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Linda Lobner

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Introduction

Public-private Partnership, a specific form of task fulfillment of administrations, has become increasingly popular over the last few years in many parts of the world as well as in Austria.

A public-private partnership can be seen as an alternative to conventional public sector procurement[1]. In traditional public sector procurement, the public administration determines specifications and design of the infrastructure facility. Then, after bidding, a private-sector contractor is paid for construction of the facility. In a public-private partnership, however, the government specifies only the outputs, which are to be provided by the infrastructure facility. Though, it does not specify how these outputs should be supplied. The private firm/consortium manages and carries out the project. It receives payments (set already ex ante) over the life of the PPP-contract, which are supposed to repay the funding costs and create a return for the investors.[2]

In the context of my thesis I want to describe public-private partnerships as a Principal-Agent relationship. The private partner (agent) does not pursue community interest, however his personal's. As a result, risks arise for the public partner (principal) on establishing a relationship with the private firm. There are two theoretical approaches that can be applied to public-private partnerships, focusing on strategic interactions between the partners. On one hand the contract is likely to be incomplete and thus the relationship can be described by means of transaction costs theory and theory of *incomplete contracts*, respectively. On the other hand, assuming complete contracts, the partnership can be described as a classic Principal-Agent relationship where the existence of *information asymmetries* causes distorting phenomena like moral hazard and adverse selection.
The public administration has to provide adequate incentives to the private consortium in order to ensure ex ante the efficient realization of the stipulated service.

[1] See page 7 for a description of this term based on its use in my work.
[2] See Yescombe (2007), p. 4

I want to describe those incentive issues in public-private partnerships and find out if PPP arrangement yields more efficient results than traditional public sector procurement.

Basics of Public Private Partnership

Public-private Partnerships are not a new phenomenon, since there are examples going back decades from now. The current trend of governments contracting private entities to provide services, however, formally began about 1992 in Great Britain when the government wanted to use private funding as a subsitute for public-sector investment. At the beginning, the British projects, called private finance initiatives (PFIs), were concentrated in the transportation sector. Nowadays they are also used in many other areas. [3]
A survey, conducted by Torres and Pina (2001) shows that an important part (more than 30%) of the services provided by the larger EU local governments are provided under PPP.[4]

Definition and disambiguation

Projects we name “public-private partnerships” are conducted in many different areas, e.g. transport, housing, urban development, urban regeneration, operating cultural institutions, area of education etc.
Because the term public-private partnership is used with too many different meanings, I cannot determine an exact and universally valid definition. In literature one can find various definitions of public-private partnership (PPP).

Even the European Commission in its Green Paper on PPP’s does not bring up a clear definition:[5] “*The term public-private partnership ("PPP") is not defined at Community level. In general, the term refers to forms of cooperation between public authorities and the world of business which aim to ensure the funding, construction,*

[3] See e.g. de Bettignies and Ross (2004), p. 136 or Grout (1997), pp. 56-59
[4] See Torres and Pina (2003), p.?
[5] See Green paper (2004), p. 3

renovation, management or maintenance of an infrastructure or the provision of a service."

Kouwenhoven (1993) has proposed following definition of public-private partnership: "*One can speak of public-private partnership if there is an interaction between the public administration and a private partner, if the achievement of converging objectives is brought into focus, if synergy effects are developed by achieving this proposes, if these objectives have both a social and a commercial character and if responsibility and identity of the partners endure*."[6]
An example of converging objectives can be that of reducing criminality.

According to Budäus und Gründing (1997), public-private partnership is defined in a narrower sense through the following properties:

- Interaction between public administration and actors from the private sector
- Focusing on achievement of converging objectives
- Potential of synergies through cooperation
- Process orientation
- The partner's identity and responsibility endure
- Cooperation relationship is stipulated[7]

Budäus (2006) most of all emphasizes the permanent need of coordination during the contract period and the unstructured initial situation, respectively, as a crucial characteristic of public-private partnerships. As a result of the long contract period (about 30 years) it is not possible to set the particular rights, liabilities, costs, accomplishments and risks in advance. [8]

Budäus and Gröning (1997) especially point out the difference between a PPP and other contracts where conflicting goals exist among the partners. As examples for this they mention contracting out and leasing. The term contracting out describes forms of cooperation between public administration and private partners whose

[6]See Kouwenhoven (1993), p. 120
[7]See Budäus und Grüning (1997), p.54
[8]See Budäus (2006), p. 15

typical characteristic is that the private partner is not interested in performance of the service itself, but in the resulting revenues. [9]

An important point to isolate public-private partnerships from other forms of cooperation is the incompleteness of the contracts, which implies a constant need of cooperation and coordination.[10]

In order to better understand the term public-private partnership it is interesting to compare it with other forms of cooperation between the public and the private sector. Schäffer and Loveridge (2002) distinguish crudely 4 forms of public-private cooperation. At this they focus on projects that should promote economic development. The election of the appropriate form of public-private cooperation depends on the distribution of risks, the expected benefits, and on the level of identity of interests.

[9]See Budäus und Grüning (1997), p. 51
[6]See Budäus(2006), p. 15

Table 1[11]: Characteristics of Different Forms of PPC

	Leader-Follower	Buyer-Seller	Joint Venture	Partnership
Purpose	Likely to be specific (e.g. investing to stimulate private redevelopment of a neighborhood)	Limited, specific (e.g., business recruitment)	Limited and specific (e.g., construction and /or operation or a facility)	Broad, general open ended (e.g., planning a strategy for the redevelopment of a neighborhood)
Decision making	Independent (leader), dependent/ conditional (follower)	Negotiated and competitive	Coordinated or joint, cooperative may also be egalitarian	Joint, cooperative, and egalitarian
Rewards	Individual	Individual, distribution depends on market strengths (which determine clout in negotiation the terms of the cooperation)	Shared, usually string correlation between rewards of participants	Shared, strong correlation between rewards of partners
Risks	Individual but correlated, limited	Individual, distribution depends on sequencing of actions (those who have to act first face the highest risk) and market strengths (which determine clout in negotiation the terms of the cooperation), limited	Shared, usually unevenly; distribution of risk(s) depends on agreement that establishes the joint venture; strong correlation between risks of all participants, limited	Shared, usually unevenly distributed but strongly correlated, limited or unlimited
Formal agreement	Depends on size of necessary investment by the leader	Depends on complexity of transaction	Yes	Yes
Duration	Limited, short to long (most likely short do medium)	Individual exchange relationship or almost always limited, but pursuit of purpose is often open ended; short to medium, depending on complexity of transaction	Limited or open ended; medium to long, depending on the complexity of the project	Open ended, long

According to Schäffer and Loveridge (2002), a public-private partnership is defined as an open ended agreement of cooperation. The partners determine the fundamental objective of the partnership, but at the same time they are open for new

[11] Schaeffer and Loveridge 2002), p. 184

developments and possibilities. Furthermore they point out that partnerships between public authorities and private firms are relatively rare in consequence of the high requirements of an ideal partnership. Long-term partnerships are more probable when there is a high level of permanent interdependency.[12]

A clear and simple definition, which should serve as a basis[13] for my work, is offered by the Canadian Council for Public-Private Partnerships: "*A cooperative venture between the public and private sectors, built on the expertise of each partner, that best meets clearly defined public needs through the appropriate allocation of resources, risks and rewards."*[14]

The term "traditional/conventional public sector procurement", which I use in this work, is not confined to any specific "conventional" form of public-private cooperation. It also includes, and this is the reference of all the theoretical models described below, contracting-out of service provision after the infrastructure has being built.

Characteristics of public-private Partnerships

In this section I will deal with general characteristics of PPP-agreements, areas of application and with the different types of PPP-contracts. In the further analysis of public-private partnerships I'll only differentiate according to the tasks which are undertaken by the private sector[15] and will not confine myself to any area of application in particular. In the sections concerning task bundling, the examined object is a PPP-project where building stage and service provision stage are bundled. This corresponds to a BTO-, BOT-, and BOO- type of PPP. Later, when focusing on the private financing aspect of public-private partnerships, the underlying project type is DBFO or PFI, respectively.

[12] Schaeffer and Loveridge, (2002), p. 181
[13] This definition is of course rather general, but consequently takes into account all the possible types of PPP-contracts, illustrated below.
[14] http://www.pppcouncil.ca/aboutPPP_definition.asp
[15] See Table 2

We have seen that existing definitions of public-private partnerships are rather vague and so not describe them clearly. However, public-private partnerships have peculiarities that make them unique.

The European Commission specified following characteristics of PPPs in its *Green Paper on public-private partnerships and community law on public contracts and concessions:*[16]

- "The relatively long duration of the relationship, involving cooperation between the public partner and the private partner on different aspects of a planned project."
- "The method of funding the project, in part from the private sector, sometimes by means of complex arrangements between the various players. Nonetheless, public funds - in some cases rather substantial - may be added to the private funds."
- "The important role of the economic operator, who participates at different stages in the project (design, completion, implementation, funding). The public partner concentrates primarily on defining the objectives to be attained in terms of public interest, quality of services provided and pricing policy, and it takes responsibility for monitoring compliance with these objectives."
- "The distribution of risks between the public partner and the private partner, to whom the risks generally borne by the public sector are transferred. However, a PPP does not necessarily mean that the private partner assumes all the risks, or even the major share of the risks linked to the project. The precise distribution of risk is determined case by case, according to the respective ability of the parties concerned to assess, control and cope with this risk."

According to Iossa and Martimort (2008), a public private partnership involves a greater risk and responsibility transfer to the private contractor than in traditional procurement. Since the government only specifies the basics of the service it want to be delivered, design, construction and operational risk are largely transferred to the private partner.[17]

[16] See Green paper (2004), p. 3
[17] See Iossa and Martimort (2008), p. 4

Keith Faulkner mentioned three characteristics of a true partnership in the public-private context:[18]

1. they share risks rather than transferring them;
2. boundaries between the parties become blurred rather than defining them too exactly; and
3. they commit to mutual gain

Grout (1997) states three main criteria that a project has to fulfill in order to belong to the category of public-finance initiatives. First, the project has to be fully or at least mainly financed by the private sector and the contract specifies details concerning service consumption and not the asset itself. Second, a significant part of the risk must be transferred to the private partner, and third, the project must be proven to bring value for money to the taxpayer.[19]

Areas of application

Fields of application of public-private partnerships we can find in most diverse territories of public acting.
A compact overview of areas of application provides table 2:

Table 2:[20]: Areas of application of public-private partnerships.

transport	Supply/disposal	Public building construction	
streets, bridges, tunnels airports waterways, harbors public transit	**energy:** generation, distribution **water:** production, preparation, distribution, canalization **garbage:** collection, disposal, recycling	**administration:** city halls, tax offices, ministries **health care/ seniority:** retirement homes, hospitals **education:** kindergartens, schools, colleges, universities	**security:** police buildings, prisons, barracks **leisure/culture:** sports facilities, museums **others:** exhibition grounds, business parks

[18] See Faulkner (2004)
[19] See Grout (1997), pp. 54-55
[20] See Bundesverband deutscher Banken (2004), p. 16

Types of public-private Partnerships

Basically there are 4 different types of public-private Partnerships, differenced by the legal nature of private-sector involvement in the project.

