the level of the fees depending on the wealth of the regions. As an example, there are some coun-

tries such as Germany for instance, where it is not culturally imaginable that car drivers pay a fee for the use of a highway.[29]

Proposition 2. *The relative efficiency of availability contracts and concession contracts is linked to the level of the fee which has two impacts: one impact on the incentives to invest ex post in a way that satisfies users and one impact on the affordability of the infrastructure or service, which may dissatisfy excluded users.*

These two impacts may vary from one region to another and none of the contractual choices is intrinsically a better choice than the other one. Concession contracts should only be prefered when users are sensitive to the level of quality and have a high willingness to pay. The efficiency of concessions and availability contracts is related to the context where they are implemented.

3.6 Conclusion

There is sometimes the possibility that both a concession or an availability contract may be used for a project. These two contractual arrangements mainly differ on the way the private operator is remunerated. In this chapter, we wondered whether one of them was to be prefered. Through an incomplete contract model, we highlighted two determinants for that choice. On the one hand, we highlight the determinant in terms of incentives to make unverifiable investments to improve quality. On this point, concession contracts provide better incentives. On the other hand, public authorities should implement the contractual arrangement that leads to the highest surplus. Thus surplus not only depends on incentives, but also depends on the level of the fees that the operator charges to users. In the end, it is likely that availability contracts lead to higher surplus than concessions, when the negative effect of the fee on the

[29]In Germany, the highway concessions are called A-modells, and the private operator can only charge trucks. Payment by car drivers is neither culturally nor politically accepted.

affordability for users outweighs the beneficial effect of the higher incentives to consider quality issues.
In a nutshell, we show that there is no univocal contractual agremeent and that the decision should depend on :

- whether users are forced to use the service when they have no alternative options, *i.e.* if they are captive.
- the sensitivity of users to quality variations. Indeed, the role of users under concession allows to discipline the operator (to influence his incentives to invest) if the demand is elastic to the quality of the service.
- the sensitivity of the demand to the level of the fees. This mainly depends on some local, economic and social aspects.
- how contractible quality is (Amaral et al. [2008]). Indeed, in some sectors, quality can be very well defined, and potential innovations will not have intense adverse effects on quality, whereas in some other sectors, quality is hard to contract on, and there are a lot of potential efforts to make that can have an impact, be it positive or negative, on quality.

In this chapter, we also pointed out the issue of the marginal cost of public funds, without discussing it enough. Yet, the marginal cost of public funds may be high in some countries, and in particular in developing countries, and it can represent an argument against the development of availability contracts. Nonetheless, the point we wanted to focus on is the way users satisfaction (through the channel of quality and the channel of prices) could be considered in the choice for a contractual arrangement. One of the contributions of this chapter is the modelization of the concession solution, but it is also one of the weaknesses. Indeed, we assume that the social benefit only comes from users. Thus, we did not consider the case when an investment aims at satisfying citizens as a whole, and not specifically users. One could think about sustainable

development innovations. In this case, such innovations may not attract new users, but increase social benefit. In order to give incentives to operators to implement them, they will have to make *ex post* verifiable investments, so that parties can renegotiate and share the costs and benefits associated to them. Future research will be devoted to that point. Future works will also consist in studying intermediate contractual forms, between the two polar cases of concessions and availability contracts with their strict allocation of the demand risk.

One public policy implication derived from this chapter concerns the implementation of availability contracts in France. As precised in Section 3.2.1., *contrats de partenariat* (the French availability contracts) can only be implemented if complexity, emergency or better efficiency is assessed. Nonetheless, the methodology to assess the better efficiency focuses on a comparison between availability contracts and public procurement contracts, as regards to the delays issue. In addition, we propose to compare the efficiency of availability contracts with the efficiency of concession contracts. Then some efficiency criteria should be added in order to evaluate the potential for *ex post* unverifiable investments and the problem of affordability for users.

Chapter 4

To Allot or not to Allot Public Services in Europe? An Incomplete Contract Approach*

4.1 Introduction

Public procurement accounts for a substantial share of total government expenditure. The World Bank estimates that this spending represents between 12 and 20% of the GDP in developed countries, and may be even higher in developing countries.[1] In the European Union, in 2007, they are estimated at 16.6% of EU GDP.[2] The efficiency and quality of procurement processes are central for how much citizens will benefit from government spending. In this context, legal reforms in Europe have developped over the last decade to increase the quality of public procurement and to reduce its cost for the public authorities. One of these significant reforms is the introduction of allotment in

*This chapter is derived from an ongoing working paper with Claudine Desrieux. We are indebted to Eshien Chong, Eva Hoppe, Stéphane saussier and Patrick Schmitz, as well as to participants to the 28th annual conference of the Journées de Microéconomie Appliquée (JMA), June 2nd-3rd 2011, Sousse, Tunisia, and to the 15th annual conference of the International Society of New Institutional Economics (ISNIE), June 16th-18th 2011, Palo Alto, U.S.A., for their comments and advice.

[1]Source: World Bank
http://web.worldbank.org/wbsite/external/countries/menaext/extmnaregtopgovernance

[2]http://europa.eu/policies-activities/tenders-contracts/index-fr.htm

the awarding procedures for public procurement (Directive 2004/18/EC of the European Parliament and of the Council, Point 9 of the Preamble). In this chapter, we aim to evaluate the consequences of this reform both on prices and on the quality of the services delivered under public procurement: Does allotment lead to lower prices? What incentives do private operators get to increase the quality when managing only a small share of a public service? What is the net impact of allotment for the users of the service?

Allotment can be defined as the horizontal segmentation of public works and services into different lots that can be awarded to different private operators. The Directive 2004/18/EC states that "in view of the diversity of public works contracts, contracting authorities should be able to make provision for contracts for the design and execution of work to be awarded either separately or jointly".[3]

Allotment is now widely observed in Europe: One of the first experiences dates back to the 1985 *Transport Act* allowing to divide the London bus network into several routes. Since then, bidders can submit bids on any number of routes and route packages. Other illustrations can be found in the French Official Journal dedicated to public procurement (*Bulletin d'annonces des marchés publics*): for instance, a recent call for tenders deals with some works to perform in September 2011 in the *Musée d'Orsay* in Paris, mentionning that those works are divided into four lots.[4]

The introduction of allotment in awarding procedures for public procurement aims to foster competition. Dividing proposed acquisitions of public works and services into reasonably small lots aims to permit offers on lower quantities than the total requirement, and then to increase the competitive pressure during the tender. Indeed, proposing lots makes the participation of small and medium enterprises easier. They would not have enough financial and opera-

[3]The transcription of this directive in the European national legislations has been progressively made (through the legislative decree n° 163 of April 2006 in Italy, the 2006 new Public Procurement Act (BVergG 2006) in Austria, the German Ordinance on the Award of Public Contracts (*Vergabeverordnung - VgV*) revised in 2009, the Law 30/2007 in Spain, and the Article 10 of the new French *Code des Marchés publics* in 2006).

[4]www.e-marchespublics.com/annoncemarchepublic125112153.html

tional capacities to bid and operate the whole market otherwise. For instance, in 2006, 17 operators were awarded one or several routes of the London bus service (Amaral et al. [2011]).

The impact of the number of bidders during a competitive tendering on the final price paid by the public authorities has already been widely documented in the economic literature.[5] However, few has been done to assess the impact of allotment both on prices and quality. This is all the more difficult as the quality of public goods and services is often regarded as "non-contractible": public authorities can hardly describe in details all aspects of the services they want, which explains the fear that quality could be sacrified in the name of profitability.

This is worrying since the quality of public goods and services has strong consequences on the economic growth (Barro [1990]), which explains the concern of public authorities to provide private operators with sufficient incentives to care for quality. For a growing number of public services, the quality is not only a matter of standard requirements to meet, but depends on the non-contractible efforts made by the operator during the execution of the contract, such as his ability to come up with innovative approaches of the service (Daniels and Trebilcock [2000]; IPPR [2001]). This need to innovate for quality often justifies the involvement of private operators in the management of public services.[6] This attention paid to innovations in public services aims to create a good business environment, as underlined in the report "Creating an Innovative Europe" (the Aho Report, Commission [2005]). This report called upon governments to "use public procurement to drive demand for innovative goods, while at the same time improving the level of public services" (Commission [2005], p.6).

[5]This *competition effect* expected thanks to a higher number of candidates during the competitive tendering has been analyzed in Gomez-Lobo and Szymanski [2001] or in Brannman et al. [1987]. Other papers show that a large number of candidates could also increase the price, because of the *winner's curse effect* (Milgrom [1989]; Hong and Shum [2002]), or because of *ex post* opportunistic renegotiations (Guasch [2004]). We will discuss these effects in section 5.

[6]Treasury [2003] states "[t]he public sector defines the service to be delivered, but it is for the private sector partner to decide how to deliver it, drawing on its own innovation and experience. This provides the private sector with an incentive to develop innovative ways to meet requirements (...)" (Bennett and Iossa [2006], footnote 1.)

This concern has also been mentionned in the 2007 *Guide on dealing with innovative solutions in public procurement* (Commission [2007]). Then, there is a need to understand how the introduction of allotment in awarding procedures impacts both on prices and on the ability to increase quality through innovations.

To address these issues, we propose a model in an incomplete contract framework (Grossman and Hart [1986]; Hart and Moore [1990]; Hart [1995]). The assumption of contractual incompleteness is often used to study contracts signed between public and private partners (Hart et al. [1997]; Hart [2003]; Bennett and Iossa [2006]; Hoppe and Schmitz [2010]), mainly because it allows to account for non-contractible quality: public authorities are assumed to be unable to fully specify the quality, or to write verifiable objectives for all possible contingencies. More precisely, we follow here the basic idea of Hart et al. [1997] and assume that, during the execution of the contract, the operator may make some *ex ante* non-contractible efforts to find innovations which improve the quality of the service or reduce its costs. Such efforts are non-contractible *ex ante* but verifiable *ex post*: whilst it is not possible to contract *ex ante* on the delivery of an innovation, once a potential innovation has been discovered, its implementation is verifiable.[7] Then, we extend the framework of Hart et al. [1997] in two directions:

First, we propose a model dealing with public procurement contracts. Public procurement are neither public provision nor privatization (described in Hart et al. [1997]) but "hybrid" structures: a private operator is chosen to provide a public good or service for a contractually-defined period. In our model, we rather focus on the procurement of public services. This describes a situation where a public authority owns a public infrastructure or public assets but contracts out their management to a private operator that is paid by a fixed price. We assume that, due to contractual incompleteness, ownership rights result in control rights: the public authority (as the owner of the facility during the contract period) has the power to decide (and veto) whether any verifiable

[7]This assumption can also be found in Hart et al. [1997] and Bennett and Iossa [2006].

innovative activity can be implemented.

