

PUBLIC PRIVATE PARTNERSHIPS IN EUROPE FOR BUILDING AND MANAGING PUBLIC INFRASTRUCTURES: AN ECONOMIC PERSPECTIVE

by

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ABSTRACT: *Public–private partnerships (PPPs) are long-term contractual agreements between the public and private sector for the provision of public infrastructures and services. Due to tighter budget constraints and to a renewed interest in greater involvement of the private sector in the provision of public services, PPPs are likely to grow in the near future. In this paper, we review the theory and practice of PPPs, highlighting their potential role as well as discussing the main factors influencing the likelihood of performance failure.*

Keywords: Incentives, infrastructures, public private partnerships, public services

JEL classification: H11, H57, L14, L24

1 Introduction

Infrastructure investment needs to be substantially increased in many developing and emerging economies in order to support more rapid economic growth and to meet environmental targets. According to the OECD (OECD 2015), total global infrastructure investment requirements by 2030 for transport, electricity generation, transmission and distribution, water and telecommunications are no less than USD 71 trillion. This represents 3.5 per cent of the annual World GDP from 2007 to 2030. In addition to those economic infrastructure' needs, there is also a need for more social infrastructure. Social infrastructures typically includes assets that accommodate social services such as schools, universities, hospitals, prisons and community housing. These are not aimed at directly supporting economic activity (although good public services can attract foreign investment and increase productivity). In some parts of the world social infrastructures

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already represent a significant part of total infrastructure investment. In Europe, social infrastructure deals amount to between €10 and €18 billion per year (Prequin 2015).

Much infrastructure investment is public investment. However, because of budget constraints, private investment is frequently mobilized through public–private partnerships (PPP). PPPs are long-term contractual agreements between the public and private sector for the provision of public infrastructure and services using the resources and expertise of the private sector. They account for up to 15 per cent of annual capital central government expenditure around the world, although there is a great variation across countries in the extent to which PPPs are used (OECD 2013).

An increasing deployment of PPPs in Europe can be expected because of two main factors. First, tighter budget constraints in Member States have increased interest in the private funding of public infrastructure, which – under certain conditions – makes it possible to use the resources of the private sector to build infrastructure ‘off balance’. Second, there is a renewed interest in a greater involvement of the private sector in the provision of public services, which is part of a general trend towards a contraction of the role of the State in the economy (see EC 2004 for further discussion). This renewed interest is only partially guided by efficiency consideration: PPPs are often viewed as a way to foster competition and to concentrate the role of governments as supervisors instead of providers of infrastructure. Furthermore, as discussed in the academic literature summarized in this paper, the rationale for PPPs lies in the incentive effect produced by bundling the design, construction, operation and finance of the infrastructure into one contract with a consortium of firms, whilst transferring operational risk to the consortium. In practice, however, operational risk has often not been appropriately transferred. Due to political opportunism, incompetence, or contractual difficulties due to transaction costs, governments have created monopoly conditions and rents for PPP contractors. For all these reasons, PPPs are not a panacea. Theoretical developments as well as empirical studies can help to delineate the specific cases where we can expect them to be efficient.

European countries have recently transposed the public procurement and concession contract directives into national law, with the underlying objective of facilitating the development PPPs in Europe, and so a natural question to ask is where we stand now with PPPs and how they might develop in future.¹ In this paper we aim at answering this question by reviewing the theory and practice of PPPs.

The paper is organized as follows. In Section 2, we define what PPPs are and we provide some figures on PPP transactions around the world. In Section 3, we review the main contributions of the economics literature on PPPs. In Section 4, we discuss the main factors influencing the likelihood of performance failure in PPPs and in Section 5, we illustrate our claims presenting the case study of Velib’ in Paris. Section 6 presents some concluding comments and highlights the priorities for PPP policy.

1 We will concentrate on Europe in this paper. Issues are qualitatively the same for PPPs in other parts of the world, but weak institutional environments exacerbate the severity of certain issues.

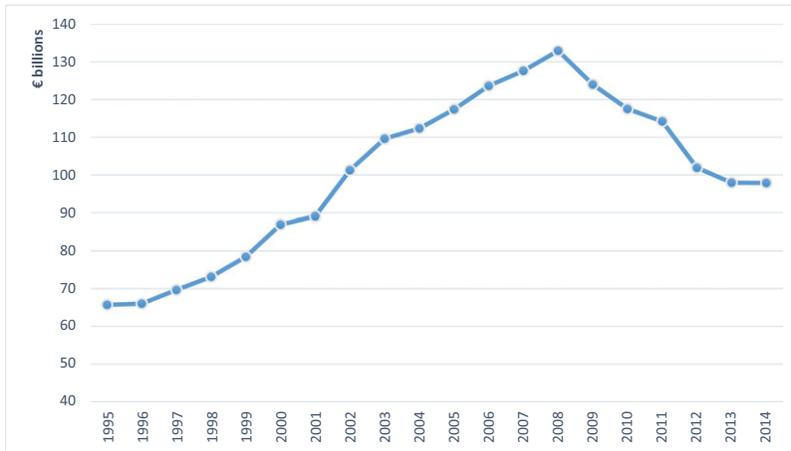


Figure 1 – EU 28 infrastructure investment: Rail /Road /Rail /Air /Sea /Inland waterways, 1995–2014. [Colour figure can be viewed at wileyonlinelibrary.com]

Source: OECD (2017), Infrastructure investment (indicator). <https://doi.org/10.1787/b06ce3ad-en> (accessed 6 August 2017).

2 PPP Contracts: what are we talking about?

2.1 Different kinds of PPPs to develop infrastructures

Infrastructure investments are at the core of economic development and constitute a large part of public procurement expenses. They have amounted in Europe to more than €100 billion every year since 2003 (see Figure 1).

Although there is some variation across European states, from 0.2 per cent in Ireland to more than 2 per cent of annual GDP in Romania (see Figure 2), there is a general perception of a global shortage of investment (OECD 2015), and a call for a better use of public money and a greater deployment of private financing of infrastructures.