Table 3:[21] types of PPPs

Contract Type	Design-Build Finance-Operate (DBFO)(1)	Build-Transfer-Operate (BTO)(2)	Build-Operate-Transfer (BOT)(3)	Build-Own-Operate (BOO)
Construction	Private	Private	Private	Private
Operation	Private	Private	Private	Private
Ownership*	Public	Private sector during construction, then public sector	Private sector during Contract then public sector	Private
Who pays?	Public sector or users	Public sector or users	Public sector or users	Private-sector offtaker public sector, or users
Who is paid?	Private	Private	Private	Private

* in all cases, ownership may be in form of a joint-venture between the public and the private partner

(1) Also known as Design-Construct-Manage-Finance (DCMF) or Design-Build-Finance-Maintain (DBFM).
(2) Also known as Build-Transfer-Lease (BTL), Build-Lease-Operate-Transfer (BLOT) of Build-Lease Transfer (BLT).
(3) Also known as Build-Own-Operate-Transfer (BOOT).

The typical PPP contract is a DBFO type, where the private partner designs, builds, finances and operates the asset.[22] These also called PFI arrangements usually involve three groups: A public sector agency, a consortium that is responsible for

[21] See Yescombe (2007), p. 12
[22] See for example IMF or Bennet and Iossa (2005)

construction and service provision, and a bank or another financial institution that finances the project. Generally there is no link between the public agency and the financial institution.[23]

Objectives and motivation of public-private Partnerships

The participating parties dispose of diverging motivations and pursue different goals within the partnership. Naturally, public and private interests are partially difficult to synchronize.

For the public administration

Kooiman (1993) mentions public-private partnerships as one of three strategies for the municipality to deal with the constantly changing line of demarcation between itself and society:

- Privatization/ socialization[24]
- (de)regulation
- public-private partnership

Motivations for public-private partnerships are diverse among several countries. Particularly in industrialized countries there is a trend to less public and more private over the last decades. In North America and also among most of the European countries, we can observe a change of paradigms, proceeding with varying velocity.

Table 4 shows an overview of changing paradigms concerning fulfillment of tasks by public administrations:[25]

[23] See Grout (1997), p. 54
[24] Socialization is a less popular strategy. It neither coincides with changing paradigms mentioned below.
[25] See Spiegl (2002), p. 39

Table 4: Changing paradigms of public administration's task fulfillment

old paradigm		new paradigm
state does everything itself	⇨	state regulates through general conditions
national solutions	⇨	transnational, international solutions
public funding	⇨	public and private funding mixed
Network and operation in one hand	⇨	Separation of network and operation
protected monopoly market	⇨	competition through liberalization
supply oriented marketing	⇨	demand orientated marketing
one-dimensional supplier-product-structure	⇨	networked suppler-product-structures

Newly industrializing countries and developing countries focus less on modernization strategies. More important is the generation of essential infrastructure for economic development, especially in countries with surpassing population growth. [26]
There are significant infrastructure expenditure needs for example in sub-Saharan Africa. Nevertheless, due to the stringent budget constraints that many developing countries have faced lately, the majority of these countries cannot afford to allocate the necessary resources to infrastructure. [27]

According to the authors' accordance, **the lack of public funds**[28] is the most essential motivation for the government to provide public services under public-private partnerships. However, the starting positions are very different. In industrialized countries the objective is to expand the existing high level infrastructure. Newly industrializing countries and developing countries, on the other hand, need to satisfy basic necessities of life and to provide a steady and secure economic situation. In the European Union, the pressure to reach the Maastricht criterions causes a wave of privatization and outsourcing of infrastructure facilities to other legal structures. Public-private partnerships help the public administration to

[26] See Spiegl (2002), p 40
[27] See Hammami, Ruhasyankiko and Yehoue (1999), p. 3
[28] Vining and Boardman (2008) mention in this context: "the unwillingness or inability to create adequate capital financing mechanisms due to institutional barriers".

evacuate projects from public budgets in order to guarantee compliance of the criterions.[29]

Vining and Boardman (2008) judge the normative basis for "minimization of on-budget government expenditures and/or the desire not to increase current debt levels", as a reason for the public administration's participation in PPPs, as weak. In the end the government or the users have to pay for construction and service of the project, independent of its form of financing. Using a PPP mainly changes the government's schedule of payment, i.e. it can distribute its cost obligations over a longer period, but it's probably not going to reduce its costs. Concerning durable infrastructure projects, which benefit more generational cohorts, time-shifting can be defended in the name of inter-generational efficiency.[30]

Dewatripont and Legros (2005) even state this as "(ab)using public accounting rules that do not correctly capture government assets and liabilities". Investigating this from the economical point of view is however not necessary as efficiency PPPs is not affected.[31]

Another resource in short supply, apart from the public administration's monetary capital, is **specific competence** possessed by the specialized private partner. Vining and Boardman (2008) describe a few reasons why, infrastructure and services can be provided more cost-efficiently, through a PPP.
First, private entities are more specialized and experienced in construction and management of many businesses and, as a result of this, better economies of scale can be realized. Private-sector infrastructure entities can be global acting firms, while governments normally have less of the experience and expertise required by the project.
The second reason for the private partner's cost-efficiency is that the private partner has a stronger incentive to minimize costs. These incentives are likely to become most evident in for example a greater willingness to alter project specifications or to use new technologies in order to reduce costs.

[29] See Spiegl (2002), p 41
[30] See Vining and Boardman (2008), p. 12
[31] See Dewatripont and Legros (2005), p. 132

Third, the private firm/consortium may have lower labor costs because it potentially hires non-union workforce.
Fourth, monopoly public administrations are especially liable to X-inefficiency or technical inefficiency. [32]

Definition of X-Inefficiency: "*While monopoly may provide the basis for extracting higher prices from customers, the lack of competitive stimulus may raise the costs of producing the goods and services it sells. The lack of incentives or competitive pressures may lead monopolistic firms to neglect minimizing unit costs of production, i.e., to tolerate "X-inefficiency" (phrase coined by H. Leibenstein). Included in X- inefficiency are wasteful expenditures such as maintenance of excess capacity, luxurious executive benefits, political lobbying seeking protection and favourable regulations, and litigation".*[33]

Collin (1998) also mentions the "commercial mental disposition" of the private partner, helping to create a climate of cost pressure and market orientation.

Many authors mention **risk-reduction** for the public sector as a further explanation for participation in a public-private partnership.
The public partner does not longer bear the financial risk linked with dealing with construction costs, maintenance costs and usage levels (revenue).It is probable that the private partner has more expertise with complex financial instruments and better access to markets that provide a more efficient risk-allocation. Another important point is that the private sector does face less political risk than the public administration. However, because a PPP does not reduce the risk itself, but only transfers and spreads risk more broadly, Vining and Boardman (2008) describe this normative justification for involvement in a PPP as "not strong". It has to be asked at what price the risk is transferred to the private sector.[34]

Vining and Boardman (2008) further mention another reason for the public sectors to form a public-private partnership. Governments think that, when providing the service by a PPP, it is **politically more realizable to introduce user-fees** which cause lower government net expenditures. There is better acceptance from the users/voters

[32] See Vining and Boardman (2008), p. 13
[33] OECD Glossary of Statistical Terms: http://stats.oecd.org/glossary/detail.asp?ID=3333
[34] See Vining and Boardman (2008), pp. 13-14

for the private sector's need to create returns in order to cover costs, repay debts or make profit, than for the government to behave like this.[35]

In summary, it can basically be said that through a public-private partnership, three problems should be solved:

1. Renewal of public infrastructure in spite of lacking budget resources due to restrictive budget policy.
2. Lack of efficiency in construction and operation in public infrastructure. Public authorities in many cases don't possess special competences needed in order to efficiently realize larger projects.[36]
3. risk reduction

For the private partner

Basically, the motivation for the private partner to take part in a public-private partnership can be assumed to be directly or indirectly connected to acquisition of profits. Profit seeking is the basic objective for every for-profit firm. The main motive for a private firm to get involved in a public-private partnership project is to make use of and to augment the existing capital as well as to seek profit and rents. Subsidies and fiscal benefits allow the PPP projects the attainment of additional returns. [37]

It is important to see that profit maximization is not a one-period phenomenon. The private firm wants to maximize its profits over the contract life and will try to find new profit sources as the contract unfolds. To prevent opportunistic behavior in that context, contracts have to be written tightly. [38]

One motivation, indirectly connected to profits, is the synergy appearing when the PPP allows a resource, which is produced by the PPP or supplied by the private partner, to be used more intensely. Another motivation is that involvement in a public-

[35] See Vining and Boardman (2008), p. 15
[36] Puwein (2004), p.??
[37] See e.g. Budäus (1997)
[38] See Vining and Boardman (2008), p. 16

private partnership can create goodwill for the private partner. Through a PPP the private firm can reveal its high quality work and its reliability as a business associate. This can improve the private partner's universal image, and reduces the municipal uncertainty about possible future contracts. [39]

Public-private partnerships from the perspective of economic theory

Basically, much of the economic literature on public-private partnerships is based on the incomplete contracts approach, while other authors assume complete contracts under information asymmetries, to explain PPPs in another way.
The most important characteristic of PPPs, which is considered by these two theory streams is the bundling of decision rights.
The different stages of a PPP-project, financing, building and operation, are strongly connected. Building of the asset determines its quality, which then has a positive or negative effect on operating cost and maintenance .The builder has to be induced to internalize possible externalities in order to avoid inefficiencies. It has been showed that the builder has an incentive to do so if he is also in charge of operating and maintaining the infrastructure.
The asymmetric information approach analyses how informational rents and incentives to make efficiency-enhancing efforts change if decision rights are unbundled. On the other hand, the other approach concentrates on the effects of contractual incompleteness on the efficient allocation of decision rights.[40]

Apart from considerations concerning task bundling, current literature pays attention to the financial side of public-private partnerships. What are the economic consequences of private funding of PPP-projects? Also this question is answered by the two theoretical streams mentioned above.