Second, we consider a public service that can be divided into several parts, so that the public authority can contract with several operators at the same time. Each of these operators manages a part of the service. This allows us to assess the consequence of allotment (when the service is divided into lots) on both prices and incentives to innovate.

When the quality of public services mainly depends on the non-contractible efforts of the private operator, our results show that allotment does not provide the optimal incentives to make these efforts, and choosing not to allot services is more socially efficient. However, under some conditions, allotment allows to increase the payoff of the public authority (by reducing the price it pays). Then, public authorities may be willing to promote allotment in public procurement procedures, even if it is not an optimal decision, but simply because it allows them to get a bigger share of the surplus. There is then a contradiction between the decision that maximizes the total surplus (*i.e.* the joint payoffs of the public authority and the private operator(s)) and the decision that maximizes only the payoff of the public authority (which is to allot public services). In a context where public authorities have strong financial constraints, this may explain why they use allotment in public procurement. Concerning the reasoning, this chapter is similar to Mougeot and Naegelen [2005]'s, who find a conflict between the award procedure of public procurement contracts that maximizes total surplus, and the one that is optimal for a shareholder's majority.

This chapter can be related to the recent literature on allotment even if it has been little investigated. Amaral et al. [2011] propose an empirical study about the impact of allotment on the prices but do not take into account quality considerations. Morand [2002] deals with allotment, but aims to compare the consequences of both allotment and subcontracting on small and medium-sized entreprises. Focusing on the French railway sector, Lévque [2007] empirically analyzes the potential benefits and drawbacks of allotment, taking into account the consequences on competition and economies of scale. However, he leaves

aside the consequences of allotment on uncontractible quality, which is a core dimension of the performance of a public service. In contrast, this chapter focuses on the consequences of allotment on both the price paid by the public authority and the non-contractible quality. Moreover, we wonder which party (the public or the private one) benefits the most from allotment. Last, our theoretical results can also be related to the empirical work of Cambini and Filippini [2003]. They analyze the optimal size of services to contract out: using data from the italian bus transportation sector, they show that the best strategy to introduce competition in this industry is a competitive tendering approach for an area of given dimension and not necessarily a route-by-route tendering. However, it seems that the criterion applied by local authorities in Italy is much more related to political issues than to a desire to promote the exploitation of economies of scale and density.

Even if the question of allotment has been little explored, a large part of the economic literature has dealt with contracts between public and private sectors over the last years. Using an incomplete contract framework, some papers (Hart [2003], Bennett and Iossa [2006] and Hoppe and Schmitz [2010]) investigate the question of bundling *vs.* unbundling between the building and operation stages. Thus, they focus on the vertical division of public services, while we focus on the horizontal segmentation. More precisely, these papers mainly compare public procurement to *Private Finance Initiative* (PFI) to wonder which of these two contractual agreements is preferable. We do not explore this question, and take the choice of public procurement for granted. What draws our attention is to know whether the public services under public procurement should be alloted or not. Last, let us also mention that a large part of the literature on public procurement relies on asymmetric information (Laffont and Tirole [1991, 1993]). We rather contribute to the growing literature using the incomplete contracting approach (and assuming symmetric information between the parties) to stress the impact of public procurement on uncontracted-for efforts (such as efforts to innovate). Such a view can be justified to account for the concern of public authorities to find innovative so-

lutions in the delivery of public services, and also because many problems of public procurement are problems of *ex post* adaptations to unforeseen contingencies rather than *ex ante* screening (Bajari and Tadelis [2001]).
The chapter is organized as follows: Section 4.2 describes the institutional framework about public procurement in Europe, and provides some illustrations. Section 4.3 presents the general framework of the model. In section 4.4, we analyze whether allotment is optimal or not under public procurement. In section 4.5, we investigate the allocation of the surplus between the operator(s) and the public authority under perfect and imperfect price competition. We show the conditions under which the public authority may prefer to allot even if this decision is not the optimal one (*i.e.* does not maximize the joint payoff of the private party and the public authority). Section 4.6 concludes.

4.2 Public procurement contracts in Europe: the institutional framework

In this section, we first describe public procurement contracts and give some illustrations of alloted public services (subsection 4.2.1). Then, we describe the impact of allotment on prices paid by public authorities (subsection 4.2.2), and how the quality of the service can depend on innovations in some sectors (subsection 4.2.3).

4.2.1 Public procurement: contractual practices

Public procurement refers to acquisitions of goods and services by public institutions. The recent European legislation defines public procurement as contracts that "cover supplies, services and works purchased by the public sector".[8] These contracts are observed in many different areas. In this chapter, we focus on public procurement contracts for the provision of public services

[8] *http* : *//europa.eu/scadplus/glossary/publicprocurementen.htm*

(rather than acquisitions of goods), such as the provision of urban transport, school catering, waste collection and treatment, or water distribution. During the contract period, the public authority keeps ownership rights on the facility supporting the public service, and on some assets used for the provision of the service. Be it at the local level or at the national level, public procurement is observed in the 27 countries of the European Union to provide public works and services.

The European public authorities can allot public services. We can find a lot of public procurement notices in official government journals that specify that public services opened to competition are divided into lots. Examples are the safekeeping service in the French Island "La Réunion", which is divided into four lots[9], or the municipal school catering in the French municipality Le Luc-en-Provence, which was divided into two lots.[10] In Germany, a public procurement notice for a transport service in the municipality of Cottbus (notice n°138-229696) has been published in the German Official Journal for public procurement on July 21^{th}, 2011. A fourth example is the competitive tendering for conveyor maintenance services in London that has recently been opened, and two lots are proposed.[11] Other examples about different European countries can be found in the supplement to the Official Journal of the European Union.[12]

The question of allotment is also at stake in the on-going reform for train liberalization in Europe: regional public authorities wonder whether they will award all their train lines to a same operator, or whether they should propose a call for tenders per lot of lines (Lévque [2007]).

[9]Decision of the *Conseil d'Etat, July 23rd 2010 Région Réunion n° 338367*

[10]Notice n°68-065677, published in the French Official Journal for public procurement, April 7th 2005. The contract began in 2005 and ended in August 2009.

[11]Notice n°138-229700, notice published in the British Official journal for public procurement, on July 21^{st}, 2011.

[12]Tender electronic daily: http://ted.europa.eu/TED/browse/browseByBo.do

4.2.2 Allotment and prices paid by public authorities

We describe here the public procurement awarding procedures and how allotment is expected to impact on the price paid by the public authorities to their private partners. The selection of the private operator[13] is generally made through a competitive tendering. This allows to create competition for the field when competition in the field is not possible. Thanks to the competition between the candidates to win the public procurement contract, the public authority hopes to benefit from low prices. Candidates bid on the price they require to provide the service, which is the main criteria to be awarded the market. This price is the only source of revenue of the private operator, and is paid by the public authority. However, when competition for the field is organized, the number of bidders is not always high: between 2002 and 2005, only one candidate applies in 62,5 % of calls for tender in the urban public transport in France (GART [2005]).
By dividing the good or service to provide into several lots, allotment allows small and medium-sized enterprises to be selected and then increases the number of bidders during the competitive tendering. The following figure illustrates this competitive effect with the case of the London bus transportation. We can see that the higher the number of bidders, the lower the average winning bidding is.

However, the performance of a public service has to be evaluated both on cost and quality criteria. While some qualitative standards can be verifiable (and then contractible), other aspects of quality are hardly contractible in some public services. For instance, the concern for a better environmental protection or the needs to better meet the users' needs call for innovative ways to deliver public services. In the following subsection, we provide some illustrations of how efforts to innovate determine the quality of some public services.

[13]Very few countries in Europe have the possibility to contract-out towards public agencies. Then, we only focus in this chapter on contracting-out towards private firms.

Figure 4.1: Number of effective bidders and costs per mile in the London bus transport (May 1999-May 2008)

Number of effective bidders per route	Number of auctions	Average bus.miles (10,000)	Average winning bid (£)	Average cost per mile of the awarded contract (£)
1	128	46.99	2,217,554	8.63
2	213	47.24	1,933,647	6.20
3	232	38.20	1,522,683	4.82
4	140	44.14	1,727,877	4.56
5	58	41.84	1,647,772	4.01
6	10	34.15	1,452,628	5.43
7	5	32.25	1,044,786	3.61
8	1	57.97	1,797,000	3.10
9	1	21.53	645,878	3.00
>5	*17*	*36.47*	*1,105,743*	*3.78*

Source: Amaral et al. (2011)

4.2.3 Quality of public services and innovations

During the execution of a public procurement contract, private operators may come up with innovative ideas to improve the quality of a service beyond the standard requirements. Recent examples are innovations implemented in the waste treatment: some contracts signed with the French company SARP have been renegotiated to add new equipments allowing to extract some metals such as Zinc and Nickel from the waste reception centres and to valorize them. This innovation that was driven by environmental concerns, increases the global quality of the waste treatment.[14] In the car park sector, the firm VINCI Park renegotiated in December 2009 its contract signed in July 2008 with the municipality *Issy-les-Moulineaux*, to implement an innovation for on-street parking. This innovation, called "Pay by Phone" is a new system of payment. Instead of coin payment machines, the users can now pay thanks to their mobile phones, just by recording their car number and the reference of the area where they are parked. This increases the quality of the service since users save time and pay for the exact parking duration.[15] Other examples of innovations in public services come from England: the company Metroline,

[14]Source: http://www.edib.info/site-edib/

[15]https://www.paybyphone.fr/issy-les-moulineaux-ville-innovante-avec-paybyphone/

which is one of the main operators present on the alloted London bus transport won in 2004 the London Transport Award for its innovation IRIS (Intelligent Route Information System). This innovation enables to track buses, inform drivers of their position in relation to other buses on the route, and provide intelligent control messages to drivers. This allows to provide a better quality of service for the users.[16]

Last, in the school catering sector, industries are looking for materials that reduce their carbon footprint, as it is the case for the company Elior and their initiative to transform wastes into compost.[17]

However, let us add that all innovations do not aim to only increase the quality of the service. Some of them try to reduce the cost to provide the service. For instance, still in the school catering sector, some companies have developed central kitchens that enable to deliver pre-cooked food to several units. This innovation reduces costs and enables to produce more meals. However, the taste of food seems to have decreased due to the necessity to cool down and then heaten the food again.[18] This shows that cost-reducting innovations may create some damages on quality.