In addition to direct public management, where the government entirely controls investments and public service provision, there are mainly three tools available to public authorities to invest in public infrastructures. All of them involve some kind of partnership (regulated by a contractual arrangement) with private contractors: Concession contracts, availability-based contracts and traditional procurement. Only the first two are usually considered as PPP.

Through concession contracts, a public legal entity entrusts investment needs and the management of a public service to a private entity² in return for a payment that depends on the results of the service operations. End-users are usually those who pay the concessionaire, although shadow tolls, where the government pays the concessionaire in proportion to the number of users, are also used. In Europe, concession contracts have been employed since the seventeenth century and are used widely for mass catering, water and sanitation, district heating, transport, sports facilities, etc.

² It is of course possible for a government, whatever the tool that is considered, to contract with a public entity. In this case, however, we talk about ‘in house provision’.

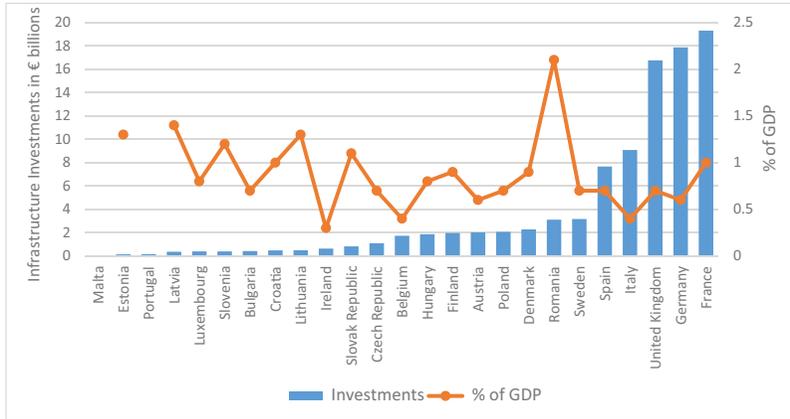


Figure 2 – Infrastructure Investment in EU 28 (no information available for three countries): Rail /Road /Air /Sea /Inland waterways, 2014. [Colour figure can be viewed at wileyonlinelibrary.com]

Source: OECD (2017), Infrastructure investment (indicator). <https://doi.org/10.1787/b06ce3ad-en> (accessed 6 August 2017).

Through availability-based contracts, a public entity entrusts investment needs and the management of a public service to a private entity in return for a payment from the public entity conditioned on key performance indicators. This kind of contractual agreement was first used in the 1990s in the UK (PFI contracts) but was then adopted all over Europe. Availability-based contracts are employed for major construction projects (educational establishments, train stations, etc.), urban infrastructures (street lighting, roads, etc.) and even sport and cultural facilities (theatres, stadiums, swimming pools, etc.). They are particularly suitable for social infrastructures when it is not easy to make end-users pay for services or when it is not efficient to transfer to the private contractor the demand risk.

Through traditional public procurement contracts, a public entity entrusts investment needs or the management of a public service for which it is responsible to a private entity in return for a payment from the public entity conditioned on key performance indicators. Because there is generally no bundling in public procurement contracts, they are usually simpler than concession and availability-based contracts (i.e. short-term contracts without any ‘partnership’). However, some infrastructure projects financed through traditional public procurement contracts might involve long-term contracting and a need for partnerships between the public and the private entities (see for example the Velib’ case discussed later in this paper). This suggests that the frontier between simple contracts and complex partnerships is blurred and cannot be reduced to concession and/or availability-based contracts. Interestingly, as we will see later, theoretical economic developments also do not reduce PPPs to specific types of contracts but to specific contractual problems that might emerge whatever the kind of contracts considered, depending on risk transfers and bundling issues.³

³ That is why, later on, we will discuss empirical findings with references to papers that are interested in public procurement and not only with a narrow focus on PPP.

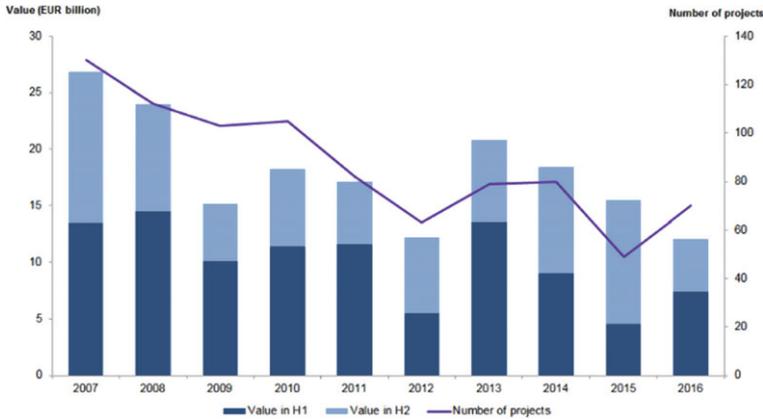


Figure 3 – European PPP market 2007–2016 by value and number of projects. [Colour figure can be viewed at wileyonlinelibrary.com]
Source: EPEC 2017.

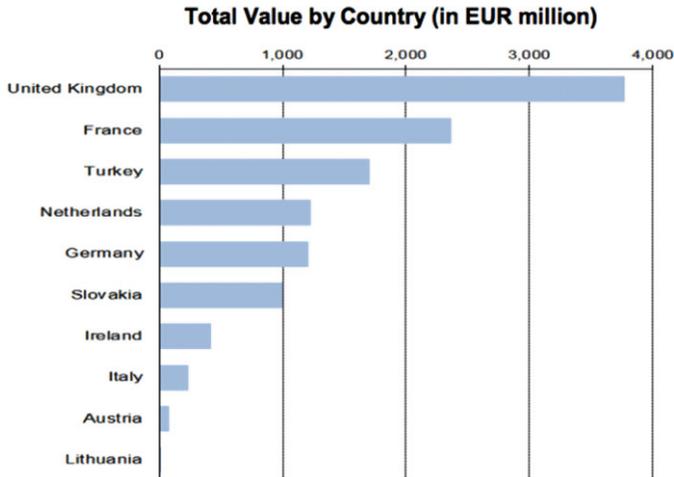


Figure 4 – Top countries in Europe (2016). [Colour figure can be viewed at wileyonlinelibrary.com]
Source: EPEC 2017.