[39] See Collin (1998), p. 275
[40] See Dewatripont and Legros (2005), p. 124

Information asymmetries and incomplete contracts are both parts of the so called contract theory. The theory of contracts has his origin basically in the objective to turn away from general equilibrium models, which were not able to explain the economy realistically enough. In the 1970s economists founded a new way to study economic relationships. "They focused on partial models that take into account the full complexity of strategic interactions between privately informed agents in well-defined institutional settings."[41]

Before explaining applications on public-private partnerships I will give an overview of the relevant economic theory, i.e. the relevant basic ideas.

Theory of incomplete contracts

The theory of incomplete contracts is mainly the continuation of transaction costs theory and formalizes its intuitions. Transaction cost economics, principally due to Coase and Williamson, assumes that agents are opportunistic but also limitedly rational.[42] The modern theory of incomplete contracts originated in Grossman-Hart (1986) and Hart- Moore (1988). The foundations of the theory were much debated in the 1990s, when Maskine-Tirole (1999) published their "irrelevance theorem".
A simplified description of this theorem was made by Siemer (2004): *"If parties can assign a probability distribution to their possible future payoffs, then the fact that they cannot describe the possible physical states (e.g., the possible characteristics of the good to be traded) in advance is irrelevant to welfare. That is, the parties can* devise *a contract that leaves them no worse off than were they able to describe the physical states ex ante."*[43]

[41] See Salanié (2005), p. 2
[42] See Salanie, p.194
[43] See Siemer (2004), p. 95, The original theorem can be found in Masine, Tirole (1999), p. 92.

Basic Idea of transaction costs theory

Transaction cost theory dates from the following question: "Why don't all the economic processes (transactions) take place in the market, but in enterprises (hierarchies)?"
According to Coase and later to Williamson, transaction costs play the crucial role for the existence of hierarchies. Transaction costs result from the search of appropriated partners, from cost of negotiation and completion of a contract as well as from **costs of controlling and enforcement of the contract**, which is the centre stage of transaction costs theory. The decision if an economic transaction is made in the market or in a hierarchy depends on the amount of total costs (transaction cost + production costs).[44]

Holdup Problem

Many assets are relationship specific and have little value outside the relationship under study. The input of specific capital has a decisive meaning. Specific investments are made for particular transactions and are not or only partially applicable to others. Hence, the contractual partner who made a specific investment is dependent on the compliance of the contract. This dependence contains the risk of renegotiations which can lead to blackmailing (holdup) respectively to the loss of quasi-rents to the contractual partner who hasn't made any or less specific investment. As a result the partners tend to underinvest.[45]
The characteristics of the holdup problem can be made more formal by an archetypical model of the incomplete contracts literature.[46]

Implications of transaction costs theory for public-private partnerships

Many tasks of the public administration require specific capital. Thus the transaction costs theory is applicable to PPPs. At the beginning of the process there is an award

[44] See Mühlenkamp (2006), pp. 33-34
[45] See e.g. Salanié (2005) p.195 or Mühlenkamp (2006), p. 34
[46] See Salanié (2005), p. 196

procedure in order to find the best potential seller. Afterwards we can find extensive, but also inevitably incomplete contracts to be negotiated, monitored and enforced. However, if the public administration chooses hierarchy as an alternative, that means it takes charge of the task itself, these costs don't arise. But on the other hand there possibly emerge higher production costs due to legal regulations or policy objectives that restrict the radius of operation more than in the private sector.[47]

Finally the **total costs** of cooperation with a private firm and a pure public solution (there are also intermediate forms) are compared. The more specific the needed capital is, the bigger is the hold-up risk and the expensive are cet.par. legal regulations and their monitoring and enforcement. When applying the transaction costs theory to PPP, one has to consider two peculiarities:

1. The public administration wants to achieve other objectives than a private enterprise – instead of realization of profits, public interests; and
2. the selection of the partner is liable to stricter regulations than in the private sector- award procedure.

In theoretic models the objective of public interest is interpreted as welfare maximization, the sum of producer surplus and consumer surplus. This implies, firstly, a conflict of interests between public administration and private partners. However, economic literature identifies this goal conflict as the driving force of operational efficiency at least in PPP undertakings.
Secondly, the aim of welfare maximization potentially weakens negotiation position of the public administration compared to the private partner. Bös (2001a) and *Bös/Lüfelsmann showed that efficient contracts[48] are possible for the cases of unilateral and mutual specific investments, if the buyer behave welfare maximizing and non varying quality.*

[47] See Mühlenkamp (2006), p. 37-38
[48] A contract is efficient if:
1. if it causes the optimal incentive to invest; and
2. if it effects optimal tradeoff

(Investment incentive is based on the expected incentive to invest.)

However, if quality is varying, which is more realistic, the re-negotiation position of the public administration worsens because of its welfare orientation. Then, efficient contracts are only possible under certain circumstances but not in general. [49]

Another peculiarity of the transaction costs theory concerning PPPs is the obligation of the public administration to a complex risky bidding procedure of the European Union:

- This leads to especially high transaction costs in public tasks.
- The supplier protection within the framework of EU- award regulations tends to result in waste of capital. Due to the possibility for a defeated bidder to controvert the award decision in the court of law, not only the winners of the tendering are betrayed into specific investment. Investment from losers of the tendering is wasted. [50]

Conclusions on PPP:

- The bidding procedure alone implies high (ex ante) transaction costs
- After placing the order, re-negotiations, legal disputes and consequently high ex post transaction costs are to be expected.
- According to the logic of transaction costs theory (and also to the theory of property rights), the private enterprise has incentives to stronger conduct negotiations/re-negotiations than the public administration. This can be assumed because in a private firm the negotiation performance is reflected in company profit respectively in management salaries. By contrast, for representatives of a public administration there usually are no financial consequences thanks to better negotiation results. These **incentive asymmetries** alone create doubts of the general advantage of PPP's for tax payers.
- Also without considering the id asymmetric incentives, because of its welfare orientation the public administration would have an inferior negotiating position to the private enterprises. [51]

[49] See Mühlenkamp (2006), p. 39
[50] See Mühlenkamp (2006), p. 39
[51] See Mühlenkamp (2006), p. 40

The above-mentioned insights on public-private partnerships are rather intuitive. The continuation/formalization of the transaction cost theory is the theory of incomplete contracts, which is also applicable to the peculiarities of PPPs.

Incomplete contracts

In many economic relationships there are contingencies that may affect the contractual relationship, but are not taken into account in the contract. There are several reasons for a contract to be incomplete. First, at some point the cost of writing a specific clause to cover an unlikely contingency exceed the benefit. The second reason is the incapacity or unwillingness of courts and third parties, to verity ex post, the value of particular variables observed by contractants. Third, in some cases it is difficult, or even impossible to assign probability to relevant events and to stipulate the clauses of the contract on these events. From all these reasons follows that contracts typically include only a limited amount of variables, the most important ones or the ones which are easiest measurable. If there are unforeseen events, arising during the relationship, which have influence on the conditions of the relationship, and the contract includes no clue as to how the parties should respond, they will renegotiate the contract. In contrast to the implications of complete contracts, renegotiation can be socially useful and occur in equilibrium. [52]

The Buyer-Seller Model

The seller S and the buyer B jointly operate a physical asset that produces a good to the seller at cost c that has value v for the buyer.
Either party can make a specific investment with the following features. First, it increases the productivity of the relationship. Second, it has a lower value outside of this relationship than inside. Third it is costly to the party that makes it. The seller's investment i_s reduces the cost for the seller (human capital investment). The buyer's investment i_b increases the value of the good. Thus, $c = c(i_s)$ is a decreasing convex

[52] See Salanié (2005), p. 194

function and $v = v(i_b)$ is an increasing convex function. Assuming that $\underline{v} = v(o) \geq \bar{c} = c(0)$, it is always efficient to produce and trade. The two parties are risk-neutral and do not discount the future. If trade takes place at price p, their utilities are $p - c(i_s) - i_s$ and $v(i_b) - i_b - p$.

If they can't agree, what is going to happen depends on who owns the right to control the asset. If only one of them has the control right, he or she can use it to trade on a competitive market where the equilibrium price of the good is p^c. Because the specific investment has no value on this market, the value of the good is v(0) and the costs are c(0). This implies that $c(0) \leq p^c \leq v(0)$. In the first-best outcome of this model the buyer and the seller always trade. The total surplus is $v(i_b) - i_b - c(i_s) - i_s$. Hence, their equilibrium investments i_s^* and i_b^* are given by $c'(i_s^*) = -1$ and $v'(i_b^*) = 1$.[53]

For a better understanding of incomplete contracts, I want to describe shortly the situation under a complete contract.

The complete contract

Under a complete contract there are no information asymmetries and no uncertainty. Under this conditions the contracts causes the first-best. Both parties choose the efficient investment level, and they accept the contract as by definition,

$$c(i_s^*) + i_s^* \leq \bar{c} \leq p \leq \underline{v} \leq v(i_b^*) - i_b^*$$

It is not required to write the values of the specific investments in the contracts. Hence, they need not to be verified by a court. It is enough to fix the price in the contract in order to ensure that buyer and seller choose first-best investment levels. Under complete contracts, the allocation of property rights has no influence on efficiency. Assuming that the good initially belongs to the buyer (seller), it is likely that the price p will be closer to $\bar{c}$ ($\underline{v}$).[54] Thus, the allocation of property rights changes the income streams and is of concern to the parties, but the efficiency of the fixed-

[53] See Salanié (2005), p. 196-197

[54] $\underline{v} = v(0) \geq \bar{c} = c(0)$

price contract does not depend on it. Salanié (2005) states this as “one of the biggest shortcomings in the theory of complete contracts”. The complete contracts theory has little to say about the efficient allocation of property rights. [55]

Incomplete contracts and property rights

The theory of incomplete contracts connects the question of property rights to legal tradition. According to Roman law, property rights are a combination of *usus* (the right to use the good), *fructus* (the right to what it produces), and *abusus* (the right to sell or give away the good. Grossman-Hart (1986) claim that property rights should be seen as residual control rights. This means, that when an unforeseen contingency occurs, the owner of the asset has the right to decide how it should be used. The owner also has exclusive rights on all incomes that have not been shared ex ante by a contractual agreement. If contracts are complete, these rights, of course, are worthless, because, by definition, no unforeseen contingency can arise. Thus, property rights only matter if contracts are incomplete.
It is assumed that the characteristics of the good, like the specific investments, cannot be verified by a court, whereas they can be observed by buyer and seller. Consequently, ex ante there can be no contract although ex post trade is always efficient. After the parties have observed the specific investments, when renegotiating, most literature assumes that they are going to share the increase in total surplus equally. The final price depends on possibilities of threat for both parties. Thus, the incentives to invest of buyer and seller and efficiency depend on the initial allocation of property rights. To show this, there are 3 cases to be distinguished:[56] In the case of a PPP, the public administration naturally corresponds to the buyer which buys a service from the private firm/consortium.