In our model, we try to account for both types of innovations: those enhancing quality and those reducing cost with a possible damage on quality. We focus on the impact of allotment on the incentives to develop both types of innovations.

4.3 General framework

4.3.1 Basic assumptions

Let us note G, a benevolent (local or national) public authority (whom we refer to as "she"), in charge of a public service. We study the case where G chooses

[16] www.metroline.co.uk/about-us.html?pgid=27

[17] www.elior.com/developpement-durable.aspx

[18] *La restauration des usagers du service public scolaire ou à caractère social en Alsace, Cour des Comptes*, Annual Public Report, February 2006.

to contract out the provision of a public service through public procurement. We assume that the service can be divided into N components: for instance, the service can be urban transportation by bus, and the components are the different routes composing the bus network of the city. Either the public authority chooses not to allot, and to give the N routes to one operator, or she chooses to allot and to give L1 routes to a private operator, and L2 routes to another private operator (L1+L2=N).

In both cases, the public authority and the selected operator(s)[19] are able to write contracts, specifying some aspects of each component of the service to be provided. However, all details are not contracted on in advance, and possible modifications of the assets used to provide the service can be made during the execution of the contract. Then, parties revise the contract *ex post*, once it is clear what kind of modifications can be introduced. In our model, we assume that during the execution of the contract, the operator can make some efforts to adapt the service to the realized contingencies. In this chapter, such efforts are not contractible *ex ante* but verifiable *ex post*: for instance, even if it is not possible to contract *ex ante* on the delivery of an innovation, once a potential innovation is discovered, its implementation becomes verifiable and renegotiations may occur. Then, the service is made up of N components and each component $j \in [1; N]$ of the service yields a benefit B_j to the society, and costs the operator C_j to produce. The operator can manipulate B_j and C_j through his effort choices. He can devote efforts to two types of innovations relative to a basic infrastructure: quality innovations (such as the IRIS system discovered by the firm Metroline in The London bus transport sector described in section 4.2.3.) and cost innovations that reduce the cost of provision but may create an adverse effect on quality (such as the central kitchen system for the school catering sector, described in section 4.2.3.). We denote the effort to search for quality innovation i, and that to search for cost reduction e.[20] Then,

[19] We exclude the case where the call for tenders would be unfruitful, and we assume that there are always bidders to answer the call for tenders.

[20] We interchangeably call e and i "investment" or "effort".

the *ex post* cost (C_j) and benefit (B_j) functions derived from the provision of the component j are the following:

$$B_j = B_j^0 - b(e) + \beta(i)$$
$$C_j = C_j^0 - c(e) + i + e$$

B_j^0 and C_j^0 are positive constants representing the contractible (verifiable) social benefit and cost of the service j; $c(e) \geq 0$ represents the cost decrease implied by an innovation in cost reduction e and $b(e) \geq 0$ corresponds to the adverse effect on quality due this investment in cost reduction. The function $c(.)$ is positive and concave, and the function $b(.)$ is positive and convex. We assume that such investments are always efficient ($c'(e) - b'(e) > 0$). As for $\beta(i) \geq 0$, it represents the increase in quality net of the potential additional cost caused by this increase in quality.[21]

A private operator has L components to manage, $L \in \{L1; L2; N\}$. If $L = \{L1; L2\}$, this means that the service has been divided into two lots (that are lot L_1 and lot L_2). If $L = \{N\}$, then the private operator has all the components of the service, *i.e.* there is no allotment.

Whatever the number L the private operator gets, he can make efforts "e" and "i" and the innovations resulting from these efforts can be implemented on the L components he manages. In other words, these efforts are made once but apply on all the components of the service managed by the private operator. For simplicity, we assume that the impact of innovations is the same for all the components on which they are applied.

As a consequence, the total *ex post* cost and benefit functions for the management of L components become:

[21] Assuming that the cost-reducing innovations could be inefficient or that the qualitative innovations produce more costs than benefits as in Chapter 3 would not change our results. Indeed these innovations cannot been implemented here due to the necessity of the public authority's acceptance as will be shown in footnote 26.

$$\sum_{j=1}^{L} B_j = (\sum_{j=1}^{l}(B_j^0)) + \mathrm{L}[-b(e) + \beta(i)]$$
$$\sum_{j=1}^{L} C_j = (\sum_{j=1}^{l}(C_j^0)) - \mathrm{L}c(e) + i + e$$

The timing of the model is as follows:

- In $t = 0$, the public authority chooses to allot or not a public service, and selects her operator(s) through a competitive tendering.
- In $t = \frac{1}{2}$, efforts e and i are made by the operator(s).
- In $t = 1$, renegotiations may occur and innovations may be implemented on the components of the service managed by the operator(s).

4.3.2 Default payoffs and renegotiations

As noted in the timing of the game, the parties have to renegotiate the contract at date 1, because they are able to verify the nature of potential quality improvements and cost reductions. Under public procurement, the public authorities own the infrastructure on which the service is based, as well as the core assets needed to provide the service. When innovations are applied on those assets, the private operator cannot implement any innovation without the agreement of the public authority.[22] We also assume that the public authority cannot realize the innovations without the private operator, since these innovations are embodied in the operator's human capital. Then, the private operator is indispensable to the implementation of these innovations.[23] Consequently, the agreement of both parties is needed to implement innovations.

[22] These assumptions can also be found in Hart et al. [1997] and Bennett and Iossa [2006]. The allocation of the control rights to the public authority plays here a critical role: it determines the default payoff of the operator by making the agreement of the public authority indispensable.

[23] We could also assume that the private operator is irreplaceable because the cost to find another operator (during the execution of the contract) to implement the innovation would be too high as regards to the cost to deal with the current operator, so that the public authority cannot get rid of the private operator until the end of the contract.

During the renegotiations, we consider that the parties implement the Nash bargaining solution, *i.e.* they split the net gains from innovations according to their bargaining power. We denote $\sigma \in (0,1)$ the *ex-post* bargaining power of the private manager.[24]

In this model, we focus on the decision to allot or not the service. We first show that allotment does not maximize the total surplus, *i.e.* the joint payoff of the public and private parties (section 4). Then, we show the conditions under which it may increase only the payoff of the public authority (section 5).[25]

4.4 The optimal decision: to allot or not to allot?

To determine whether allotment is optimal or not, we solve the game by backwards induction: we first determine the incentives to make efforts e and i in $t = \frac{1}{2}$, and we deduce whether allotment should be chosen or not in $t = 0$.

4.4.1 The incentives to make efforts

In $t = \frac{1}{2}$, we assume that a private operator has L components to manage, and is paid a fixed price P_L for the management of his L components. This price results from the competitive tendering at date $t = 0$. As described

[24]We did not discuss here the source of the bargaining power. The bargaining powers of the parties can be different because the parties' degree of impatience on the outcome of the bargaining is different. Since it is time consuming to negotiate, and time is valuable to the parties, a player's bargaining power is higher the less impatient he is relative to the other negotiator. For a discussion on the determinants of bargaining powers, see Muthoo [1999]. Moreover, we assume that σ does not depend on the number of components the operator manages: a higher number of components may lead to increase the bargaining power of the private operator. But the public authority can also threat not to renew the contract on all these components, and this threat is all the stronger as the number of components contracted out is high.

[25]We call "payoff" the final gain UG for the public authority and UM for the manager, and "surplus" the sum of these payoffs, $S = UG + UM$.

above, the operator may make efforts to innovate or to adapt the contract to the relevant contingencies. He anticipates that in $t = 1$, he will renegotiate with the public authority to implement these innovations. The approval of both parties is needed, so that in case of failure of the renegotiation, their default payoffs corresponds to their basic contractible payoffs. With an *ex post* bargaining power of $\sigma \in (0, 1)$ for the private operator, the payoffs of the operator (UM) and of the public authority (UG) resulting from the Nash bargaining are respectively:

$$UM_L = (P_L - \sum_{j=1}^{L}(C_j^0)) + \sigma \mathrm{L}[c(e_L) - b(e_L) + \beta(i_L)] - e_L - i_L$$
$$UG_L = (-P_L + \sum_{j=1}^{L}(B_j^0)) + (1-\sigma)\mathrm{L}[\beta(i_L) + c(e_L) - b(e_L)]$$

Consequently, we find the following incentives to invest e_L and i_L:

$$\begin{aligned} e_L &= \arg\max_{e} UM_L \\ i_L &= \arg\max_{i} UM_L \end{aligned}$$

The first-order conditions give us the investment level e_L and i_L such as:[26]

$$\begin{aligned} L \quad & \sigma[c'(e_L) - b'(e_L)] = 1 \\ L \quad & \sigma\beta'(i_L) = 1 \end{aligned}$$

From proof n°1 in the appendix , we can establish that:

Lemma 1. *The incentives to innovate under public procurement are increasing in the number of components a private operator manages (L).*

[26]Let us notice that in case innovations would be inefficient such that $c'(e) - b'(e) < 0$ or $\beta'(i) < 0$ then no innovation would be implemented. Then, assuming that the innovations could be inefficient would not change our qualitative results, since they would not be implemented.

This lemma can be interpreted as follows: when the private operator manages a large number of components of the service, the innovations can be implemented on a large scale. Then, he gets more gains from these innovations and has more incentives to make efforts to search for them.[27]

As a consequence, under public procurement, the total *ex post* surplus reached when an operator manages L components of the service is:

$$S_L = (\sum_{j=1}^{L}(B_j^0 - C_j^0))+\mathrm{L}(c(e_L) - b(e_L) + \beta(i_L)) - e_L - i_L$$

4.4.2 The optimal decision regarding allotment

The optimal decision (*i.e.* to allot or not the service) maximizes the total *ex post* surplus. Since allotment leads to a surplus $S_A = S_{L1} + S_{L2}$ and non-allotment leads to S_N, we have to determine which surplus is the highest.