2.2 PPPs in Europe

In relation to measurement issues, little is known about PPPs in Europe. More precisely, measurement efforts are concentrated on one kind of PPP – namely, the availability-based contract. The European PPP expertise centre, EPEC, collects information on such contracts in order to strengthen the ability of the public sector to engage in PPPs by providing information on best practices (see Figure 3).

The transport sector is the largest sector in value terms, with over €3.7 billion worth of transactions. Education is the most active sector in terms of number of deals, with 27 projects closed and an aggregate value of €1.6 billion. In the healthcare sector, the

aggregate value is €2.3 billion. Telecommunications (€1.2 billion), defence (€1.2 billion) as well as the environment (€1.2 billion) sectors are also opening to PPP agreements.

Overall, the United Kingdom and France led the PPP market in Europe over the past five years (EPEC 2017).

Very little is known concerning the value or the number of concession contract deals in Europe, as there is no monitoring body collecting data. The same is true for public procurement contracts in infrastructures. However, aggregated data show that such investments are significant (see Figure 1) and mainly financed through concession and traditional public procurement contracts. That is why the European Commission pushed forward two new European directives on concession and public procurement contracts in 2014.

Directive 2014/23 is the first dedicated to the award of concession contracts with the scope of ‘favouring public investments in infrastructures and strategic services to the citizen’. Article 2 now provides that: ‘The award of a works or services concession shall involve the transfer to the concessionaire of an operating risk in exploiting those works or services encompassing demand or supply risk or both.’ The demand risk is to be understood as the risk on actual demand for the works or services which are the object of the contract. Supply risk is to be understood as the risk on the provision of the works or services which are the object of the contract, in particular the risk that the provision of the services will not match demand.⁴ For the purpose of assessment of the operating risk the net present value of all the investment, costs and revenues of the concessionaire should be taken into account in a consistent and uniform manner.

This is an important novelty in European Law, which has been strongly advocated in the academic debate. As discussed in the literature summarized in this paper, the rationale for PPPs lies in the incentive effect produced by the bundling of design, construction operation and finance into one contract with a consortium of firms, provided that this is accompanied by the transfer of operating risk to the consortium. In practice, however, operating risk has often not been appropriately transferred. Instead, central and local governments have colluded with the private sector – for reasons of political opportunism or incompetence – and ensured monopoly conditions and rents to private concessionaires.

2.3 What are the main characteristics of PPPs for economic analysis?

Why do we need PPPs and where does their efficiency (if any) derive from? The economic literature suggests that the rationale for PPPs lies in the incentive effect produced by the bundling of design, construction operation and finance into one contract

⁴ The Directive also clarifies that an operating risk should stem from factors which are outside the control of the parties. Risks such as those linked to bad management, contractual defaults by the economic operator or to instances of force majeure are not decisive for the purpose of classification as a concession, since those risks are inherent in every contract, whether it be a public procurement contract or a concession. An operating risk should be understood as the risk of exposure to the vagaries of the market, which may consist of either a demand risk or a supply risk, or both a demand and supply risk.

Table 1 – Types of PPP contracts

| | Public Procurement contracts | Concession contracts | Availability-based contracts |
|---|------------------------------|----------------------------|------------------------------|
| Payment delayed | No | Yes, by the user generally | Yes, by the public authority |
| Transfer of production risk (associated with the service or infrastructure) | Yes | Yes | Yes |
| Transfer of demand-related risk | No | Yes | No or not significantly |
| Transfer of risk associated with operating costs | Yes in service contracts | Yes | Yes partially |
| Global contract (i.e. tasks bundling) | Generally, No | Yes | Yes |
| Project management / financing | Public | Private | Private |
| Duration of contract | Short-medium term | Medium-long term | Long term |

Source: Adapted from Saussier and Tireole 2015.

with a consortium of firms, provided that this is accompanied by the *transfer of operating risk* to the consortium.

PPP contracts can be categorized into two different types: (i) the financially free-standing projects, such as concession contracts, where the private-sector party's main source of income is constituted by user fees, and (ii) the operation Private Finance Initiative (PFI) projects or availability contracts, where the private-sector party mainly sells the service to the public-sector party. The first type of project is often referred to as 'concession', and the second type of project as 'availability contract'.

Focusing on bundling and risk transfer, we can characterize more easily the different types of PPPs we just mentioned. They differ depending on risk transfers, payments and bundling of investments and delivery of services (see Table 1).

For the purpose of this paper, we characterize PPPs in terms of four main features: (i) task bundling, (ii) risk transfer, (iii) medium- to long-term contracting, and (iv) private finance. We shall first briefly discuss each of these features in turn.

- (i) **Bundling.** A PPP typically involves the bundling of the design, building, finance, and operation of a project, which are contracted out to a consortium of private firms. The consortium includes a construction company and a facility-management company and is responsible for the service provision (or for some aspects of it). The consortium may operate as a temporary joint venture or can set up a single-purpose entity known as a special purpose vehicle (SPV) to manage the different stages of the project and to allocate risks among the parties of the SPV. As setting up an SPV is costly, it is done only for large value projects. The SPV then acts as the delivery body for the intervention. The SPV is typically a private sector consortium to develop, build, maintain and operate the asset for the contracted period. In cases where the government has invested in the project, it is typically (but not always) allotted an equity share in the SPV. The consortium is usually made up of building contractor, facility management, maintenance company, but may include also bank lenders and other financial institutions.
- (ii) **Risk transfer.** The rationale for PPPs provides for design, construction and operational risk to be substantially transferred to the private-sector party, with

a view to optimally trade-off incentive provision and risk premium. We shall return to this below.