[55] See Salanié (2005), p. 197
[56] See Salanié, p. 198 et seq

The seller owns the asset

If the seller doesn't agree on a price with the buyer, he can sell the good on the competitive market. In that case, the buyer has spent i_b in vain. If the parties renegotiate a price p, the seller obtains a utility gain $(p - p^c)$, while the buyer gains $(v(i_b) - p)$.

At the Nash solution, the final price is: $p = \frac{v(i_b) + p^c}{2}$.

The buyer's ex post utility is: $v(i_b) - i_b - p = \frac{v(i_b) - p^c}{2} - i_b$.

The seller's ex post utility is: $p - c(i_s) - i_s = \frac{v(i_b) + p^c}{2} - c(i_s) - i_s$.

These formulas indicate that the seller has the incentive to choose the efficient investment level i_s^*, while the buyer underinvests: $v'(i_b) = 2$

The buyer owns the asset

If the buyer owns the asset, he can ask another seller to operate it for price p^c, while the initial seller has made an investment of i_s in vain. Renegotiating increases the buyer's utility by $p^c - p$ and the seller's utility by $p - c(i_s)$. It can be shown by simple calculations that the buyer invests at the efficient level and the seller underinvests: $c'(i_s) = -2$

Joint ownership

Both parties need the accordance of the other to operate the asset. If the parties do not trade, both lose their investments. Trading they gain $p - c(i_s)$ and $v(i_b) - p$.

The resulting equilibrium price is $p = \frac{v(i_b) - c(i_s)}{2}$ and final utilities are

$\frac{v(i_b) - c(i_s)}{2} - i_b$ and $\frac{v(i_b) - c(i_s)}{2} - i_s$.

Under joint ownership, however, both parties underinvest, as $v'(i_b) = 2$ and $c'(i_s) = -2$.

Depending on the shape of c and v, in this simple model, both, a seller or buyer ownership can be optimal. Joint ownership is the worst case. The model implies that the owner always invests efficiently. Under incomplete contracts, property rights protect their holders against a holdup. Then the optimal allocation of property rights depends on the particular social costs of underinvestment made by the contractants.

Asymmetric Information Problems

Numerous Authors make use of the classic Principal-Agent approach, where contracts are in general counted as complete[57], in order to explain the peculiarities of public-private partnerships. Contrary to this approach, we have seen the incomplete contracts approach where the information structure is assumed to be symmetric.[58] There are 3 types of asymmetric information problems:

1. Moral hazard
2. Adverse Selection
3. Signalling

The first two problems occur frequently in the public-private partnership's literature, while Signalling isn't mentioned to the same extend. Before expanding on the implementations on PPPs, I'm going to describe the basic moral hazard and adverse selection problems. To be able to compare the cases of asymmetric information, a base model is needed.

Symmetric information contracts

First-best:

All the relevant information is verifiable (both have the same information), and the principal's problem is to design a contract that the agent will accept. The principal

[57] From the legal point of view, the contract is complete since obligations are specified for all states of the world.
[58] See Martiensen (2000), pp. 361, 367

has to decide the effort e that he/she demands of the agent and the wages $\{w(x_i)\}_{i=1,...,n}$ that the agent will earn according to the result. The set of possible results is finite, and the probability of result x_i depends on effort e: $\Pr[x = x_i | e] = p_i(e)$, for $i \in \{1,2,...,n\}$. The principal will try to determine the cheapest contract that the agent is going to accept, given a certain effort level. The principal has to offer the agent a utility level, which is greater or equal the utility level that the agent would obtains from a outside relationship.[59]

Solving the following problem, leads to the (pareto) efficient solution:

$$\underset{[e,\{w(x_i)\}_{i=1,...,n}]}{Max} \quad \sum_{i=1}^{n} p_i(e)B(x_i - w(x_i))$$

s.t. $\sum_{i=1}^{n} p_i(e)u(w(x_i)) - v(e) \geq \underline{U}$ *agent's participation condition*

Where $U(w,e) = u(w) - v(e)$ is the agent's utility function and the principal's behavior depends on the function $B(x-w)$. B is assumed to be concave increasing: $B' > 0$, $B'' \leq 0$. The concavity of B suggests that the principal is either risk-neutral or risk-averse. The marginal disutility of effort is not decreasing: $u'(w) > 0$, $u''(w) \leq 0$, $v'(e) > 0$, $v''(e) \geq 0$.
The principal is not directly interested in the agent's effort, but in the result of the task.

According to the solution of the id maximization problem, the **optimal contract** has the following characteristics:

The optimal distribution of risk implies that the ratio of the marginal utilities of the principal and the agent should be constant, independent from the result:

[59] See Lafont and Martimort (2002), p. 34

$\frac{B'(x_i - w^*(x_i))}{u'(w^*(x_i))}$ =constant[60] *efficiency condition*

Depending on the objective functions of both parties, there are several implications of the efficiency condition:

If the principal is risk-neutral, $B' =$ constant, then the efficiency condition requires that $u'(w^*(x_i)) =$ constant for all i. If the agent is risk-avers, then $u'(w^*(x_i)) = u'(w^*(x_j))$ and thus $w^*(x_i) = w^*(x_j)$. Consequently, at the optimal contract, the agent's payoff is independent of the result. If the principal is risk-neutral, he accepts all the risk in the optimum. The agent receives the same payoff in all eventualities and w* depends only on the effort demanded.

If the agent is risk-neutral, $u' =$ constant, and the principal is risk-averse, $B'' =$ constant, then there appears the opposite scenario. The efficiency condition requires that $B'(x_i - w^*(x_i)) =$ constant for all i. Hence $x_1 - w^*(x_1) = x_2 - w^*(x_2) = ... = x_n - w^*(x_n)$. Now, the principal's profit is independent of the result and the agent bears the full risk, insuring the principal against variations in the result. This can be interpreted as a franchise contract.

If both parties are risk-averse, each one will have to bear a part of the risk, depending on their degrees of risk-aversion. From the Kuhn-Tucker first order condition of the id maximization problem, it can be derived that

$$-\frac{B''}{B'}\left[1-\frac{dw^*}{dx_i}\right]+\frac{u''}{u'}\frac{dw^*}{dx_i}=0$$

Macho-Stadler and Pérez-Castrillo (2001) denote the principal's measure of absolute risk-aversion by $r_p = -\frac{B''}{B'}$, and by $ra = -\frac{u''}{u'}$ the agent's measure of absolute risk-aversion. Thus, the above equation can be written as:

[60] See Macho-Stadler (2001), p. 21-22 for formal proof.

$$\frac{dw^*}{dx_i} = \frac{r_p}{r_p + r_a}$$

This equation pictures how the agent's wage changes given an improvement in the result. The more risk-averse is the agent (i.e. the greater r_a), the less the wage is influenced by the result. The optimal contracts can be of a complex shape. A simple contract format is the set of linear contracts: $w^*(x_i) = c + bx_i$.

The linear contract is only optimal when $\frac{dw^*}{dx_i} = b$. Though, this condition is satisfied in very few occasions since it requires that the participants have constant risk-aversion. Even when information is symmetric, optimal contracts are only infrequently based on linear payments.[61]

In the case of complete information, delegation does not entail any costs for the principal. He/she receives the same utility as if he/she carried out the project him/herself.[62]

Moral hazard

Second-best:

"A moral hazard problem exists when the agent's action is not verifiable, or when the agent receives private information after the relationship has been initiated."[63]

Moral hazard[64] would not be a problem if agent and principal had identical objective functions. The conflict over which action should be taken out is the source of the arising agency costs. [65]

There are two possible forms of the moral hazard problem:

[61] See Macho-Stadler and Pérez-Castrillo (2001),pp.17-27
[62] Seee Laffont and Martimort (2002), p. 34
[63] See Macho-Stadler and Pérez-Castrillo (2001), p. 9
[64] As well as adverse selection
[65] See Laffont and Martimort (2002), p.146

1.: The parties possess the same information when the relationship is established. The informational asymmetry is due to the fact that once the contract has been signed, the principal cannot observe/verify the action/effort of the agent, or at least, the principal cannot perfectly control the action. In order to model this situation it is assumed that the agent's effort, made after signing the contract, is not verifiable, and thus this variable cannot be explicitly included in terms of the contract. Consequently, the agent's payoff cannot depend on the effort he offers, or that he has been contracted to offer. The corresponding timeline is showed in Illustration 1.

III. 1[66]: The standard moral hazard problem.

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P designs the contract	A accepts (or rejects)	A supplies non-verifiable effort	N determines the state of the world	Outcome and payoffs

The most famous example for this kind of moral hazard problem is a simple labor contract where the effort of the employee (agent) is not verifiable.

If the agent is risk-neutral, there is no effect on trade efficiency resulting from non-observability of efforts. The principal can obtain the first-best outcome by offering a contract that is contingent on the production level. The contract includes incentives for good production and penalizations in the case of bad production. The risk-neutral agent is willing to accept this contract if his ex ante participation constraint is satisfied by the expected payment. It is possible to induce the optimal effort level without violating the agent's participation constraint.[67]

If we now consider, for example, the case of a risk-neutral principal and a risk-adverse agent[68], the solution will obviously differ from the optimal contract under symmetric information. A constant wage in this case provides full insurance but does not motivate the agent to exert any effort. In order to do this the principal must make the agent bear some risk. Thus the agent has to obtain a risk premium from the

[66] See Macho-Stadler and Pérez-Castrillo (2001), p. 9
[67] See Laffont and Martimort (2002), p. 147
[68] This is also the case that is mostly assumed concerning a relationship between the public administration (principal) and a private partner (agent) in a PPP-relationship. See page 51 and following for a further discussion.

principal. There is a conflict between the participation and the incentive constraint that leads to an "insurance-efficiency trade-off".[69]

In this second-best world, the agent's effort is not observable, and once he has signed the contract, he will make the lowest possible effort (e^{min}). The principal will now obtain a lower expected profit than in the symmetric information situation because the agent's effort is lower than the efficient level. The principal will anticipate this behavior, and thus if he/she offers a contract based on a fixed payoff, he/she will choose the wage (w^{min}) that exactly compensates the agent for the effort he uses.