By defining the average surplus function $F(L) = \frac{S_L}{L}$, we can show that this function is increasing in L (see proof n°2 in the appendix), so that $S_N \geq S_{L1} + S_{L2}$. This average surplus function has increasing returns to scale on the efforts to innovate: the average quantity of social surplus per component is increasing as the operator manages a large number of components, since he has higher incentives to innovate. Then, the optimal choice (*i.e.* maximizing the total surplus) in $t = 0$ is not to allot: $L^* = N$.

Proposition 1. *When the quality of public services depends on non-contractible efforts made by the private operator, the choice that maximizes*

[27]The innovation can only be applied on the components managed by the private operator and cannot be implemented on the components managed by the other operator. This is explained by the fact that the human capital of the manager making the effort e or i is indispensable to the implementation of the innovations resulting from these efforts. Moreover, the operator who discovered the innovations cannot be asked by the public authority to implement these innovations on the lots he is not responsible for.

the total surplus is not to allot the service. Allotment in public procurement reduces the incentives to innovate and thus the total surplus.

4.5 Allocation of the gains: what drives public authorities' decision

In the previous section, we have shown that the optimal decision is not to allot public services when the quality of the public services depends on the non-contractible efforts made by the private operator during the execution of the contract. In this section, we focus on the choice made by the decision maker, *i.e.* the public authority. We show that depending on the nature of *ex ante* competition (perfect or imperfect price competition) during the competitive tendering, there might be a conflict between the optimal choice and the choice that maximizes the share of the gains the public authority gets. This might change her decision not to allot. To characterize the conditions under which this conflict appears, we explore two scenarios: that of perfect price competition (in subsection 4.5.1), and that of imperfect price competition (in subsection 4.5.2).

4.5.1 The allocation of surplus under perfect competition

Let us assume here perfect price competition (*à la* Bertrand) during the competitive tendering allowing to select the private operator(s) in period $t = 0$. Since *(i)* the parties are able to anticipate *ex ante* their future investment behavior[28], and *(ii)* because of the competitive pressure, the private operators propose a price that just covers their costs, so that their final payoff is equal to zero. This allows us to determine the price paid by the public authority to have the public service provided:

[28]They can anticipate the efforts e and i even if they cannot contract on them (See Hart [2003]; Hoppe et al. [2011]).

$$
\begin{aligned}
UM_L &= 0 \\
&\Leftrightarrow \quad P_L - (\sum_{j=1}^{L}(C_j^0)) + L \times \sigma[c(e_L) - b(e_L) + \beta(i_L)] - e_L - i_L = 0 \\
&\Leftrightarrow \quad P_L = (\sum_{j=1}^{L}(C_j^0)) - L \times \sigma[c(e_L) - b(e_L) + \beta(i_L)] + e_L + i_L
\end{aligned}
$$

This results in the public authority getting all the surplus:

$$
\begin{aligned}
UG_L &= (\sum_{j=1}^{L}(B_j^0)) + L \times (1-\sigma)[c(e_L) - b(e_L) + \beta(i_L)] - P_L \\
&= (\sum_{j=1}^{L}(B_j^0 - C_j^0)) + L \times [c(e_L) - b(e_L) + \beta(i_L)] - e_L - i_L \\
&= S_L
\end{aligned}
$$

Then, under perfect price competition, the optimal decision (not to allot) also maximizes the payoff of the public authority. There is no conflict between the maximization of total surplus, and the maximization of the payoff of the public authority. Then and the public authority decides not to allot public services.

4.5.2 The allocation of surplus under imperfect price competition

In this subsection, we explore a second assumption, that of imperfect price competition in period $t = 0$. We assume that the number of candidates participating to the competitive tendering determines the intensity of the competitive pressure, and the prices charged by the private operator(s). The larger the number of candidates, the lower the price the public authority pays. We first justify this assumption (subsection 4.5.2.1) and then draw its consequences (subsection 4.5.2.2).

4.5.2.1 Imperfect price competition in public procurement

By selecting the private operator through a competitive tendering, the public authorities want to create competition for the field, when competition in the field is not possible. However, the number of candidates may vary from one service to another, and in many cases, only few candidates participate in the competitive tenderings of many local public services (GART [2005]). Moreover, numerous empirical studies have shown that an increase in the number of bidders encourages bidders to propose lower prices (Amaral et al. [2011]; Gomez-Lobo and Szymanski [2001]; Brannman et al. [1987]; Estache and Limi [2011]), so that competition prices (equal to the cost to perform the service) should be obtained only when there are a large number of candidates.[29] Figure 1 in section 4.2 also illustrates this competition effect in the case of the London bus transport: the bids proposed by the candidates decrease in the number of competitors. These empirical results seem to suggest that the so-called "Bertrand paradox" applies in the public procurement sector.[30]

To account for such a competition effect, we now assume that the winner of the competitive tendering gets a price above his marginal cost, *i.e.* the price is equal to the cost to perform the service plus a mark-up. Then, the operator

[29]Let us also add that some other studies report that an increase in the number of bidders could also lead to higher prices because of the winner's curse effect (Hong and Shum [2002]). This effect mainly appears in common value auctions, *i.e.* a situation where the actual value of the item for sale is the same for everyone but bidders have different private information about what that value is. The winner tends to be the bidder with the most overly optimistic information concerning the service or object's value. When a bidder bids only as regards to his private information, this would lead to negative expected profits. Consequently, in equilibrium, we should expect a rational bidder to internalize the winner's curse problem by bidding less aggressively (Milgrom [1989]). Compte [2004] shows that such effect can persist in pure private-value auctions. However, in our model, since the cost to perform the service is observable by all the parties, there is no possibility of winner's curse effect. Then, an increase in the number of bidders should only lead to a competition effect, *i.e.* a decrease in prices (as it has been empirically shown in the case of the London bus transport (Amaral et al. [2011])).

[30]This paradox is that it usually takes a large number of firms to ensure that prices equal marginal costs, while the competition (in prices) between only two firms should theoretically be sufficiently to charge a price equal to the marginal cost. For the theoretical approaches of the Bertrand Paradox, see Cabon Dhersin and Drouhin [2010]; Vives [2001]; Spulber [1995]; Kreps and Scheinkman [1983]; Edgeworth [1925].

gets a share of the total surplus, which means that his payoff is no longer equal to zero as under perfect price competition. To determine his payoff, we introduce an *ex ante* bargaining power of the operator(s) $\gamma \in (0,1)$ so that the share the private operator gets is equal to a proportion γ of the total surplus. Since the number of candidates is higher under allotment than under non-allotment, we assume that the *ex ante* bargaining power of the private operators are lower under allotment, *i.e.* $0 \leq \gamma^A < \gamma^W \leq 1$, where γ^A is the *ex ante* bargaining power of the winners of the competitive tendering under allotment, and γ^W is his bargaining power when there is no allotment ("W" stands for "*without allotment*").[31]

Then, when the operator manages L components of a service, the price P_L is such that the operator covers his costs and gets a proportion $\gamma^{\{A;W\}}$ of the surplus:

$$\begin{aligned} & UM_L = P_L - C_L = \gamma^{\{A;W\}} S_L \\ \Leftrightarrow \quad & P_L = C_L + \gamma^{\{A;W\}} S_L \end{aligned}$$

where C_L denotes the global cost to manage L components of the service:

$$C_L = \sum_{j=1}^{L} (C_j^0) - L \times \sigma[c(e)_L - b(e_L) + \beta(i_L)] + e_L + i_L$$

4.5.2.2 Payoffs of the parties under imperfect competition

From the previous subsection, under imperfect price competition, the payoff of the private operator is $\gamma^W S_N$ when there is no allotment, while under allot-

[31]The higher competitive pressure caused by an increasing number of bidders is also explained in the economic literature in theoretical models assuming private information on the costs of bidders. See McAfee and MacMillan [1987] or Milgrom [1989].

ment, the payoffs of the private operators are $\gamma^A S_{L1}$ and $\gamma^A S_{L2}$.
Moreover, from proposition 1, we can establish that:

$$\begin{aligned} S_N &\geq S_{L1} + S_{L2} \\ \Rightarrow \gamma^W S_N &\geq \gamma^W S_{L1} + \gamma^W S_{L2} \geq \gamma^A S_{L1} + \gamma^A S_{L2} \\ \Rightarrow \gamma^W S_N &\geq \gamma^A S_{L1} + \gamma^A S_{L2} \\ \Rightarrow UM_N &\geq UM_{L1} + UM_{L2} \end{aligned}$$

This inequality shows that the proportion of the total surplus the public authority has to give up to the private party is higher when there is no allotment than when the service is alloted. This implies that thanks to allotment the public authority saves on the share of the surplus given up to the private party by an amount: $\gamma^W S_N - \gamma^A S_{L1} - \gamma^A S_{L2} \geq 0$.

Lemma 2. *Allotment allows the public authority to give up a lower part of the total surplus to the private party.*

4.5.2.3 Innovation vs. sharing of the gains: the trade-off of the public authority, under imperfect competition

From lemma 1 and lemma 2, we can establish that allotment has two effects:

- Allotment decreases the incentives of a private operator to innovate and then the total surplus
- Allotment increases the proportion of the total surplus the public authority gets

These two effects impact on the payoff of the public authority $UG_L = (1 - \gamma^{\{A,W\}})S_L$, since her payoff depends on the total surplus (S_L) and on the

proportion of this surplus given up to the private party ($\gamma^{\{A,W\}}$). We want here to determine the conditions under which the net impact of allotment is positive for the public authority, *i.e.* when her payoff is higher under allotment than without allotment.

Allotment increases the payoff of the public authority when $UG_N \leq UG_{L1+L2}$, *i.e.* when:

$$(1-\gamma^A)(S_{L1}+S_{L2}) \geq (1-\gamma^W)S_N$$

$$\Leftrightarrow \quad \frac{1-\gamma^A}{1-\gamma^W} \geq \frac{S_N}{S_{L1}+S_{L2}} \tag{4.1}$$

The coefficient $\frac{1-\gamma^A}{1-\gamma^W} > 1$ represents the multiplier of the public authority's bargaining power when choosing allotment. Let us denote z this coefficient, such as $z = \frac{1-\gamma^A}{1-\gamma^W}$. This means that choosing to allot the service multiplies by z the bargaining power of the public authority, since it increases from $(1-\gamma^W)$ to $(1-\gamma^A) = z \times (1-\gamma^W)$.