- (iii) Long-term contracting. A PPP contract is a medium- to long-term contract. The contract duration combines with tariff levels and adjustments and with government contributions to determine the return for the contractor. Together, they have to ensure that the project is ‘bankable’ – that it is able to cover the initial investment of the contractor, or is socially desirable enough to justify payments coming from public authorities.
- (iv) Private finance. The private sector finances the project via equity or debt, and then recoups its revenues either directly from users or from the government in the form of shadow tolls/prices or availability payments and other financial contributions. In particular, where the government is the main purchaser of services, shadow tolls paid by the government (i.e. usage payments related to the demand for services) or service payments by the government under availability contracts (which are independent of the realized demand and based only on availability of the infrastructure under agreed quality standards) are used to compensate the contractor. The government may also make a direct contribution to project costs. This can take the form of equity, a loan, or a subsidy. For large projects the PPP financing is provided via the SPV. Investor funding is channeled into the SPV which enters into a contract with the contracting authority.

There exist different types of PPP. For example, there is the traditional BOT (build–operate–transfer) contract. In a BOT contract, the private-sector party takes responsibility for building (B), operating and managing (O) assets. The bundling of these activities is meant to provide incentives for the private-sector party to take into account the cost of operating the asset not only in the operation phase but also early in the construction phase. In the BOT contract, investment in capital assets is undertaken by the private-sector party but it is financed by the public-sector party, which retains the financial risk. Upon contract expiry, the ownership of the assets is transferred (T) to the public-sector party under the terms of the original agreement, unless a contract extension or renewal is granted.

In a DBFO (design–build–finance–operate) contract, the private-sector party (typically a consortium of firms) is in charge of all the stages of a project for the provision of a public service. This PPP contract involves the design (D), building (B), finance (F) and operation (O) of the project.

3 Economic literature: Where do we stand?

The economic literature on PPP has elaborated many insights of the agency literature (Laffont and Martimort 2002) and the literature on procurement and regulation (Laffont and Tirole 1993). Its main objective has been to provide a rationale for the main characteristics of PPP and test empirically the theoretical predictions. We can therefore organize this literature around the four main characteristics of PPPs. A unified framework is developed in Iossa and Martimort (2015), whilst a comprehensive literature with an extensive policy discussion is found in Engel et al. (2014) and Saussier and De Brux (2018).

3.1 Bundling and risk transfer

Iossa and Martimort (2015) study the conditions under which bundling of project phases (in particular, building and operation) into a single contract is optimal. An important distinction that they draw is between positive and negative externalities across different stages of production. They use the term ‘positive externality’ (resp. ‘negative externality’) when a building innovation is associated with reduced (resp. increased) cost at the management stage. Bundling induces the contractors to look at the long-term performance of the asset (the so-called ‘whole life asset management’) and thus internalize the positive externality across stages. This affects the incentives of the contractor to invest in asset quality weakening moral hazard problem at design and construction stage. Provided there is an incentive problem, the results of Iossa and Martimort (2015) hold regardless of the contractual framework used and of the quality of the information held by the government.

An interesting feature of optimal contracting with positive externalities which Iossa and Martimort (2015) emphasize is that bundling goes hand in hand with higher-power (and more pressing) incentives – when bundling is optimal, more risk is also transferred to the contractor. This provides the rationale for both bundling and risk transfer to be key features of PPP arrangements. It also explains the greater risk premium that is typically observed in PPP contracts compared to traditional procurement. Furthermore, Iossa and Martimort (2015) show that private ownership during the contract dominates public ownership and the gain from bundling with private ownership is greater for generic facilities, such as leisure centres, accommodation and public housing, than for specific facilities, such as prisons, hospitals and schools (which have limited use outside the public sector). Once equipped with the rationale for bundling and risk transfer in PPP agreements, Iossa and Martimort (2012, 2015) develop their basic insights in more elaborate environments, which have been viewed as particularly interesting both in the public debate and within recent academic research.

The rationale for PPP in the presence of positive externalities is in line also with earlier papers developed under an incomplete contracting framework. Hart (2003) built on Hart et al. (1997), providing a model where the sole source of incentives is ownership. A builder can perform two kinds of investment (productive and unproductive) which may both reduce operating costs, although only the productive investment involves also the benefit of providing the service. Under traditional procurement, the builder cannot internalize the impact of his effort either on benefits or on costs, and as a result implements too little of the productive investment but the right amount of the unproductive one. Under PPP, the builder partly internalizes the impact of his productive investment whereas he also implements too much of the unproductive one.

Bennett and Iossa (2006) studied the desirability of bundling project phases and of giving ownership to the investor. In their model, innovations are non-contractable *ex ante* but verifiable *ex post*. Ownership of the asset gives control to the owner to decide whether to implement quality-enhancing or cost-reducing innovation proposed by the investor. It is shown that the hold-up problem is less severe under PPP, compared with traditional procurement, when there is a positive externality between the building and managing stages. Further, public ownership acts as a commitment for the government to renegotiate and share with the investor the surplus from the implementation of the

innovation. Private ownership is however optimal for generic facilities with high residual value.

Martimort and Pouyet (2008) built a model where both the quality of the infrastructure and operating costs are contractable. Agency costs are lower under a PPP when there is a positive externality between building and managing assets compared with traditional procurement. Granting ownership is an imperfect way of aligning incentives, but to a large extent, the important issue is not who owns the asset but instead whether tasks are bundled or not. That insight is developed by Martimort and Pouyet in various extensions of their basic model, allowing for risk-sharing as a motive for forming consortia, or political economy. In this respect, a common theme of their model is that PPP comes with higher-powered incentives which are prone to collusion and the capture of public officials. When those institutional costs are taken into account, relying on PPP becomes less attractive.

An alternative, complete-contract, approach to PFI was taken by Bentz et al. (2001). They showed that the government will wish to buy services (as in PFI) rather than facilities (as in traditional procurement) if the building and service delivery costs are low.