Formally, the problem can be written like this:

$$\underset{\left[e,\{w(x_i)\}_{i=1,\ldots,n}\right]}{Max} \quad \sum_{i=1}^{n} p_i(e)B(x_i - w(x_i))$$

s.t. $\sum_{i=1}^{n} p_i(e)u(w(x_i)) - v(e) \geq \underline{U}$ *participation constraint*

$e \in \arg\underset{\hat{e}}{Max}\left\{\sum_{i=1}^{n} p_i(\hat{e})u(w(x_i)) - v(\hat{e})\right\}$ *incentive compatibility constraint*

The notation "argmax" denotes the arguments that maximize the objective function that follow.[70]
Solving the id program is difficult and not necessary for my purpose.[71]

An easier way to obtain many of the conclusions of more general models it to study the problem, where the agent can only choose between two possible effort levels, high (H) and low (L). $e \in \{e^H, e^L\}$
It is also assumed that the disutility for the agent is greater when he/she supplies high effort than when he makes lower effort: $v(e^H) > v(e^L)$

[69] See Laffont and Martimort (2002), p. 148
[70] Holstroem (1979), p.76
[71] Holstroem (1979) mentiones two approaches that can be used so solve the program. See e.g. Spence and Zeckenhauser (1971) for one approach and e.g. Mirrlees (1974) for the other.

For all results $x_1 < x_2 < ... < x_n$, from worst to best, the probabilities, $p_i^L = p_i(e^L)$ and $p_i^H = p_i(e^H)$, that the result will be x_i when the agent offers low (high) effort, are greater than zero.

The Principal prefers high effort to low, since good results are more likely when the agents works hard than when he is lazy.

p^H first order stochastically dominates p^L:

$\sum_{i=1}^{k} p_i^H < \sum_{i=1}^{k} P_i^L$, for all $k = 1,...,n-1$

This expresses that productivity is greater given high effort than given low effort.

In order to simplify the analysis, the principal is assumed to be risk-neutral. The case where the agent is risk-neutral is easy to solve and not very insightful since the solution (a franchise contract) is the same as in the symmetric information case.

Thus, the focus is only on a relationship involving a risk-averse agent.

If the principal demands e^L, no moral hazard problem exists. In this case the principal pays a fixed amount to the agent (as under symmetric information) and the agent makes low effort. If the principal pays a fixed amount, he cant prevail on the agent to make more effort than e^L.
However, if the principal demands high effort e^H, which means that the good results are very attractive, he/she needs to find a contract under which the agent's payoff depends on his/her effort. The corresponding incentive compatibility constraint is written as follows:

$\sum_{i=1}^{n} P_i^H u(w(x_i)) - v(e^H) \geq \sum_{i=1}^{n} p_i^L u(w(x_i)) - v(e^L)$ *incentive compatibility constraint*

The agent will make the effort e^H if the expected utility gain associated with this effort is greater than the implied increase in cost. The principal has to solve the same program as above, but with the new incentive compatibility constraint.

Solving the id problem, some conclusions can be made on the optimal contract situation under a moral hazard problem:

Unsurprisingly, the principal's profit is strictly lower under information asymmetries than when he/she faces symmetric information.

The wage will be greater the smaller the ratio p_i^L / p_i^H is.

If a risk-neutral principal pays the agent according to the result, it is only to give him incentives to make higher effort. In order to do this, he writes the contract on the only verifiable variable, the result x_i. It is important to understand that the wage should not depend at all on the value that the principal places on the result. The reason is that this valuation is independent of the effort made and thus doesn't serve as an incentive for the agent to work harder. On the other side, the result, of course, provides information about the agent's behavior. The payoffs are related to this information and will increase in the result as long as a greater result is associated with greater effort. The objective of the contract is not the optimal risk-sharing arrangement, but that of giving incentives to the agent. [72]

2. Some moral hazard problems are attributable to informational asymmetries arising when, before executing the contracted effort, the agent observes the result of Nature's decision but the principal doesn't. When the contract is signed the uncertainty is equal for both, but before undertaking the contracted action, the agent will have and informational advantage by observing a relevant variable. (See Ill. 2)

[72] See Macho-Stadler and Pérez-Castrillo (2001), pp.37-51

Illustration 2[73]: Moral hazard with hidden information.

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P designs the contract	A accepts (or rejects)	N chooses the state of the world which is only observed by A	A makes effort	Outcome and payoffs

To this form of moral hazard problem, the literature has paid less attention, but it is still interesting to resume it briefly. An example for this kind of problem can be the relationship between an investor (individual) and a financial intermediary who has information about the current stock-market conditions that the individual doesn't possess.

After signing the contract, the agent observes if the conditions are favorable or unfavorable, θ^G or θ^B. In the second case the agent may regret having signed it, as he/she normally will get less utility under unfavorable conditions.

There are two types of models. One includes an ex ante participation constraint (given the expected utility at the moment when the contract is signed), where the agent cannot break off the contract after having signed. The other model type includes ex post participation constraints, so that the agent gets an expected utility which is never less than his reservation utility.

If the principal offers a fixed wage, whenever the agent observes the good state of the world θ^G, he/she will be interested in making an effort less than the optimum, and then telling the principal that the market conditions were θ^B. Under the optimal contract in this case, when the agent learns that the conditions are good, the contract will lead him to make an effort e^G, where w^G is the corresponding wage. A distortion is introduced with respect to the effort demanded when the market is unfavorable. The objective of this is to make the contract less attractive to the agent when the market situation is good.

[73] See Macho-Stadler and Pérez-Castrillo (2001), p. 10

When the participation constraint is to be satisfied ex ante, on average, the agent's utility will be equal to the reservation level. In the case of an ex post participation constraint, the agent will get his reservation utility $\underline{U}$ when the market situation is bad. However, if the market conditions are good, then his utility will be greater than $\underline{U}$. These results are already close to those under adverse selection models, mentioned in the next chapter. [74]

Adverse Selection

An adverse Selection problem occurs when the agent holds private information before the relationship is begun. The principal can verify the agent's behavior, but the optimal decision, the cost of this decision depends on the agent's type which is private information to the agent. The principal knows that the agent can be one of several possible types but he/she cannot identify it.

In contrast to the moral hazard problem where the uncertainty is exogenous, in this case the uncertainty is exogenous to the principal.[75]

Illustration 3[76]: Adverse Selection Problem

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N chooses the type of A which is only observed by A	P designs the contract	A accepts (or rejects)	A supplies effort	N chooses the sate of the world	outcome and payoffs

An example for a situation where the principal does not have all the relevant information about the agent would be that of a person who hires a carpenter for home renovations. In this case the actual task may be well defined, but e.g. the worker's ability, cleanness, and attitude are not.

[74] See Macho-Stadler and Pérez-Castrillo (2001), pp.51-57
[75] See Laffont and Martimort (2002), p. 146
[76] See Macho-Stadler and Pérez-Castrillo (2001), p.11

The adverse selection problem does not only exist when the agent's informal advances concerns his own personal characteristics, but also when there is asymmetric information relating to any variable relevant to the contractual relationship. Macho-Stadler and Pérez-Castrillo (2001) mention in that context the example of a firm negotiating a license agreement for the acquisition of a technology. Another example could be that of a public agency contracting a private firm for construction of a hospital without having information about the latest technology innovations, concerning hospital building.

In their Model, Macho-Stadler and Pérez-Castrillo (2001) consider a risk-neutral principal who contracts a risk-neutral or risk-averse agent to undertake some action on his/her behalf. Making an effort e is associated with an expected payment to the principal of $\prod(e)$. The agent's effort is assumed to be verifiable. The objective function is concave, thus is assumed that $\prod'(e) > 0$ and $\prod''(e) < 0$.

The agent can be of two different types, which is not distinguishable by the principal. The two agent types differ only concerning their effort disutility function, which is $v(e)$ for type 1, and $Kv(e)$, with $k > 1$ for type 2. Thus the disutility for any particular effort level is lower for type 1. The first type is now termed the "good" type (G) and the second is the "bad" type (B).

The agent's utilities are $U^G(w,e) = u(w) - v(e)$ and $U^B(w,e) = u(w) - kv(e)$.

If there was no adverse selection problem, there would be two different optimal contracts according to the agent's type. In the optimum the principal would demand more effort from the good agents (to whom effort is less costly): $e^{G*} > e^{B*}$.
Under symmetric information, the wage amount the two agent types will receive depends on the particular problem.[77]

The optimal contract under asymmetric information describes a trade-off between rent extraction and efficiency:[78]

[77] On the one hand for a given effort level, B requires a greater wage than G in order to participate. However, on the other hand, the principal demands less effort from B than from G, and thus the latter should receive a greater wage, at equal effort costs.

If under asymmetric information, the principal offered these two id contracts to any agent, allowing him to freely select the contract that he most likes, then a bad agent will choose the contract that is designed for him, but the good agent also prefers $(e^{B}*, w^{B*})$ to (e^{G*}, w^{G*}):

$$U^{G}(w^{B*}, e^{B*}) + u(w^{B*}) - v(e^{B*}) > u(w^{B*}) - kv(e^{B*}) + \underline{U}\,.$$

Under asymmetric information the principal can not identify the agent's type. Therefore the principal considers that the probability of an agent being type G is q, where $0 < q < 1$.

The principal can design a menu of contracts $\{(e^{G}, w^{G}), (e^{B}, w^{B})\}$, where (e^{G*}, w^{G*}) is directed designed for the most efficient type agent, while (e^{B*}, w^{B*}) is catered to the least efficient type. By separating the two contracts, the principal can generally obtain greater expected profits than if only one contract was provided. In order to make either type select his/her adequate contract, the scheme must be self-selective. The menu of contracts must cause that each agent receives greater utility by truthfully revealing his type than by deluding the principal.

The principal, thus, maximizes his/her expected profits subject to the restrictions that, the agent decides to sign that contract designed for his particular type:

$$\underset{[(e^{G}, w^{G}), (e^{B}, w^{B})]}{Max} \quad q\left[\Pi(e^{G}) - w^{G}\right] + (1-q)\left[\Pi(e^{B}) - w^{B}\right]$$

s.t.