The equation (4.1.) allows us to define a threshold concerning this multiplier. We denote $\bar{z} = \frac{S_N}{S_{L1}+S_{L2}}$ this threshold. Then:

- Whenever $z \geq \bar{z}$, then the public authority has a higher payoff under allotment than without allotment. The increase of her bargaining power caused by a higher number of bidders during the competitive tendering allows her to get a higher share of the total surplus. This positive effect offsets the losses caused by the lower incentives to innovate of the private operator under allotement.

- Whenever $z \leq \bar{z}$, then the public authority is better off without allotment, since the increase of her bargaining power is unsufficient to offset the losses caused by the lower incentives of the private operator to innovate under allotment.

Proposition 2.

- Under imperfect price competition,

- when the quality of the public service highly depends on the non-contractible efforts made by the operator during the execution of the contract, and

- when the impact of allotment on the bargaining powers of the parties is strong enough,

then allotment is not the solution allowing to maximize the total surplus (i.e. the joint payoffs of the public and the private parties) but benefits to the public authority, by increasing her own payoff.

4.5.3 Discussion: What choice for public authorities ?

As a decision-maker, the public authority chooses to allot public services when allotment increases her own payoff. From the previous subsection, the public authority then decides to allot when $z \geq \bar{z}$, even if this decision is not the optimal one, *i.e.* does not maximize the total surplus (made up of the joint payoffs of public and private parties).

However, this result comes from the fact that in our model, the public authority represents the users of the service. Then, she looks for the solution allowing to maximize the payoff of the users, *i.e.* she allots public services when $z \geq \bar{z}$ even if this decision does not maximize the total surplus because of the lower incentives of the private operator to make non-contractible efforts when the service is alloted (*lemma 1*).[32]
An alternative could be to model the public authority as a benevolent social

[32] A solution could be to choose the solution that maximizes the total surplus, and then implement redistributive policies. However, this implies to rely on an efficient tax system, and the effect of redistribution could be anticipated by the operators, thus lowering their efforts to innovate.

planner, maximizing the total surplus of both the users and the firms. In this case, the result would be different: the public authority would only care about the solution maximizing the total surplus, and would choose not to allot public services.

Then, our results open the question of how to model public authorities, and what objective function to give to them. Do public authorities represent the users of the service or do they represent the whole society and then care about the benefits of the users as well as the benefits of the firms? Our results highlight that this choice leads to different results as regards to policy recommandations.

Public law may give some elements of answers to this debate. Legal scholars often mention that the goal of public authorities is to represent the "public interest". More specifically, the organization of public services is justified by the concern for the "public interest". However, this notion is vague, controversial and raises many debates (Hantke-Domas [2003]).[33] Its definition varies from one country to another: public interest may be understood as the sum of the individual interests (Smith [1776]), or as the interest of a people as a whole.[34] By considering that the public interest is that of the people as a whole, it seems that the goal of the public authorities is rather to represent and defend the interests of the users of the service, against those of private firms. Then, by considering that public authorities represent the users, potential conflicts may arise between the solution that maximizes the total surplus and the solution maximizing only the interests of the users.

[33]Let us note that the public interest is a fundamental notion of public law, but few has been written on the economics of public interest and on the economics of public law. See Rose-Ackerman [1994] for a contribution to the economic analysis of public law.

[34]The public interest as the interest of the people as a whole mainly refers to the "general will" as described by Rousseau [1762].

4.6 Conclusion

In Europe, public authorities are suggested to allot their public services under public procurement. We show that allotment does not provide the optimal incentives to make non-contractible efforts to increase quality and reduce costs during the execution of the contracts. Then, it is more efficient not to allot public services when their quality mainly depends on those non-contractible efforts made by the private operator.

However, we also show that under some conditions, allotment may allow to increase the payoff of the public authorities (by increasing their bargaining power). Then, public authorities may have an interest to promote allotment in public procurement procedures, even if it is not an optimal decision, but simply because it allows them to get a bigger share of the surplus. There is then a conflict between the decision that maximizes the total surplus (*i.e.* the joint payoffs of the public authority and the private operator(s)) and the decision that maximizes only the payoff of the public authority (which is to allot public services). In a context where public authorities have strong financial constraints, or have to be particularly careful to users, this may explain why allotment is practiced in public procurement: it mainly benefits to the users of the service represented by the public authority.

In this chapter, we focus on the public procurement practices in Europe, but our results may also have some implications for other countries. For instance, the 2001 World Bank report (No. 21823-IN) "Indonesia, Country Procurement Assessment Report, *Reforming the public procurement system*" opens the question of allotment of contracts in developing countries.

Our results may also have implications for the literature on the optimal size of public services. This question is particularly important as regards to other legal reforms promoting the association of municipalities (inter-communalities) or even mergers of municipalities so as to manage public services on a larger

scale.[35] Our model suggests that such associations or mergers of municipalities would allow increasing the incentives of the private operator in charge of public services to make non-contractible efforts, but may also decrease the net benefits of the service for the users, since the private operator gets a higher share of the total surplus due to lower competition.

This chapter also calls for several extensions. Future works could focus on the consequences of allotment on prices and quality for different types of contractual agreements between public and private partners. Although the European reform is specific to public procurement, the issue of horizontal segmentation is also at stake for concession contracts, as in the A1 highway in Poland. Another extension would be to include information asymmetries about the private cost of the operators. Allotment would allow public authorities to practice benchmark, and to force them to reveal their private information. Last, we could also include organizational costs in our analysis. Allotment implies to organize separate calls for tenders, which may increase organizational costs. However, such costs may also decrease with the experience accumulated in the organization of call for tenders. In a dynamic setting, since allotment increases the number of calls for tenders, public authorities could learn faster.

Appendix

Proof n°1

By the implicit function theorem,

[35] Recent references on mergers of municipalities are Hirota and Yunoue [2011]; Di Porto et al. [2011]; Frère et al. [2011].

$$\begin{aligned}\frac{d(e_L)}{dL} &= -\frac{(c'(e_L)-b'(e_L)}{L(c''(e_L)-b''(e_L))} > 0\\ \frac{d(i_L)}{dL} &= -\frac{(\beta'(i_L))}{L(\beta''(i_L))} > 0\end{aligned}$$

Proof n°2

Let us show that F(L), the average surplus function, is increasing in L, where L denotes the size of the lot managed by an operator.

$$\begin{aligned}F(L) = \frac{S_L}{L} &= \frac{1}{L}[\sum_{j=1}^{L}(B_j^0 - C_j^0) + L[c(e_L) - b(e_L) + \beta(i_L)] - i_L - e_L]\\ &= (\tilde{B_j^0} - \tilde{C_j^0}) + (c(e_L) - b(e_L) + \beta(i_L)) - \frac{e_L + i_L}{L}\end{aligned}$$

where $\tilde{B_j^0}$ and $\tilde{C_j^0}$ denote the average contractible social benefit and the average contractible cost.
Let us show that F(L) is increasing in L (so that the average surplus function is increasing in the number of components managed by a private operator):

$$\begin{aligned}F'(L) = \frac{d(F(L))}{dL} &= (c'(e_L) - b'(e_L))\frac{d(e_L)}{dL} + (\beta'(i_L))\frac{d(i_L)}{dL}\\ &\quad -\frac{1}{L^2}[\frac{d(e_L)}{dL}L - (e_L)] - \frac{1}{L^2}[\frac{d(i_L)}{dL}L - (i_L)]\end{aligned}$$

$$F'(L) = \frac{d(F(L))}{dL} = (c'(e_L) - b'(e_L) - \frac{1}{L})\frac{d(e_L)}{dL} + (\beta'(i_L) - \frac{1}{L})\frac{d(i_L)}{dL} + \frac{(e_L)}{L^2} + \frac{(i_L)}{L^2}$$

From the first-order conditions defined in subsection 4.1, $(c'(e_L) - b'(e_L)) = \frac{1}{\sigma L}$ and $\beta'(i_L) = \frac{1}{\sigma L}$.

$$F'(L) = \frac{d(F(L))}{dL} = (\frac{1}{\sigma} - 1)(\frac{1}{L})\frac{d(e_L)}{dL} + (\frac{1}{\sigma} - 1)(\frac{1}{L})\frac{d(i_L)}{dL} + \frac{(e_L)}{L^2} + \frac{(i_L)}{L^2}$$

Moreover, from proof n°1, we show that $\frac{d(e_L)}{dL} \geq 0$ and $\frac{d(i_L)}{dL} \geq 0$. Since $\sigma \in (0,1)$, then $(\frac{1}{\sigma} - 1) \geq 0$.
Consequently, $\frac{d(F(L))}{L} \geq 0$: the average surplus function is increasing in L.
Since $N \geq L_1$ and $N \geq L_2$, it follows that:

$$F(N) \geq F(L_1) \Leftrightarrow \frac{S_N}{N} \geq \frac{S_{L_1}}{L_1} \Leftrightarrow L_1\frac{S_N}{N} \geq S_{L_1}$$
$$F(N) \geq F(L_2) \Leftrightarrow \frac{S_N}{N} \geq \frac{S_{L_2}}{L_2} \Leftrightarrow L_2\frac{S_N}{N} \geq S_{L_2}$$

By addition, $L_1\frac{S_N}{N} + L_2\frac{S_N}{N} \geq S_{L_1} + S_{L_2} \geq 0 \Leftrightarrow (L1 + L2)\frac{S_N}{N} \geq S_{L_1} + S_{L_2} \Leftrightarrow S_N \geq S_{L_1} + S_{L_2}$.

The social surplus is higher when there is no allotment than under allotment.

General Conclusion

While strong links have been established between infrastructure services and economic growth (Guasch et al. [2003]; Calderon et al. [2003]; Calderon and Serven [2002]), several policy agendas following the recent crisis have put an emphasis on the delivery of infrastructure and services, as explained for example in Brussels, November 26*th* 2008, by José Manuel Durão Barroso, President of the European Commission, for the European Economic Recovery Plan.
However, strong organizational changes have affected the provision of public infrastructure and services for the past decades, leading to a sharp increase of the use of public-private arrangements. Thus, there is a need to understand in which conditions public-private arrangements allow to reach efficient results.