As already mentioned, the bundling of project phases into a single contract is the key characteristic of PPP contracts. If the design, construction, time schedule and operation risk are transferred to the private sector, the bundling of project phases encourages the contractor to think about the implications of its actions at different stages of the project (from the building to the operation) and thus favours a whole-life costing approach (Bennett and Iossa 2006, Martimort and Pouyet 2008, Iossa and Martimort 2015). Bundling may also boost incentives to innovate and to gather private information about future costs to adapt service provision to changing circumstances (Hoppe and Schmitz 2013). This is why design, construction, time scheduling, and operational risks should be transferred to the private sector.

However, risk sharing may become desirable in situations where the public authority has an informational advantage over the contractor, for example in relation to the value of the assets. This is particularly relevant when the PPP contract involves renovation rather than construction of a facility or infrastructure, as is often the case for PPPs in transport, water, and energy. It is also relevant for prison services, clinical services, and water services, where the public sector owns assets such as pumps, water pipes, metering systems, etc. In these cases, the authority has better knowledge of the state of the underlying assets and may therefore be in a better position to evaluate (at least some of) the cost and risks associated with service provision, as shown by Martimort and Sand-Zantman (2006).

3.2 Private finance

One of the arguments often put forward by policy makers is that PPP can be beneficial because of the private finance that is involved, in the sense that it can help to build infrastructures at a lower cost for the public sector. This argument is however misplaced. As shown by Engel et al. (2013), private finance does not help to save on distortionary taxation, and cannot therefore be justified on this ground. This is because any additional \$1 invested by the contractor saves society distortionary taxes but the

concessionaire must be compensated for the additional investment through a longer contract term and this costs society future distortionary taxes at least equal to the initial tax saving, given that the financier also needs to be compensated for the risk he bears.

If there is one, the benefit of private finance must therefore come on other grounds. Iossa and Martimort (2012, 2015) point to one benefit that stems from the expertise and information that may be brought about by the financier. In this case, outside finance may improve risk-allocation by helping to alleviate the contract's moral hazard at construction or operational stage.

3.3 Long-term contracting

Iossa and Martimort (2011) discuss the cost of long-term PPP contracts. They show how long-term agreements are subject to contractual hazards, especially in view of incentivizing investment over the length of the contract. They start by considering the case of a public authority having a strong commitment power; the risk of unilateral changes of contract terms by governments is then minimal. The optimal long-term contract entails increasing incentives over time to foster the renewal of investment. Cost-plus contracts arise in early periods whereas fixed-price agreements are expected close to the end of the contract duration.

Long-term contracts however suffer from being signed in contexts where uncertainty over the realizations of future demand and cost levels is pervasive. When estimates turn out to have been optimistic, renegotiation of contract terms may occur, partially nullifying the incentive power of the initial contract. To prevent this, incentives should be tilted towards being low-powered, and less risk should be transferred at the earlier stages of contracting. However, this non-stationarity of incentives does not necessarily undo the benefits of bundling.

The effect of contract duration on the trade-off between incentives and flexibility was examined by Ellman (2006). He showed that a longer contract length helps to protect the contractor from his investment being expropriated by the government but it reduces the incentive of the government to seek or implement new service innovations since changes are costly to renegotiate.

Long-term contracts suffer from uncertainty over the future evolution of users' needs. This might make them unsuitable in circumstances where user needs evolve rapidly and the output specifications set up in the initial contract become quickly obsolete. For fast-moving sectors, the benefit of bundling needs to be weighed against the cost of contract rigidity. This cost may be severe enough to make PPPs unsuitable when user needs evolve rapidly.

4 Factors influencing the likelihood of performance failure in a PPP agreement: Empirical evidence

Worldwide experience with PPP suggests there is no a 'one-size-fits-all' principle that might simplify the design of a PPP contract for a given objective and sector. However, the empirical evidence suggests that some factors heavily influence the likelihood

of performance failure in a PPP agreement (though these factors are not specific to PPPs):

- i. the tender and contract design and the contract management
- ii. the characteristics of the targeted sector and the market structure
- iii. the degree of macroeconomic instability
- iv. the country's regulatory and institutional framework.

4.1 The tender and contract design and the contract management

PPPs are not a free lunch. In order for PPPs to be successful, public authorities need to carefully think about the steps of tender design, contract design, and contract management.

Concerning the tender design, a large part of the empirical literature has analysed the choice between rigid auctions focusing on price competition vs. more flexible auctions reducing 'competition' and opening room for negotiation. Bajari et al. (2009) examined a comprehensive data set of private-sector building contracts awarded in Northern California during the years 1995–2000. Their analysis suggests a number of possible limitations to the use of auctions. Auctions may perform poorly when projects are complex, contractual design is incomplete, and there are few available bidders. Furthermore, auctions may stifle communication between buyers and sellers, preventing the buyer from utilizing the contractor's expertise when designing the project. What is true for private auctions is also true for public ones, and the implications of these results for procurement in the public sector are straightforward.

The benefits of negotiation during the selection stage is also emphasized by Coviello et al. (2017a). Using regression discontinuity design analysis to document the causal effect of increasing buyers' discretion on procurement outcomes in a large database for public works in Italy, they found that discretion increases the probability that the same firm wins repeatedly, but it does not deteriorate the procurement outcomes. This result is robust controlling for the geographical location, corruption, social capital, and judicial efficiency in the region of the public buyers running the auctions. In the same vein, Chever et al. (2017), using data on 180 call for bids and contracts signed by a French local public buyer of social housing, found that limiting competition (i.e. restraining the number of responses to call for bids) for small simple projects enables economies to be made on transaction costs without increasing procurement costs or corruption and favouritism.

The complexity of the tender design might also impact on the contract execution stage. Estache and Limi (2009) use data from road and railway concessions in Latin America to study the probability of renegotiation in connection with the selected award criteria. They found that that auctioneers tend to adopt the multidimensional format when the need for social considerations, such as alleviation of unemployment, is high, but renegotiations are more likely to occur when the multidimensional format is used. Good governance, particularly regulatory quality and anti-corruption policies, can mitigate the renegotiation problem. Simple tender design focusing on prices is not without any drawbacks however. Decarolis (2014) found evidence of a trade-off induced by first-price auctions between low prices at the awarding stage and poor ex post performance when bids are not binding commitments. By exploiting the different timing with which first-price auctions were introduced in Italy to procure public works, he found that at

least half of the cost savings from lower winning prices are lost because of ex post renegotiations.