$u(w^{G}) - v(e^{G}) \geq \underline{U}$	*participation constraint (good agent)*
$u(w^{B}) - kv(e^{B}) \geq \underline{U}$	*participation constraint (bad agent)*
$u(w^{G}) - v(e^{G}) \geq u(w^{B}) - v(e^{B})$	*incentive compatibility constraint[79] (good agent)*
$u(w^{B}) - kv(e^{B}) \geq u(w^{G}) - kv(e^{G})$	*incentive compatibility constraint (bad agent)*

[78] See Laffont and Martimort (2002), p. 41

[79] A menu of contracts $\{(e^{G}, w^{G}), (e^{B}, w^{B})\}$ is incentive compatible when (e^{G*}, w^{G*}) is weakly preferred to (e^{B*}, w^{B*}) by the type-G agent and (e^{B*}, w^{B*}) is weakly preferred to (e^{G*}, w^{G*}) by the type-B agent. (See Laffot and Martimort (2002), p. 37)

The first participation constraint is implied by the second and the third equation. Thus it is possible to exclude the first constraint, which is an important feature of the adverse selection problem. The principal just needs to take into account the participation constraint to the least efficient agent.

After solving the id problem, we can observe the following characteristics of the optimal contract menu $\{(e^G, w^G), (e^B, w^B)\}$:

- The characteristic feature of adverse selection contracts is that the most efficient agent receives greater utility than his reservation level due to his private information- the high-efficient agent's participation constraint is always strictly satisfied. This is due to the fact that if a menu of contracts makes it possible for the low-efficient agent to reach his reservation utility, it will also be possible for a high-efficient agent that faces lower production costs. Thus only the efficient type gets a positive information rent.[80]
- The incentive condition for the best agents binds in the solution, while that corresponding to low-efficient agents doesn't.
- The efficiency condition binds for the good agent. The only efficient contract is that designed for the agent with the best characteristics.
- A downward output distortion for the type-B agents is introduced. This is to make the contract (e^{B*}, w^{B*}) less attractive to type-G agents. The effects of a distortion are that the principal looses efficiency regarding type-B agents, but pays less informational rent to the type-G agents. This trade-off is favorable to the distortion.

Incomplete contracts theory and public-private partnerships

One of the most important features of public private partnership is the long contract period (including the building and operating-phase), attributable to the long life cycle of infrastructure facilities. As explained above, in order to reduce transaction costs

[80] See Laffont and Martimort (2002), p. 42-43

the partners involved in a PPP try to design contracts that prevent them from hold-ups. However, it is not possible to anticipate every incident and development that will affect the partnership over the contract period and even if all contingencies would be predictable, it will presumably be too complicated to include all that in the contract. Thus, the public-private partnerships contracts are incomplete. Renegotiations of PPP-contracts, that may arise, generate inefficiencies and make residual rights significantly relevant. [81]

The basis of recent articles on public-private partnerships, using an incompletes contract approach, is the classic literature on privatization and contracting out of public services. An important paper, written by Schmidt (1996), developed a model of privatization dealing with different allocations of ownership rights that affect allocative and productive efficiency. Hart, Schleifer and Vishny (1997) formulated a Model to explain when a government should provide a service itself and when it should contract it out. Their Model concentrates on the provision of prisons, but is also applicable to provision of other goods or service. An insightful adaptation of this model in order to explain the costs and benefits of public-private partnerships provides Hart (2002). A recent work by Iossa and Martimort (2008) provides a further model.

De Bettignies and Ross (2006) deal with the question of when private financing of public projects is optimal.

See Table 5 for an overview of the models discusses in my work.

[81] See Grout (1997), p. 64 and de Bettignies and Ross (2004), p. 140

Table 5: Incomplete Contracts models of PPPs

Model	*Features and Assumptions*
Hart, Shleifer, Vishny (1997)	• belongs to classic make-or-buy literature – deals with contracting-out • used as foundation for model of Hart (2002), discussing PPPs • assumed that cost and quality innovations can be introduced without breaking the initial contract • difference to standard property rights model: only one party invests, but can make two kinds of investment contracts define the extent to which quality can vary
Task Bundling	**When is bundling of building and operation optimal?**
Hart (2002)	• choice between public and private ownership is ignored • contract is incomplete in both cases – public provision and PPP • builder can make productive (reduces total costs, increases quality) and unproductive investment (reduces total cost and quality) • Difference to basis model of incomplete contracts: takes length of contract as given, world ends at date 2→ doesn't matter who owns asset at the end of the contract
Iossa and Martimort (2008)	• PPP is characterized by bundling, private ownership during the contract period, and ownership transfer to the government when contract period ends • residual value of the asset cannot be specified ex ante, but is observable ex post • discusses bundling and unbundling in two different cases - public and private ownership
Financing	**When is either public or private financing preferable?**
Model	*Features and Assumptions*
de Bettignies and Ross (2006)	• objective: determination of the optimal contract between developer and investor • two cases: public and private development – 2 equilibriums • project duration is assumed to be 2 periods, project can be terminated after period 1 • payoffs are not known ex ante and depend on whether the project-management has been "good" or "bad" • main assumption: either party has the same probabilities of being a good or bad manager

Incomplete contracts and task bundling

Let's begin with a more precise description of **Hart, Shleifer and Vishny (1997).** Their Model wants to explain why private contracting is generally cheaper and why in some cases the quality of the service provided by the private contractor is lower, and in other cases higher than under government provision. This model does not deal directly with public-private partnerships, but is insightful as contracting out is the origin of PPPs.
Within the model, the government agency chooses between contracting out and in-house provision. The provider of the service, the government employee or a private contractor, can invest his/her time in quality improvement or in cost reduction efforts. Cost reduction has an adverse effect on quality and neither innovation can be included in the contract ex ante.

The adverse effect on quality is modeled like this:

$$B = B_o - b(e) + \beta(i)$$
$$C = C_o - c(e)$$

B stands for benefit, C for costs; e and i denote effort corresponding to cost innovation and quality innovation; $c(e) \geq 0$ is the reduction in cost corresponding to the cost innovation: $b(e) \geq 0$ is the reduction in quality due to cost innovation; and $\beta(i) \geq 0$ describes the quality increase less cost from the quality innovation.

The key role in this model is played by the function $b(e)$, which measures how much quality falls caused by a cost cut.

They make the important assumption that cost and quality innovations can be introduced without breaking the initial contracts because it is sufficiently incomplete. Further, they assume that the government and the Manager (private or government employee) are at least partly locked into each other once their relationship is in motion.

Both types of innovation need the allowance of the owner of the asset – the one who owns the residual control rights - to be carried out.

If the provider is a government employee, she/he needs the approval from the government for either improvement. Consequently, the government employee receives only a fraction of the returns of the particular improvement. Furthermore, because the government employee is replaceable, the ways of effective compensation for either improvement are limited.

On the other hand, if the provider is a private contractor, he/she doesn't need the government's approval for a cost reduction. However, for quality improvements if he wants to get a higher price.

Thus, the private contractor has basically stronger incentives to improve quality and to reduce costs than the government employee. Though, the private's incentive to reduce costs is too strong as he ignores the adverse impact on quality.

After analyzing the model, Hart, Shleifer and Vishny (1997) set up some propositions about the efficiency of the different ways of service provision. Their arguments basically suggest: In-house provision is more advisable when non-contractible cost reductions have larger deleterious effects on quality, when quality innovations are unimportant, and when corruption in government procurement is a severe problem. In contrast, when quality reducing cost reductions can be controlled through a contract or competition, when quality innovations are important, and when patronage and powerful unions are a severe problem inside the government, privatization should be preferred.

According to Hart (2002), the model of Hart, Shleifer and Vishny (1997) ignores investment on the government side but supposes that the prison manager can make two kinds of investment. He points out that a government employee has little incentive to make either investment because it is easy for the government, which is the owner, to hold up the employee. The model of Hart, Shleifer and Vishny (1997) differs from the standard property rights model of the firm in two ways. First, only one party invests, but makes two kinds of investments. Second, the contract between the

government and the prison provider defines the extent to which quality can vary and thus plays an essential role. In the standard property rights model, long-term contracts are assumed to be sufficiently incomplete and thus useless.

The model of Hart, Shleifer and Vishny (1997) deals with the question of when contracting out and when in-house provision is optimal, but doesn't refer to public-private partnerships.

Contracting-out is the fundament for PPP but there are some crucial differences between these two forms of public-private cooperation:[82]

1. the large number of tasks that are assigned to the same private partner (task bundling), and
2. the privatization of project funding.

Hart (2002) designed a model in terms of public-private partnerships. To explain the costs and benefits of public-private partnerships, he uses a model from the type of Hart, Shleifer and Vishny (1997). The choice between public and private ownership is ignored for convenience, and all provision is assumed to be private. He takes into account that under a PPP, construction and service provision are bundled. In case of a prison, the builder builds and runs the prison, more precisely, he may also subcontract with another firm to run it. Under conventional provision, however, the government enters into a contract with the builder that builds the facility and afterwards with another private party to run it. Under conventional provision, the government specifies the basic characteristics of the facility, required after the build stage, while under a public-private partnership it stipulates the basic service that should be provided in the operation stage.

In both cases the contract is incomplete, allowing variations of the facility and the service, without breaking the contract. In that model, the builder can make two different investments, i and e, while i is a productive investment[83] that makes the

[82] See de Bettignies and Ross (2006)
[83] As examples for i, he mentions a higher quality, more pleasant or airier building.

prison more attractive and easier to run and e is an unproductive investment[84] that reduces total costs and quality.
Concerning the example of a bridge, e can be using a new technology that reduces the stress on the beams, which lowers the repair-frequency and hence leads to less traffic interruptions; i can be a design with fewer traffic lanes, which reduces cost of cleaning, painting and maintenance, but leads to higher traffic congestion.[85]

The builder faces a total investment cost of $i + e$.

The unverifiable benefit of the society, measured in money, is described like this: $B = B_o + \beta(i) - b(e)$, and the cost from running the prison is $C = C_o - ?(i) - c(e)$.

Thus, the investment i raises B and reduce C, while investment e reduces B and C.

In the first-best situation, the net benefit, $B - C - i - e$, is maximized by selecting the adequate amounts of i and e:

$$B_0 + \beta(i) - b(e) - C_0 + ?(i) + c(e) - i - e$$

The first order conditions are:

$$\beta'(i^*) + ?'(i^*) = 1$$
$$c'(e^*) - b'(e^*) \leq 1 \text{ with equality if } e^* > 0$$

It is assumed that $c'(0) - b'(0) \leq 1$, which means that e is socially unproductive.