We identified four obstacles that may cancell the benefits of public-private arrangements if they are neglected: first, there are recurrent renegotiations, that are often accused of having a negative impact on surplus. Second, the performance of contracts is not only a matter of prices, but quality matters as well. Third, there is a diversity of public-private arrangements, which may be confusing for unaccustomed decision makers. And fourth, there might be unsufficient *ex ante* competition.

The first obstacle regarding public-private arrangements performance relies on the recurrent occurence of renegotiations which are pointed as a symptom of their failure. Part 1 of this dissertation was dedicated to the analysis of this issue. Through two case studies, we highlighted in Chapter 1 that renegotiations leading to an increase of surplus of all the parties at stake exist. These observations are not in line with the general literature about renegotiation issues.

Thus, we had to wonder on a larger basis, whether renegotiations lead to a mutually beneficial outcome. Finding a positive answer was a first step to wonder, in a second stage, which type of public-private arrangements are most likely to lead to satisfactory *ex post* modifications. To reach this goal, we built an original database made of several hundreds of car park contracts, and we drew several features of renegotiations. We wondered in chapter 2 how these different features affect the satisfaction of parties, measured by the renewal of contracts.

Thanks to these detailed features of renegotiations, we found noticeably finer results than previous studies. In particular, in concession contracts, we found that a certain frequence of renegotiations per year yields satisfaction to parties. Some types of renegotiations are more or less prone to increase their satisfaction as well. Our conclusions thus conduct to accept renegotiations as necessary adaptation processes that are punished when they lead to unbalanced results between the parties.

The way parties, including users, benefit from *ex post* adaptations, is central in Part 2 of this dissertation. We tackle the analysis of several public-private contractual arrangements and the impact of *ex post* modifications on the quality of service. We used an incomplete contract framework for both Chapters 3 and 4, that offers an interesting perspective for the study of or-

ganizational structures in public services and the trade-off between cost and quality.

In Chapter 3, we tried to take into account the large diversity of contractual arrangements, by studying concession contracts that had been left aside by this literature so far. We compared them to availability contracts that are also public-private partnerships, but that entail a different sharing of the risks. Our results show that concession contracts lead to higher incentives for the private operator to improve quality, since he internalizes the reaction of users. On the contrary, in an availability contract, the private operator only maximizes financial surplus, which may lead to implement investments that have important adverse effects on quality. Nonetheless, we show that although concession contracts lead to a better quality than availability contracts, concession contracts are not necessarily the solution to be prefered, *i.e.* the solution that leads to the highest total surplus. Indeed, in concession contracts, private operators are paid through fees that are paid by users. The level of the fee may exclude users, and thus decreases the level of surplus. We highlighted a trade-off between quality and quantity.

In Chapter 4, we started from some observations claiming that *ex ante* competition is weak (Guérin-Schneider and Lorrain [2003]). Hence, we studied the recent European 2004/18/EC Directive which promotes, among other things, the horizontal segmentation of public procurement contracts, *i.e.* allotment of infrastructure-based public services. This practice has been promoted in order to increase *ex ante* competition for the field and reduce the price paid by public authorities to have their services provided. Another priority of the European Commission is about how to promote innovation by private operators through public procurement contracts. Our results enable to highlight that allotment reduces the incentives of private operator to innovate, since they have lower diffusion possibilities. However, when there is imperfect *ex ante* competition, the choice that maximizes total surplus (no allotment) is also the choice

that conveys a lower share of the surplus to the public authority. Thus, public authorities have to choose between maximizing total surplus and maximizing their share of the surplus. In a period of mistrust toward private operators and of strong financial constraint, this may explain why public authorities prefer the solution that leads to an allocation of the gains that favours them more.

The results of this Ph.D. dissertation should be seen as a first stage that will give rise to several extensions and deeper investigations. Concerning our empirical work based on the car park sector, it would be interesting to confront our results with results from other sectors. More importantly, we should compare them with data coming from a different institutional environment. Indeed, the French institutional environment can be characterized as stable. It is likely that contract renegotiations are of different types in other countries, and that parties are less prone to be forward thinking about contract renewals if future is too uncertain. Obviously, the study of the link between discretionary power and public-private arrangements' efficiency requires deeper empirical investigations, in particular to be able to clearly differentiate discretionary power and potential corruption, and to identify the conditions in which users' satisfaction is also considered when *ex post* modifications occur. The potential distinction between institutional environment should be taken into account in the future investigations concerning the *intuitu personae* principle. Indeed, the frontier between this principle and corruption might be more or less thin and hard to detect depending on the environment.

We would also like to have further opportunities of data collection that would allow us to endogeneize the likelihood of renegotiation. For the moment, our essays on endogeneisation are not satisfying enough due to a lack of instruments. In the near future, our goal is to collect finer data about the contractual clauses and their evolution through time, as well as about the price evolution of petrol, about the number of other car parks in the municipalities, with a different co-contractor from the one for which we have data, and about the

other means of transports, and in particular we would like to know whether the municipalities have implemented free access bicycle services. We are also seeking for information about what the non-renewed contracts have become, if they have gone back to public provision, or if another private operator won the competitive tender.

In Chapter 3, we have addressed the relevancy of implementing the concession or the availability risk solutions, but this should not prevent from answering to a preliminary question about the relevancy of the projects. Indeed, *white elephants* are more likely to be implemented through availability contracts, since operators do not have to bear the demand risk. Future research should be devoted to how to avoid *white elephants*. Moreover, we could refine the benefit function defined in Chapter 3, in order to take into account the cost and benefits of *ex post* investments for citizens as a whole, and not only for users. One objective of a future research is also to account for refined forms public-private partnerships, such as shadow toll contracts and mixed solution between public subsidies and users' fees.

Finally, our theoretical work in Chapter 4 would deserve some empirical investigations. For example, the benchmarking issue associated with allotment has been left aside, and this would be an interesting way to know how prices and quality evolve when allotment has been implemented. We could also refine our models by including other assumptions, such as the organizational costs induced by the different contractual choices. Our conclusion underlining a trade-off between total surplus maximisation and the maximisation of the public authority's share of surplus would deserve to investigate further the Public Choice literature.

Yet, we can already derive some important public policy implications from this Ph.D. dissertation.

The first one deals with the issue of renegotiations. Indeed, more than providing empirical results for the theoretically still on-going debate about the opportunism of renegotiations, we also derive some public policy implications.

In particular, our results only hold for contractual arrangements which allow a minimum level of discretionary power for public authorities. At a period where the European Union tries to set up a legal framework for concession contracts, we could recommend not to categorically reject the possibility for public authorities to use the *intuitu personae* principle. Indeed, such a principle can allow public authorities to use their past experiences and to adapt their efforts to craft contractual agreements efficiently.

The second stricking public policy implication, that is derived from Chapter 3 is that public authorities should be aware of the local cultural, social and economic characteristics of their population to make the most relevant contractual choice. In countries that provide for *ex ante* evaluations aiming at choosing the most relevant contractual scheme, we recommend a systematic comparison of the availability contract solution with regards to the concession solution, which, as the French example, is rarely the case. Moreover, in the French legislation, the availability contract solution, namely the *contrat de partenariat* solution is allowed only in case of special dispensations, when the complexity, the emergency or the better efficiency is proved. However, what is meant by "better efficiency" is not well defined. We suggest to consider the issue of users captivity, the capacity to define contractible quality objectives, the local sensitivity of users to the level of the fees, the potential for innovations in the sector, and the sensitivity of users to quality variations.

Finally, the debate raised by Chapter 4 leads to question the objective function of public authorities: between the choice that maximizes surplus and the choice that leads to an allocation of surplus they benefit more from, public authorities should provide an answer, in order to avoid potential misalignements between their objectives and the results for which they have to give an account to their citizens.

In a nutshell, this dissertation enabled to question the issue of renegotiations that has been pointed at as sign of public-private arrangements licking.

More generally, we were interested in studying the environment that allows to reach efficiency in the delivery of public services and infrastructure. The incomplete contract framework appears as a relevant theoretical framework to analyze organizational structures of public services. This dissertation has tried to propose some extensions to this framework and it seems that global organizational efficiency is not just a contractual matter, but also strongly depends on the environment (political preferences, cultural and social acceptation of the fees for instance) in which public-private arrangements are implemented.

References

Affuso, L. and Newbery, D. (2002). The impact of structural and contractual arrangements on a vertically separated railway. *The Economic and Social Review*, 33(1):83–92.

Akerlof, G. A. (1970). The market for lemons: quality uncertainty and the market mechanism. *The Quarterly Journal of Economics*, 84(3):488–500.

Alcazar, L., Abdala, M., and Shirley, M. (2002). *Thirsting for efficiency: the economics and politics of Urban water system reform*. World Bank.

Amaral, M., Saussier, S., and Yvrande-Billon, A. (2008). Auction procedures and competition in public services: The case of urban public transport in france and london. *Utilities Policy*, 17(2):166–175.

Amaral, M., Saussier, S., and Yvrande-Billon, A. (2011). Does competition for the field improve cost efficiency? evidence from the london bus tendering model. *Journal of Transport Economics and Policy*.

Araujo, S. and Sutherland, D. (2010). Public-private partnerships and investment in infrastructure. Technical Report 803, OECD.

Armstrong, M. and Sappington, D. (2006). Recent developments in the theory of regulation. In Armstrong, M. and Porter, R., editors, *Handbook of*

Industrial Organization, volume 3. Elsevier Science Publisher. (forthcoming).

Athias, L. (2009). Political accountability, incentives and contractual design of public-private partnerships. *Working Paper*.

Athias, L. and Nunez, A. (2008). Winner's curse in toll road concessions. *Economics Letters*, 3(101):172–174.

Athias, L. and Saussier, S. (2007). Un partenariat rigide ou flexible? Théorie et application aux concessions routières à péage. *Revue Economique*, 58:565–576.

Auriol, E. and Picard, P. M. (2011). A theory of BOT concession contracts. *CEPR Discussion paper*, (DP8323).