Those studies suggest that the tender procedure is crucial and needs to be chosen in accordance with contract design and the institutional framework the project is embedded in.

Concerning the contract design, as discussed in detail by Iossa Spagnolo Vellez (2009), aspects such as the risk allocation or the payment mechanism significantly affect the PPP outcomes. Project-related risks, such as construction risk, cost overrun risk, and demand risk, are allocated through the contract design. The sheer complexity of PPP projects makes contract design a key issue for the success of a PPP project: the contract may transfer an inappropriate type and amount of risk to the contractor.⁵ In addition, the need for public authorities to be protected against third party critics (Spiller 2009, 2011) lead them to transfer as much risk as possible, sometimes more than what is optimal, through rigid contracting that does not anticipate the need for flexibility of long-term contracts.

Very promising evidence on the impact of PPP in the presence of positive externalities is found in Mollisi (2017). Relying on data collected from the Italian District Heating industry, he finds that the PPP contract allows the technological externality between the different phases of a project to be internalized leading to a positive effect of PPP contracts on total factor productivity. In particular, a unit increase in the capital quality proxy shifts up the output of PPP by 15 per cent.

In every infrastructure project the main types of risk that arise are as follows:

- *Statutory/planning risk.* This alludes to the uncertainty that construction permissions of the infrastructure project may be refused, that unacceptable conditions may be applied to any planning permission granted, and that the planning process may take longer than anticipated and cost more than expected.
- *Misspecification of output requirements.* This risk refers to the possibility that the output characteristics specified in the contract and which form the basis of the contractual obligations are ill or not clearly described.
- *Design risk.* This comprises the possibility of failing to complete the design process in time and within the budgeted costs, or failing to deliver a solution that works satisfactorily and meets the requirements set by the public authority, and of changes in technical standards during the design phase.
- *Construction and time schedule risk.* This refers to construction delay and cost overruns that may arise from changes in labour and materials costs, inadequate cost management, inefficient construction practices, adverse site and weather conditions, protester action, delays in obtaining approvals and permits, and the failure of private partners to perform.
- *Operation risk.* This relates to large operation costs and failure to meet availability and performance standards that may arise from shortage of skilled labour, labour

⁵ The complexity of a project is often a reason for public authorities to decide not to contract out. Levin and Tadelis (2010) used a dataset of service provision choices by US cities and identify a range of service and city characteristics as significant determinants of contracting decisions. One of their results is that the more complex public services are, the less they are contracted out by the cities. Their explanation relies on contracting difficulties.

disputes, late delivery of equipment, poor maintenance schedule, inadequate cost management, etc.

- *Availability risk.* This covers situations where, during the PPP's operational phase, an underperformance linked to the state of the PPP assets results in services being partially or wholly unavailable, or where these services fail to meet the quality standards specified in the PPP contract.
- *Demand risk.* This alludes to the possibility of making lower-than-expected revenues if the actual demand for service falls short of the demand initially forecasted.
- *Risk of changes in public needs.* It refers to the possibilities that output specifications set up in the initial contract become inadequate because of changes in society's preferences. The relative importance of this risk increases with contract length, as for a longer contract the chance of changes in public needs is greater.
- *Legislative/regulatory risk.* This risk includes the changes in the legislative and regulatory framework, e.g. unexpected modifications in tax legislation, tariff-setting rules, and contractual obligations regarding investment and quality standards.
- *Financial risk.* This risk comprises operating and capital losses that may result from interest and exchange rate fluctuations, capital controls restricting convertibility and transferability of profits, etc.
- *Residual value risk.* This is the uncertainty of holding a facility (e.g. land, buildings, water plant) whose value at the end of the contract is lower than that anticipated at the start.

The economic theory has given clear guidelines as to the benefit and cost of transferring risk to the agent. Their basic insights suggest that we should transfer more risk the more the agent can control it and mitigate its consequences (among other factors). The success of PPPs is strictly linked to whether these principles of risk allocation are applied in practice. As discussed in Iossa et al. (2014), many factors may contribute to determine an inefficient risk allocation, raising the risk of project failure. These include political interference, opportunistic renegotiations close to elections (Le Squeren 2016), unsuitable revenue guarantees, and incompetency.

Of course, as soon as an inefficient risk allocation is decided, the management of the contract is more difficult. In Latin American Countries, most cases of renegotiation or contract termination were due to contract design failing to manage risks (Guasch 2004). But also in the EU and the US, risk assessment and allocation are problematic issues, leading to contract revisions (Estache and Saussier 2014, OECD 2017) and unanticipated financial burdens for the public sector (Renda and Schrefler 2006).

4.2 Market structure and sector

The characteristics of the sector targeted by a PPP contract and the prevailing market structure also help in explaining PPP performance. Differences across sectors have for example been observed in the incidence of contract renegotiation for LAC countries. The highest renegotiation incidence corresponds to concessions for essential facilities such as transport and water, where 55 and 74 per cent of the contracts ended up under revision (Guasch, 2004). In the UK, the HM Treasury recommended against the use of PPPs for IT services because fast-changing technology makes long-term contracts

unsuitable. In general, PPPs for sectors where users pay (such as transport sector) and there is alternative infrastructure available, have the additional advantage of allowing users to react to poor service quality, thus providing more incentives to perform to the private contractor.