If $e^* = 0$ there is a corner solution in the first-best. All other first order conditions are assumed to have interior solutions.[86]

[84] An unproductive investment can be that in the building process of the prison, the builder might recognize that installing an electric fence reduces the likelihood of escapes. That would reduce operating costs because fewer guards had to be hired, but probably it would not be desired by the government since it reduces quality.
[85] See Dewatripont and Legros (2005)., p. 126
[86] See Hart (2002), p. 6

In the second-best, the builder's investments are non-verifiable, so they cannot be included in the contact. However, it is assumed that the provider of the prison services notices i and e. There are two different cases to be compared.

1.: Separate contracts – unbundling:

In this case the prison is built by one firm and then another firm is contracted for service provision.
Imagine that the government contracts with a builder to build a prison, with specified basic characteristics, for a fixed price. When the facility is built, the government offers a contract for service provision to the lowest-bidding private entity. If there is competition among the bidders, the government will pay a price equal to the operating cost for the provision of the prison. Unsurprisingly, in this case the builder builds the cheapest prison possible, without breaking the contract. Although either investment affects the operating contract price the government has to pay later, the builder doesn't pay attention to this. $i = e = 0$

2.:PPP – bundling:

This case corresponds to service provision through a public-private partnership, where one private firm/consortium builds and operates the asset.
The government specifies the basic quality of the service to be provided between dates 1 and 2 at a price P and offers this contract before the facility is built. In this case the builder internalizes the cost of service provision, because he either provides the service him/herself or subcontracts the service.

At date 0 the builder selects i and e to solve the following problem:

Max $P - C - i - e = P - C_o + ?(i) + c(e) - i - e$

s.t. $?'(.) = 1$

$c'(.) = 1$

In summary, under unbundling the productive investment, i, is too low, but the unproductive investment, e, has the right amount. In contrast, under bundling, the builder does still too little, but more, of the productive investment, but also more of the unproductive investment.

Hart(2002)'s simple conclusion is that unbundling is good if the quality of the building can be well specified, but the service quality cannot be. In that case, underinvestment in i under conventional provision isn't a serious problem, while overinvestment in e under PPP may be.
Grout (1997) states that one of the biggest problems of the PPP model is that service specification in advance may not always be optimal. It may be difficult to anticipate e.g. reasonable quality standards for the following 20-30 years, which are determined by e.g. technological progress.[87]

On the other hand, according to Hart (2002), PPP is good if the service quality can be well specified in the initial contract, or, more generally if there are good performance measures which can be used to reward or penalize the service provider, whereas the quality of the facility can't be. Under these circumstances, underinvesting in i under unbundling may be a serious problem, but overinvestment in e under PPP isn't.

Hart guesses that prisons and schools fall into the first category since contracting on the building is rather simple, while contracting on the service isn't. Hospitals may fall into the second category, although specifying service quality may not be easy. However, it may be easier to find some reasonable performance measures concerning how patients are treated than to specify the hospital's building quality.

Hart (2002) states that his conclusions are at odds with much current thinking of policy makers because they frequently argue that PPPs are good because the private sector is a cheaper source for financing or insurance than the public sector. The current paper may shift attention from financing issues to what seems to be the central issue: (relative) contracting costs.

[87] See Grout (1997), p. 64

The important difference of Hart's model, in comparison with the basis model of the incomplete contracts theory, is that he takes the length of contract as given. It is implicitly assumed that the world ends at date 2. As a result, it doesn't matter who owns the asset at the end of the contract.[88] The Model can also be applied outside the public-private context.

Iossa and Martimort (2008) take both, the "agency route" and the "ownership route" to explain the applicability of public-private partnerships. The results of their model of "pure agency considerations" are described below. Considering only this agency theory they arrive at the result that "PPPs should always be weakly preferred." In order to find circumstances under which unbundling may be optimal they define PPP as an organizational form, which is characterized by bundling of design and operation, but also by private ownership of the asset over the length of the contract.[89]

Ownership matters as far as the asset has some residual value for the owner at the end of the contract. To benefit from this, the residual market value provides incentives to invest in asset quality. Thus, ownership can be seen as a substitute for more complete contracts. This residual value depends on the specificity of the asset. Facilities that provide public services can be of two different categories:

1. generic facilities as for example leisure centers, office accommodation and IT systems
2. specific facilities such as schools, prisons and hospitals

The less specific is the asset, the more demand exists from other users than the government, and the less differ the public and private residual value of the asset. The residual value is not contractible ex ante, but can be observed ex post.

Formally, the value of the asset at the end of the contract, when the government uses this facility for public service provision, is denoted as sa, with $s > 0$ and a denoting quality enhancing effort. The corresponding value for private use is αsa, with $\alpha < 1$. α describes the degree of asset specificity, with a higher α

[88] By ignoring ownership-considerations, he may be running the risk of overlooking important incentive issues.
[89] This corresponds to the characteristics of a BOT-contract. (See Table 3)

corresponding with less asset specificity. It is always optimal that the government owns the facility at the end of the contract since $\alpha < 1$.
Ownership transfer to the government when the contract period ends, is one of the main characteristics that differentiates PPPs from privatization.

1. The model shows that **public ownership** has no influence on incentives. The reason is that the government owns the asset throughout the contract (there is no sale of the asset after the contract expires) and the quality enhancing effort is not contractible. Thus it is not possible to give any incentives to the firm, and whether bundling or unbundling is chosen, efforts and welfare do not change.

2. In the case of **private ownership**, at the end of the contract, efficiency requires to transfer ownership to the government. Ex post, the price $p*$ at which the ownership is transferred is a result of Nash bargaining with equal bargaining power between the two parties:

$$p* = \arg\max_{p}(sa - p)(p - \gamma sa) = \frac{(1+\gamma)}{2} sa$$

The net benefit of the private owner, $\frac{(1-\gamma)}{2} sa$, from transferring the ownership (ex post) increases in quality enhancing effort a and thus strengthens his incentives to improve the assets' quality.

The owner's incentive to invest is greater when the asset is less specific. Asset specificity reduces the payoff if ownership is not transferred to the public sector when the contract expires. This compounds the hold-up problem and reduces the private party's incentives, since asset specificity reduces its possibility to be sold otherwise.

Unbundling: In this case the builder, who is also the owner, has the following incentive constraint:

$$a_u^{pr} = \frac{(1-\gamma)}{2} s$$

The operator's effort and optimal incentives are equal to the second-best results of pure agency considerations mentioned below:

$$e_u^{pr} = e^{SB}_u = \frac{1}{1+r\sigma^2} < 1$$

Bundling: The consortium maximizes its expected payoff for effort levels that solve:

$$(a,e) = \arg\max_{(\tilde{e},\tilde{a})} \frac{(1-\gamma)}{2} s\tilde{a} + \alpha - \beta(\theta_0 - \tilde{e} - \delta\tilde{a}) - \frac{\tilde{a}^2}{2} - \frac{\tilde{e}^2}{2} = \left(\beta\delta + \frac{(1-\gamma)}{2} s, \beta\right)$$ [90]

where s is large enough to insure a positive quality enhancing effort even with a negative externality.[91]

Comparing public with private ownership, the model reveals that private ownership always dominates public ownership, regardless of choosing bundling or unbundling. Further it explains that public-private partnerships (private ownership and bundling), strictly dominate traditional contracting (private ownership and unbundling), if and only if there is a positive externality between the design and the operation phase. If the externality is negative (compared to the case of public ownership, which has no effect on efforts) bundling leads now to strictly lower efforts than unbundling under private ownership! The incentives of the owner to invest in asset quality are lowered if the builder has to internalize the negative externality that asset quality has on operational cost.[92]

[90] Notation: $\frac{\tilde{e}^2}{2}$ and $\frac{\tilde{a}^2}{2}$ are the quadratic disutility functions. Service cost to the firm are $C = \theta_0 - e - \delta a + \varepsilon$, where ε is a random variable with variance σ^2 and mean of zero which denotes operational risk that the firm faces while managing the asset. θ_0 is the inborn cost of service. e denotes cost-reducing effort and a denotes quality-enhancing effort in the build stage.

[91] A negative externality occurs when improving the quality of the asset increases operational costs. See pure agency-considerations from Iossa and Martimort (2008) below.

[92] Iossa and Martimort (2008), pp. 14-17

Incomplete Contracts and financing of public-private partnerships

Concerning the issue of private financing in PPPs, there is a model developed by **de Bettignies and Ross (2006)** using the incomplete contracts approach. They focus on the privatization of the finance function since this is a much discussed characteristic of public-private partnerships. On one hand, many governments benefit from public-private partnerships because they can reduce their debt level. However, on the other hand, opponents of public-private partnerships object that governments are able to borrow with a lower interest rate than private firms and thus, the government should keep financing the project, at least in parts. Therefore, they want to find out when either public or private financing is preferable.

Their model analyzes a particular project (e.g. construction and operation of a bridge), that can be financed and developed by either a private party or by the government. Either party has to find an investor to guarantee the initial capital required if he/she undertakes the project. The project duration is 2 periods and at dates 1 and 2 it produces profits and consumer surplus. The project can be ended at date 1, after the date 1 surpluses have been generated. In this case the assets are redeployed and profits of termination and consumer surplus are generated in the next period. The project payoffs are unknown ex ante and its ex post value depends on the quality of project management. Either party is of one of two types of, the “good” and the “bad” type. The main assumption of the model is that the probabilities of being good or bad are the same for private and public developers. The developer’s type is not known at the beginning of the project and is revealed to herself/himself and to the investor at date 1 when the first period payoffs are observed. It is assumed that if the developer is bad, termination of the project is socially optimal. In contrast, if the developer is from the good type, it is socially optimal to continue the project. The model leads to equilibriums under either form of project development, which are tested for ex ante and ex post (in)efficiencies.

To sum up, I want to picture the most interesting results of de Bettignies and Ross (2006), without describing the details of the model:
Under private project development (PPP), two problems emerge:

1. The private developer mainly maximizes profits. Social surplus is not maximized, and hence the impacts of decisions on consumer surplus are ignored. This may result in an inefficient continuation or termination decision after the first period. The government however has the incentive and the means[93] to ensure that efficient decisions are made by the private developer and thus this externality has no negative impact on social surplus in equilibrium. This means that private development is ex post efficient.

2. The second problem arises because of contractual incompleteness. For the investor to provide the loan to the private developer, he has to expect non-negative returns on his investment. Loan repayment is assumed endogenously in this model. The private developer may have an incentive to "strategically default", if the benefit from not having to make the debt repayment is larger than the loss of control and second period payoffs. Consequently, the amount the private developer can commit to repay and the amount a lender is content to provide in the first place, are limited. Thus, some projects that would be funded in a first-best world, are not funded under private development. Private development is ex ante inefficient.