Baffray, L. and Gattet, P. (2009). Gestion des parcs de stationnement, perspectives de marché en 2009, forces en présence et stratégie de croissance. Xerfi Etudes France.

Bajari, P., Houghton, S., and Tadelis, S. (2007). Bidding for incomplete contracts: An empirical analysis. *Working Paper, Duke University*.

Bajari, P., MacMillan, R. S., and Tadelis, S. (2009). Auctions versus negotiations in procurement: An empirical analysis. *Journal of Law, Economics and Organization*, 58(3):372–399.

Bajari, P. and Tadelis, S. (2001). Incentives versus transaction costs: A theory of procurement contracts. *RAND Journal of Economics*, 32(3):387–407.

Baker, G., Gibbons, R., and Murphy, K. J. (2002). Relational contracts and the theory of the firm. *The Quarterly Journal of Economics*, 117(1):39–84.

Baker, G., Gibbons, R., and Murphy, K. J. (2008). Strategic alliances: Bridges between "islands of conscious power". *Journal of the Japanese and International Economics*, 2(22).

Bank, W. (2006). *Approaches to Private Participation in Water Services: A Toolkit*. The World Bank and Public-Private Infrastructure Advisory Facility, Washington DC, USA.

Barro, R. J. (1990). Government spending in a simple model of endogenous growth. *Journal of Political Economy*, 98(5):S103–26.

Barro, R. J. and Sala-i Martin, X. (1992). Public finance in models of economic growth. *Review of Economic Studies*, 59(4):645–61.

Bennett, J. and Iossa, E. (2006). Building and managing facilities for public services. *Journal of Public Economics*, 90(10-11):2143–2160.

Bolton, P. and Dewatripont, M. (2005). *Contract Theory*. MIT Press, Cambridge.

Boycko, M., Shleifer, A., and Vishny, R. W. (1996). A theory of privatization. *Economic Journal*, 106(435):309–319.

Brannman, L., Klein, J. D., and Weiss, L. W. (1987). The price effects of increased competition in auction markets. *The Review of Economics and Statistics*, 69(1):24–32.

Brousseau, E. (1994). Contrats et comportements coopératifs : le cas des relations interentreprises. In *Coopération entre les entreprises et organisation industrielle*. Edition du CNRS.

Cabon Dhersin, M.-L. and Drouhin, N. (2010). The end of the Bertrand paradox? *Working Paper CES*, (2010.79).

Calderon, C. A., Easterly, W., and Serven, L. (2003). *Latin Americas Infrastructure in the Era of Macroeconomic*. Princeton University Press, Princeton.

Calderon, C. A. and Serven, L. (2002). The output cost of Latin Americas infrastructure gap. *Working Paper Central Bank of Chile*, (186).

Cambini, C. and Filippini, M. (2003). Competitive tendering and optimal size in the regional bus transportation industry: An example from Italy. *Annals of Public and Cooperative Economics*, 74(1):163–182.

CERTU (2000). *Les enquêtes de stationnement. Guide méthodologique*. Lyon.

Coletto-Labatte, F. (2008). *Le Stationnement Urbain. Opérateurs, Marchés et Concurrence*. Edilivre Collection Universitaire, Paris.

Commission, E. (2003). *Guidelines for Successful Public-Private Partnerships*.

Commission, E. (2004). *On public-private partnerships and community law on public contracts and concessions*. Commission of the European Communities, Brussels, Belgium.

Commission, E. (2005). Creating an innovative europe. Technical report, European Commission.

Commission, E. (2007). Guide on dealing with innovative solutions in public procurement: 10 elements of good practice. Technical report, Directorate - General for Enterprise and Industry.

Commission, E. (2011). Evaluation report, impact and effectiveness of EU public procurement legislation, part 1. Technical report, Internal Market and Services Directorate.

Compte, O. (2004). Prediction errors and the winner's curse. Working Paper.

Coux, P.-D. (2011). Partenariats public-privé ferroviaires, une voie d'avenir? *Lignes d'Avenir, le magazine des enjeux ferroviaires*, 12:8–13.

CRE (2010). Rapport sur la "qualité de l'électricité". diagnostics et propositions relatives à la continuité de l'alimentation en électricité. Technical report, Commission de Régulation de l'Energie, Paris, FRANCE.

Crocker, K. J. and Masten, S. E. (1991). Pretia ex machina: Prices and process in long term contracts. *Journal of Law and Economics*, 34(1):64–99.

Crocker, K. J. and Masten, S. E. (1996). Regulation and administered contracts revisited: Lessons from transaction-cost economics for public utility regulation. *Journal of Regulatory Economics*, 9(1):5–39.

Crocker, K. J. and Reynolds, K. J. (1993). The efficiency of incomplete contracts: an empirical analysis of Air Force engine procurement. *RAND Journal of Economics*, 24(1):126–146.

Dal Bo, E. and Di Tella, R. (2006). Plata o plomo? bribe and punishment in a theory of political influence. *American Political Science Review*, 100(1):41–53.

Daniels, R. J. and Trebilcock, M. J. (2000). *An organizational analysis of the public-private partnership in the provision of public infrastructure.*

Dassiou, x. and Stern, J. K. (2008). Infrastructure contracts: Trust and institutional updating. *City University Economics Discussion Paper.*

De Brux, J. (2010). The dark and bright sides of renegotiation: An application to transport concession contracts. *Utilities Policy*, 18(2):77–85.

Deffains, B. and Kirat, M. J. (2001). *Law and Economics in Cival Law Countries.* JAI Press & Elsevier.

Desrieux, C., Chong, E., and Saussier, S. (2010). Putting all ones eggs in one basket: Relational contracts and the provision of local public services. Working Paper.

Dewatripont, M. (1989). Renegotiation and information revelation over time: The case of optimal labor contracts. *Quaterly Journal of Economics*, 3(104):589–619.

Dewatripont, M. and Legros, P. (2005). Public-private partnerships: contract design and risk transfer. *European Investment Bank, Economic and Financial Studies*, (5).

Di Porto, E., Paty, S., and Merlin, V. (2011). Determinants of fiscal cooperation decision-making: The case of french municipalities. *CREM Working Paper*.

Dupas, N., Marty, F., and Voisin, A. (2010). Partenariats public-privé, crise financière et refinancement. *Revue Bancaire et Financière*, (1):62–68.

Edgeworth, F. (1925). The pure theory of monopoly. *Papers Relating to Political Economy 1*, pages 111–142.

EIB (2004). The EIB's role in public-private partnerships (ppp). Technical report, European Investment Bank.

Engel, E., Fischer, R., and Galetovic, A. (1997). Highway franchising: pitfalls and opportunities. *The American Economic Review*, 87(2):68–72.

Engel, E., Fischer, R., and Galetovic, A. (2001). Least-present-value-of-revenue auctions and highway franchising. *Journal of Political Economy*, 109(5):993–1020.

Engel, E., Fischer, R., and Galetovic, A. (2006). Renegotiation without holdup: Anticipating spending and infrastructure concessions. *Cowles Foundation Discussion Paper*, (1567).

Engel, E., Fischer, R., and Galetovic, A. (2009). Public-private partnerships: when and how? *NBER Working Paper*, (13284).

Engel, E., Fischer, R., and Galetovic, A. (2010). The basic public finance of public-private partnerships. *Universidad de Chile Working Paper*, (257).

Engel, E., Fischer, R., and Galetovic, A. (2011). Public-private partnerships to revamp U.S. infrastructure. *The Hamilton Project*, pages 1–26.

Estache, A. (2006). PPI partnerships vs. PPI divorces in LDCs. *Review of Industrial Organization*, 29(1):3–26.

Estache, A. and Limi, A. (2011). *The Economics of Public Infrastructure Procurement in Developing Countries: Theory and Evidence*. Centre for Economic Policy Research.

Estache, A. and Wren-Lewis, L. (2009). Towards a theory of regulation for developing countries: Following Jean-Jacques Laffont's lead. *Journal of Economic Literature*, 47(3):729–770.

FMVM and local, D. C. (2006). *Les services publics locaux dans les Villes Moyennes et leurs intercommunalités*. Paris.

Frère, Q., Leprince, M., and Paty, S. (2011). The impact of inter-municipal cooperation on local public spending. *Working Paper*.

GART (2005). *La passation des DSP en Transport Urbain - Données chiffrées 2005*. Paris.

Gautier, A. and Yvrande Billon, A. (2009). Contract renewal as an incentive device: An application to the french urban public transport sector. *Working Paper*.

Gibbons, R. (2002a). Make, buy or cooperate? *Lecture note 4*.

Gibbons, R. (2002b). Relational contracts. *Lecture note 2*.

Gibbons, R. (2005). Four formal(izable) theories of the firm. *Journal of Economic Behavior and Organization*, 58(2):202–247.

Gil, R. (2011). The interplay of formal and relational contracts: Evidence from movies. *forthcoming in Journal of Law and Economic Organization*.

Gil, R. and Marion, J. (2009). The role of repeated interactions, self-enforcing agreements and relational [sub]contracting: Evidence from california highway procurement auctions. Working paper.

Goldberg, V. P. and Erickson, J. R. (1987). Quantity and price adjustment in long-term contracts: A case study of petroleum coke. *Journal of Law & Economics*, 30(2):369–98.

Gomez-Lobo, A. and Szymanski, S. (2001). A law of large numbers: Bidding and competitive tendering for refuse collection contracts. Technical Report 1.

Grossman, S. J. and Hart, O. (1986). The cost and benefits of ownership: A theory of vertical and lateral integration. *Journal of Political Economy*, 94(4):691–719.

Guasch, J., Kartacheva, A., and Quesada, L. (2000). Contract renegotiations and concessions in Latin America and Carribean region: an economic analysis and empirical implications. *World Bank Policy Research Working Paper*.

Guasch, J.-L. (2004). *Granting and Renegotiating Infrastructure Concession: Doing It Right*. The World Bank, Washington DC, USA.

Guasch, J.-L., Laffont, J.-J., and Straub, S. (2003). Renegotiation of concession contracts in Latin America. *Policy Research Working Paper, The World Bank Group*, (3011).

Guasch, J.-L., Laffont, J.-J., and Straub, S. (2006). Renegotiation of concession contracts: A theoretical approach. *Review of Industrial Organization*, 1(29):55–73.