The level of competition that may differ from one sector to another also plays a role in a PPP's success or failure. The capability to attract efficient bidders at the selection stage and to avoid collusive agreements between firms is crucial, as also is the ability for public authorities to credibly threaten private firms to reverse the decision to contract out in the case of bad outcomes. Chong et al. (2015) illustrated this well. They studied the provision of municipal water services in France, a setting characterized by both direct public provision and concession contracts with private providers. They found that small municipalities pay a significant price premium for water provided through PPPs when compared with publicly provided water; in contrast, large municipalities do not pay a premium on average. Further, large municipalities are less likely to renew an incumbent franchisee that charges an 'excessive' price, while small municipalities' renewal patterns are not influenced by franchisees' excessive pricing. Chong et al. interpret the results as evidence that, although large municipalities can discipline franchisees and thus prevent extraction of quasi-rents by credibly threatening to reverse the contract, small municipalities are less able to do so due to weaker alternative options.

4.3 Macroeconomic instability

The degree of macroeconomic and political instability also matters in accounting for PPP outcomes. In an uncertain macroeconomic environment, contract design failures are more likely since it is difficult for the contracting parties to envisage future contingencies and write the contract terms accordingly (thus aggravating problems arising from contract incompleteness). *Ex ante*, a high aggregate risk level discourages long-term contractual relationships and weakens incentives to undertake investment in infrastructure projects that typically have long maturity.

Empirical evidence shows a correlation between macroeconomics instability and renegotiation incidence: the peaks of contract revision occurred when negative shocks hit LAC countries and triggered severe macroeconomic crises. For instance, generalized renegotiations were observed soon after the Argentine hyperinflation in 1990, the Mexican crisis in 1995, the Brazilian devaluation in 1999, the Colombian recession in 2000, and the Argentine crisis in 2001 (Guasch et al. 2003). Moreover, political instability translates into higher risks of government-led renegotiations which may affect the profitability of the project and impact on the insolvency of the private partner.

4.4 Country regulation and institutional framework

For similar reasons, the regulatory and institutional framework heavily matter since the quality of contract enforceability and governance are critical factors affecting PPP agreements. In LAC countries, weak governance and the government's lack of commitment not to renegotiate also accounted for the recurrent contract revisions. In many of these countries, the regulatory agencies were rarely given training and instruments to carry on their mandate with competence and even lacked political support from the

government. Moreover, in some cases, the government had political control over them, raising concerns on autonomy and accountability issues (Estache 2006). There were instances in which the private partner considered its main counterparts to be ministers and secretaries rather than the regulatory agency. For example, in the Buenos Aires water concession, the Secretary of the Environment and Sustainable Development bypassed the regulators, arguing that regulation of water provision was too complex to be managed by the regulatory agency. Weak institutions reduce the commitment level of the initial contractual agreement and the ability to credibly transfer risks. As an example, Coviello et al. (2017b) showed how inefficient courts can sway public buyers from enforcing a penalty for late delivery in order to avoid litigation, therefore inducing sellers to delay contract delivery. More precisely, using a large dataset on Italian public procurement, they found that where courts are inefficient: (i) public works are delivered with longer delays; (ii) delays increase for more valuable contracts; (iii) contracts are more often awarded to larger suppliers; and (iv) a higher share of the payment is postponed after delivery.

Weak political and regulatory institutions also raise the risk of corruption (see Iossa and Martimort 2016) reducing the performance of PPP contracts. As an example, Coviello and Gagliarducci (2017) studied the impact of politicians' tenure in office on the outcomes of public procurement using a dataset on Italian municipal governments. They found that an increase in tenure is associated with worse procurement outcomes. They suggest that time in office progressively leads to collusion between government officials and local bidders.

A number of political motives have been proposed to explain the interests of the public sector party itself in reneging PPP contracts. The government may increase its chances to be re-elected by expanding spending or by promoting investment in public works that create jobs and boost economic activity (Guasch 2004). By reneging, the government may also circumvent the opposition's scrutiny and reap the political benefits resulting from higher present spending, e.g. a higher probability of being re-elected (Engel et al. 2006). Whatever the reasons, renegotiations have a large cost, as illustrated by Bajari and al. (2014). Studying highway paving contracts, they found that renegotiation imposes significant adaptation costs. Their results suggest that bidders respond strategically to contractual incompleteness and that adaptation costs are an important determinant of their bids: they account for 7.5 to 14 per cent of the winning bid.

5 The case of Paris Velib' as an illustration

The Velib' case illustrates how important are the bundling and risk sharing issues, and what can go wrong in a PPP when these are not appropriately handled.

5.1 Initial agreement: bundling billboards and bicycles

The objective of the Paris Mayor – Bertrand Delanoé – was to provide the largest bicycle-sharing scheme in the world to Parisians without financial contributions from the City. A contraction of *vélo* (bicycle) and *liberté*, (liberty), Vélib' was launched on

15 July 2007 with 10,000 bicycles distributed across 750 automated rental stations. Within two years the scheme had doubled in size to 20,600 bicycles and 1,450 stations.

The Velib' contract bundled the provision of Velib' infrastructure (bike stations and vehicles) and services with the management of the City's billboards. The reason for such an innovation was the promise of the Mayor that the City will not have to pay for the service to be provided (i.e. no need to raise taxes). In exchange for managing Paris' billboards, private companies made offers concerning the number of bicycles they would provide during the 10-year contract. The demand risk was not transferred to the private company: its revenues were not dependent on the success of the Velib' but on its ability to meet the KPIs set out in the contract. All the money coming from the users collected by the private company was to be given back to the City.⁶

It is striking to note that the initial contract was bundling two activities for bad reasons. Economic theory suggests bundling activities in the same contract in order for the private company to internalize the positive externality that may exist. In the Velib' case, there is no link between billboards and Velib', no externalities. The bundling decision is made only to create the illusion that the bicycle sharing program will be for free for the City.

5.2 Call for bids, few competitors and aggressive bids

At every step of a PPP, there are some potential transaction costs (Williamson 1976). The City needs to invest at each step and should not consider PPP as a free lunch. The first critical step is the call for bids. Clear Channel won the first round of offers at the end of 2006, with a proposal of 14 000 bikes. JCDecaux, a French company, proposed only 8000 bikes. After this first call for bids there was an objection from JC Decaux, and the City had to re-organize a call for bids in January 2007. In this second round JC Decaux won with a new offer of 20 000 bikes, 1450 bike stations, and €11 million investment over 10 years.