Guasch, J.-L., Laffont, J.-J., and Straub, S. (2007). Concessions of infrastructures in latin america: Government-led renegotiation. *Journal of Applied Econometrics*, 22(7):421–442.

Guasch, J.-L., Laffont, J.-J., and Straub, S. (2008). Renegotiation of concession contracts in Latin America. evidence from the water and transport sector. *International Journal of Industrial Organization*, 26:421–442.

Guasch, J.-L. and Straub, S. (2006). Renegotiation of infrastructures concessions: An overview. *Annals of Public and Cooperative Economics*, 4(77):479–493.

Guérin-Schneider, L. and Lorrain, D. (2003). Note de recherche sur une question sensible. les relations puissance publique - firmes dans le secteur de l'eau et de l'assainissement. *Flux*, 2-3(52):35–54.

Halvey, J. and Melby, B. (1996). *Information Technology Outsourcing: Process, Strategies and Contracts*. John Wiley & Sons, New York.

Hammami, M., Ruhashyankiko, J., and Etienne, Y. (2006). Determinants of public-private partnerships in infrastructure. *International Monetary Fund Working Paper*, (06/99).

Hantke-Domas, M. (2003). The public interest theory of regulation: Non-existence or misinterpretation. *European Journal of Law and Economics*, 15:165–194.

Hart, O. (1995). *Firms, Contracts and Financial Structure*. Oxford University Press, Oxford.

Hart, O. (2003). Incomplete contracts and public ownership: Remarks, and an application to Public Private Partnerships. *Economic Journal*, 113(485):C69–C76.

Hart, O. and Moore, J. (1990). Property rights and the nature of the firm. *The Journal of Political Economy*, 98(6):119–1158.

Hart, O., Shleifer, A., and Vishny, R. W. (1997). The proper scope of government: Theory and an application to prisons. *Quarterly Journal of Economics*, 112(4):1127–1161.

Hirota, H. and Yunoue, H. (2011). Municipal mergers and special provisions of local council members in Japan. *Working Paper*.

Hong, H. and Shum, M. (2002). Increasing competition and the winner's curse: Evidence from procurement. *Review of Economic Studies*, 69(4):871–898.

Hoppe, E., Kusterer, D., and Schmitz, P. (2011). Public-private partnerships versus traditional public procurement: An empirical investigation. *Forthcoming in the Journal of Economic Behavior and Organization*.

Hoppe, E. and Schmitz, P. (2010). Public versus private ownership: Quantity contracts and the allocation of investment task. *Journal of Public Economics*.

Iossa, E. and Martimort, D. (2011). Post-tender corruption and risk allocation: Implications for Public-Private Partnerships. CEIS Working Paper 195.

Iossa, E. and Rey, P. (2009). Building reputation for contract renewal: Implications for performance dynamics and contract duration. CEIS Working Paper.

IPPR (2001). Building better partnerships. Technical report, Institute for Public Policy Research.

Kappeler, A. and Nemoz, M. (2010). Public-private partnerships in Europe, before and during the recent financial crisis. *European Investment Bank, economic and financial Report*.

Kessides, I., Miniaci, R., Scarpa, C., and Valbonesi, P. (2009). Toward defining and measuring the affordability of public utility services. *World Bank Policy Research Working Paper*, (4915).

Klein, B., Crawford, R. G., and Alchian, A. A. (1978). Vertical integration, appropriable rents, and the competitive contracting process. *Journal of Law and Economics*, 21(2):297–326.

Kreps, D. M. and Scheinkman, J. A. (1983). Quantity precommitment and bertrand competition yield cournot outcomes. *Bell Journal of Economics*, 14(2):326–337.

Laffont, J.-J. (2005). *Regulation and Development*. Cambridge University Press, Cambridge.

Laffont, J.-J. and Martimort, D. (2002). *The theory of Incentives: The Principal-Agent Model*. Princeton University Press, Princeton and Oxford.

Laffont, J.-J. and Pouyet, J. (2004). The subsidiarity bias in regulation. *Journal of Public Economics*, 88(1-2):255–283.

Laffont, J.-J. and Tirole, J. (1991). The politics of government decision-making: A theory of regulatory capture. *The Quarterly Journal of Economics*, 106(4):1089–127.

Laffont, J.-J. and Tirole, J. (1993). *A Theory of Incentives in Procurement and Regulation*. MIT Press, Cambridge.

Lévque, J. (2007). Allotissement et rendements d'échelle. application aux réseaux de transports ferroviaires. *Economie et Prévision*, 178(4):147–159.

Levy, B. and Spiller, P. T. (1994). The institutional foundations of regulatory commitment: A comparative analysis of telecommunications regulation. *Journal of Law, Economics, and Organization*, 10(2):201–246.

Lopez-De-Silanes, F. and Chong, A. (2004). Privatization in Latin America: What does the evidence say? *Economia*, 4(2):37–111.

Macaulay, S. (1963). Non-contractual relations in business. *American Sociological Review*, 28:55–70.

MacNeil, I. (1974). The many features of contracts. *Southern Caifornia Law Review*, 47:691–816.

MacNeil, I. (1978). Contracts: adjustment of long-term economic relations under classical, neoclassical and relational contract law. *Northwestern University Law Review*, 72:854:905.

Malin, E. and Martimort, D. (2000). Transaction costs and incentive theory. *Revue d'Economie Industrielle*, 92:125–148.

Martimort, D. and Pouyet, J. (2008). "'build it or not": Normative and positive theories of public-private partnerships. 26(2):393–411.

Martimort, D. and Straub, S. (2006). Privatization and changes in corruption patterns: The roots of public discontent. ESE Discussion Papers 147, Edinburgh School of Economics, University of Edinburgh.

Marty, F. and Voisin, A. (2006). Le contrat de partenariat constitue-t-il une Private Finance Initiative à la française? *Revue internationale de droit économique*, XX(2):131–150.

Masten, S. E. and Saussier, S. (2000). Econometrics of contracts: An assessment of developments in the empirical litterature of contracting. *Revue d'Economie Industrielle*, 92:215–237.

McAfee, R. P. and MacMillan, J. (1987). Auctions and bidding. *Journal of Economic Literature*, 25(2):699–738.

McCubbins, M. D. and Schwartz, T. (1984). Congressional oversight overlooked: Police patrols versus fire alarms. *Amercian Journal of Political Science*, 28(1):165–179.

Megginson, W. L. and Netter, J. M. (2001). From State to market: A survey of empirical studies on privatization. *Journal of Economic Literature*, XXXIX(2):321–389.

Milgrom, P. (1989). Auctions and bidding: A primer. *Journal of Economic Perspectives*, 3(3):3–22.

Morand, P.-H. (2002). Accès des PME aux marchés publics : allotissement ou groupement ? *Economie Publique*, 10(1):73–100.

Mougeot, M. and Naegelen, F. (2005). A political economy analysis of preferential public procurement policies. *European Journal of Political Economy*, 21(2):483–501.

Muthoo, A. (1999). *Bargaining Theory with Applications*. Cambridge University Press.

Office, C. B. (2008). *Issues and Options in Infrastructure Investment*.

Office, N. A. (2003). Operational performance of prisons. Technical report.

Oxley, J. and Silverman, B. (2008). Inter-firm alliances; a new institutional economics approach. In Brousseau, E. and Glachant, J.-M., editors, *New Institutional Economics: A Guidebook*, pages 209–234. Cambridge University Press, Cambridge, UK.

Parliament, E. (2006). Public-private partnerships: Models and Trends in the European Union. Technical report, European Parliament, DG Internal Policies of the Union.

PricewaterhouseCoopers (2005). Delivering the PPP promise: A review of PPP issues and activity. Technical report.

Prud'homme, R., Koning, M., and Kopp, P. (2008). Substituting a tramway to a bus line in Paris: Costs and Benefits. *Transport Policy*, 18(4):563–572.

Rose-Ackerman, S. (1994). The economic analysis of public law. *The European Journal of Law and Economics*, 1(1):53–70.

Rosenau, V. (2000). *Public-private policy Partnerships*. MIT Press.

Rousseau, J.-J. (1762). *Le contract social*.

Sappington, D. and Stiglitz, J. (1987). Privatization, information and incentives. *Journal of Policy Analysis and Management*, 6:567–582.

Saussier, S. (2000). Transaction costs and contractual incompleteness: The case of Electricité de France. *Journal of Economic Behavior and Organization*, 42(2):189–206.

Smith, A. (1776). *An inquiry into the Nature and causes of the Wealth of Nations*. R.H. Campbell, Reed. 1976, Glasgow.

Spiller, P. T. (2008). An institutional theory of public contracts: Regulatory implications. NBER Working Papers, National Bureau of Economic Research, Inc.

Spulber, D. F. (1995). Bertrand competition when rivals' costs are unknown. *Journal of Industrial Economics*, 43(1):1–11.

Tessier, A. (2004). Le livre vert de la commission européenne sur les partenariats public-privé et le droit communautaire des marchés publics et concessions. *Bulletin juridique des contrats publics*, 37:419–423.

Treasury, H. (2003). *PFI: Meeting the Investment Challenge*. HM Treasury, London, UK.

Treasury, H. (2011). UK Private Finance Initiative projects: summary data. Technical report, London, UK.

Vives, X. (2001). *Oligopoly Pricing: Old Ideas and New Tools*, volume 1 of *MIT Press Books*. The MIT Press.

Williamson, O. E. (1975). *Markets and Hierarchies, Analysis and Antitrust implications: A Study in the Economics of Internal Organization*. Free Press, New York, NY, USA.

Williamson, O. E. (1976). Franchise bidding for natural monopolies: In general and with respect to CATV. *Bell Journal of Economics*, 7(1):73–104.

Williamson, O. E. (1985). *The Economic Institutions of Capitalism*. The Free Press, New York, NY, USA.

Williamson, O. E. (1999). Public and private bureaucracies: a transaction cost economics perspectives. *Journal of Law, Economics and Organization*, 15(1):306–342.

Yvrande-Billon, A. (2006). The attribution process of delegation contracts in the French urban transport sector: Why is competitive tendering a myth? *Annals of Public and Cooperative Economics*, 77(4).

Zupan, M. A. (1989). Cable franchise renewals: Do incumbent firms behave opportunistically? *RAND Journal of Economics*, 20(4):473–482.

List of Tables

List of Figures