What explained the switch from 8000 to 20 000 bikes? Nobody knows. But such a change suggests that it might be an aggressive bid, with JC Decaux anticipating ex post renegotiations.

5.3 Incomplete contracting and quality of service

In order to secure the bid, the City included in the initial agreement bonuses and penalties linked to performance indicators. However, several KPIs chosen by the City were clearly not effective and gave rise to strategic behaviours from the private company. For example, one KPI stated that the private company needed to invest in order for Parisians to have the 'ability to pick up a bike at every station in less than three minutes'. This objective was not easy to meet because some bike stations were regularly saturated while others were regularly without any bikes (for example those at

6 Officially, this contract is a traditional public procurement contract. In our definition, it looks more like a PPP with availability payment which thanks to the bundling become zero.

the top of hills). Therefore, the private company had to move many bikes across stations during the day. However, controls made by the City showed that JC Decaux met the objective by leaving a broken bike at every station (Chambre régionale des comptes 2012).

For two other KPIs (safety and cleanliness) the City of Paris agreed to revise and decrease its expectations, accepting that the initial objectives were too high, as it soon became clear that they were unachievable by the private company.

The City also set up penalties in the contract in order to ensure that the number of bicycles contracted for would be deployed on time. However, the private partner was unable to meet the deadlines. The city chose not to apply the penalty of 100 € per missing bike per hour late. This is not a surprise as empirical studies show that penalties are very rarely applied in PPPs (Williamson 1976, Girth 2012).

5.4 Monitoring and public capabilities

The Velib' contract needed a close revenue monitoring from the City as the private company was supposed to give back to the City the money collected from the users. However, it appears that the City contented itself with justifications provided by the private company as to why they did not give sufficient information to enable the city to achieve effective controls (Chambre régionale des comptes 2012). The contract stipulated that 'the account and the books of the company can be checked at any time by the city of Paris' and that 'The controllers will have computer access to view at any time Revenue and users' databases built for this purpose'. But it appears that the City never exercised this option before 2011. A lack of involvement? A lack of capability? A too trusting relationship?

5.5 Incomplete contracting, asymmetric information and renegotiations

There is no full commitment in long-term contracts. Renegotiations are the rule, not the exception (Estache and Saussier 2014). 'Unexpected' vandalism pushed the contracting parties to renegotiate the initial agreement. It was expected initially to renew the bicycle fleet every three years. However, by 2008, 61 per cent of the fleet had been renewed because of broken and stolen bikes. Renegotiations took place in December 2009, leading to a financial contribution by the City (400€ per stolen bicycle over a threshold).

Renegotiation periods are dangerous. They can reflect the willingness of the parties to adjust the contract to new unanticipated circumstances, but they also open the door to strategic behaviour, leading parties to retain their information and haggling for increasing their revenues. The demand from JC Decaux for the City to pay for stolen bikes seems to be a good example of opportunistic behaviour with one party more informed than the other. Indeed, the new contract did not provide that the money should be given back to the City if the stolen bikes were later recovered! This was a serious shortcoming – by 2009, 71 per cent of the stolen bikes had been recovered, although JC Decaux did not give this information to the City. Between 2009 and 2011 the City paid the company several times for the same bike! (Chambre régionale des comptes 2012).

5.6 Evolution of risk transfer

During renegotiations, the contracting parties also agreed to introduce a progressive bonus per level of activity to reflect the increasing difficulty of winning new users: 'For the portion of net revenues between €14 million and €17.5 million of annual profit the private operator keeps 35% of net revenues; For the fraction of net revenues exceeding €17.5 million a year the private operator keeps 50% of net revenues'. The initial traditional public procurement contract moved gradually to a kind of concession contract, whereby the private company was paid by the end users and bore the demand risk to give it incentive to increase the quality of the service and attract new users. This is what economic theory would have suggested at the beginning of the agreement: that the City should transfer some demand risk to the agent which can partially control it and mitigate its consequences.

5.7 Renewal time

The intention of the city mayor was that the Velib' would be free for the City (by giving the management of Paris billboards to the private company operating the scheme), but in the end it cost the City €16 million (Rapport IGP 2016). In April 2017 the city decided to unbundle the management of billboards and the bike sharing scheme – as economic theory suggests – and to award the new contract to a French–Spanish consortium, Smoovengo. JC Decaux contested the decision in court, but lost the case. Discontent with JC Decaux might explain why JC Decaux's contract was not renewed, as incumbent operators are usually favoured at contract renewal time (Chong et al. 2015). JC Decaux also lost the contract for the management of billboards, which was later tendered separately.

6 Conclusion

Economic theory suggests that, in the presence of positive externalities, asymmetric information problems and lack of contractibility of quality dimensions, PPP contracts can result in better-quality infrastructures and services and in lower whole-life costs than traditional procurement.

However, the success of a PPP project in practice depends critically on whether tenders and contracts are designed and implemented in an optimal way from the perspective of economic theory, and this is an institutional factor that changes from country to country, depending on the public-sector accountability and competence. In this regard, the New European Directive on Concessions makes a significant contribution towards more appropriate contracting for PPPs, by requiring PPP contracts to transfer operational risk to the contractor, which, as we have seen, often has not been done in practice. However, whether this norm will have the power to change the implementation of PPPs is something that we will be able to assess only after the transposition of the Directives into the national laws and their applications.

Overall, the years to come will find an increasing role for PPPs in the provision of public infrastructures and services, even if we must be extremely cautious about their

practical implementation. The example of Paris and Velib' illustrates the difficulties for the public sector in handling complex PPP agreements. As experience accumulates, the public sector capacity to deal with PPP contracts is bound to increase. Academia and policy makers should promote more information sharing among administrations and the use of model tenders (standardized tenders) and model contracts (standardized tenders) to improve the tendering and contracting of administrations. Open data and open government would also facilitate learning and accountability, paving the way for more efficient PPPs.

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