Under public financing, the conclusions are different. Governments in principle want to maximize total surplus, however they also have some self-interest. The government doesn't want to reveal bad public management since if it is perceived as being a good manager it is more likely to be re-elected. Thus, terminating a project may entail political costs as it symbolizes weakness. In equilibrium, a weak government has an incentive to inefficiently continue projects, in order to manipulate the voters' view of the government's type. Public funding is thus ex post inefficient. However, ex ante inefficiency arises also for the same reason. This can also be described as the existence of "soft budget constraint"-inefficiencies.[94]

Hence, private development may be ex post superior to public development because it leads to efficient ending of bad projects, whereas public managers may continue such projects in order to avoid political costs. Private funding may be preferred since

[93] E.g. by "subsidizing" termination with tax revenues.
[94] See de Bettignies and Ross (2006)

it hardens the project budget constraint; however, projects with lower expected returns can only be financed by public developers, who can commit to larger debt repayments than private developers.[95]

The term soft budget constraint, founded by Janos Kornai, was adopted from microeconomic theory of the household. The budget constraint is softed „*when the strict relationship between the expenditure and the earnings of an economic unit (firm, household, etc.) has been relaxed, because excess expenditure will be paid by some other institution, typically be the paternalistic State, and when the decision-maker expects such external financial help with a high probability, which is included in his behaviour.*[96] Originally the soft budget constraint was first observed in in socialist economies in the 1980s in Eastern Europe and Asia, and has played an important role in transition economies. The soft budget constraint, however, is also from concern outside socialist economies.[97]

According to Dewatripont and Legros (2004), the softness of budget constraints shows lacking commitment or a lack of completeness of contracts. They ask if outside financing can help to harden the budget constraint and thus can prevent opportunistic behavior of consortium. Problems resulting from opportunistic behavior can be partly diminished by auditing and monitoring. In order for this to be effective, the auditors and monitors must have enough knowledge about the concerning area. Further, sufficient incentives have to be provided for them to spend the required resources. Under outside financing, the investors have the stake to bear monitoring costs, and, if they are specialized in financing large projects, they also have the expertise and the prestige to be reliable monitors. Financial intermediation can be seen as delegated monitoring.[98]

[95] Further insights by Iossa and Martimort (2008) concerning bundling of financing and operating tasks, are described below.
[96] See Kornai (1986), p. 4
[97] See Dewatripont and Roland (1999), p. 2
[98] See Dewatripont and Legros (2004), p. 140

Asymmetric information and public-private partnerships

There are a number of asymmetric information models discussing public-private partnerships. An overview of the models discussed in the next pages is provided in table 6.

Table 6 Asymmetric Information Models of PPPs

Task Bundling	**When is bundling of building and operation optimal?**
Model	*Features and Assumptions*
Bentz, Grout and Halonen (2005)	• two separate equilibriums: low one off service set up cost high one off service set up cost • All agents are risk-neutral
Iossa and Martimort (2008)	• two different externality-scenarios: positive externality: quality-improvement reduces operational cost negative externality: quality-improvement increases operational cost • incentive constraints depend on sign of externality • government: risk-neutral, private firm/consortium: risk-averse
Iossa and Martimort (2009)	• slightly different purpose comparing to their previous paper: focus on transportation sector shows additionally how task bundling is linked with risk transfer • government: risk-neutral, private firm/consortium: risk-averse
Financing	**When is bundling of finance and operation optimal?**
Model	*Features and Assumptions*
Iossa and Martimort (2008)	• extension of their basic model • Modelling transaction cost: outside financiers have expertise to get access to some informative signal, which the government cannot observe. • Government: risk-neutral, private firm/consortium: risk-averse

Asymmetric information and Task bundling

With reference to Hart, Shleifer and Vishny (1997) and Hart (2002), who dealt with PPPs under an incomplete contracts approach, there is a paper by **Bentz, Grout and Halonen (2005)** using an complete contracts approach in order to complement the incomplete contracts approach. They also ask for when it is advisable for the government to form a public-private partnership, and when it should keep to traditional procurement, but the difference is that they do not focus on ownership. They argue that ownership and the incomplete contracts approach, respectively, cannot fully explain the distinction of public and private for two reasons.
First, within some PPP models, the ownership of the asset is transferred to the public sector upon completion, and then it is leased to the private party.[99] This cannot be explained by the incomplete contracts.
Second, ownership per se is only weakly emphasized by governments, when identifying the benefits of PPPs. Governments rather stress the fact that whoever builds the asset has to deal with long run consequences.

Their model focuses on the role of the procurement process and rests on the strong assumption that contracts about asset procurement are complete.

The principal characteristics of the model are as follows:
There are two or three players, government, builder and service provider, whereby the builder and service provider are combined in a PPP. In the so called conventional model, the government, G, purchases the asset from a private builder, B, and the service is provided by a service provider, SP, who uses G's asset. Every party has private information. They identify two asymmetric information problems:

First, there is a *moral hazard problem at the build stage*: The quality of the asset (i.e. how cheap it is to operate it later on) depends partly on the investment made by the builder, and whether he/she has made the appropriate quality-enhancing investment is the builder's private information. The government needs to create incentives at the build stage if it buys or builds the asset, in order to guarantee that this investment is made.

[99] See BTO-Contract, Table 3.

Second, there is an *adverse selection problem at the service provision stage*. Service provision costs (unit cost of service provision, which can be high or low) are private information to the service provider. As the service provider will state the provision costs as high even if they are low, the government has to provide appropriate incentives to ensure that he/she reveals the correct costs.

Further there are one-time set up costs at the service provision stage, which are private information to the government. The government may have information about these costs, for example because it may have provided that service itself in the past. The set up costs are revealed in equilibrium of this model. An important assumption is that the fixed set up costs, are large enough to ensure a separating equilibrium, one with low set up costs and another with high set up costs.

Under conventional procurement the government has to give incentives separately to the builder and to the service provider. Under a PPP, however, the same party builds and operates the asset. Thus, given that the cost of the quality enhancing investment at the build stage is sufficiently low, the private party has an incentive to build the best asset possible since this maximizes information rent at the service provision stage. Consequently, under a PPP, the government doesn't have to pay incentive costs to guarantee a quality enhancing investment at the build stage. A PPP is always the best policy if the quality enhancing investment cost at the build stage is low.

If quality enhancing costs are high, in a PPP the government can still ensure that the correct build is made by increasing the payments it makes to achieve cost revelation. These payments are higher than would be necessary to achieve revelation if the cost structure could be taken as given, but a PPP is still the best approach if costs are not too high. Under traditional procurement the separate incentives can be designed specifically to each task. Once it becomes too expensive to incentivize the PPP only through the revelation mechanism, traditional procurement becomes superior. Thus PPPs are optimal when quality enhancing investments at the build stage are relatively cheap and the set up cost at the service provision stage are low. However, carrying out a PPP when government costs are high will not lead to lower costs.

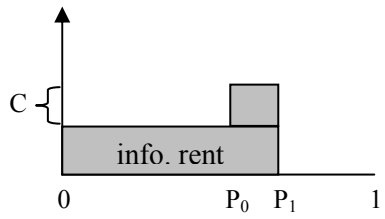
This indicates that *comparisons between the traditional procurement model and PPPs can suffer from sample selection bias*. Traditional procurement should not be compared to PPPs, but to the costs that would be delivered by a PPP in the high cost scenario. Without correcting for project type, PPPs may falsely appear more efficient and cost effective than public sector provision. This sample selection bias is a problem for cross section comparisons, but should not be a problem for comparing activities that have been moved from the public to the private sector. However, most examples of activity comparisons bear on privatization and not on public-private partnerships.

See Ill. 4 for an overview of Bentz, Grout and Halonen (2005)'s results.

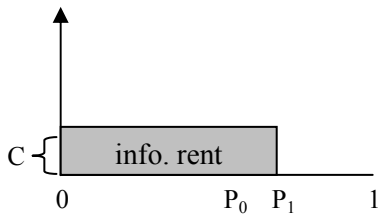
Illustration 4[100]: Difference between a PPP and conventional procurement.

(1) Required investment c is small: PPP preferred

Conventional:

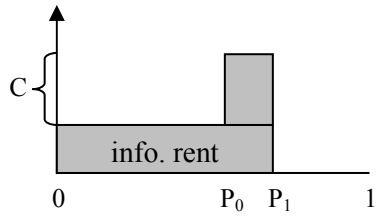


public-private partnership:

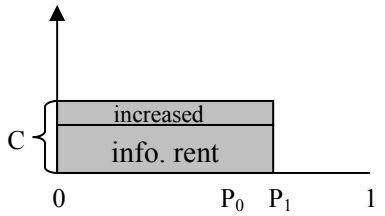


(2) Required investment c is large: Conventional procurement preferred

Conventional:



public-private partnership:



P_0 is the probability that the asset is efficient regardless of who builds it. $(1-p_1)$ is the probability of the asset to be inefficient. With the probability $(p_1 - p_0)$, the asset will be inefficient, unless whoever

[100] See Bentz, Grout and Halonen (2005), p.21

builds it makes an investment of cost c, in which case the asset will then be efficient. These probabilities and the investment cost c, are common knowledge.

In (1), under PPP, the government pays only the information rent to the service provider, while under conventional provision, G has to pay the same information rent plus $c(p_1 - p_2)$ to the builder as an incentive for the quality enhancing investment. A PPP is obviously cheaper for the government. In (2), when c is larger, G can generate the quality enhancing investment only by raising the transfer in the revelation mechanism. The higher c or the closer p_0 to p_1, the more attractive is conventional provision to the government.

Corresponding to the objective of my thesis I want to picture more precisely the case of *public-private partnership with low set up cost*, which is an optimum according to Bentz, Grout and Halonen (2005):[101]

G buys the service from the private sector consortium (PC), which is responsible for building the asset and providing the service. The government offers a refined contract[102] to the private sector consortium, by which the PC learns pre-contractual information about the project's characteristics, which are the service set up cost and whether efficiency improvements need to me made at the build stage. The contract is the standard, second-best (truth-telling), contract under adverse selection, and allows the PC to obtain information rent whenever service provision cost is low. The incentive for the PC to invest in efficient assets is determined by the size of the information rent. The standard information rent required to oblige truth-telling is sufficient to implement optimal investment as well.

Notations:

The unit cost of service provision is denoted as $\tilde{\theta}$. If the asset is efficient, $\tilde{\theta} = \theta_e$, if the asset is inefficient, $\tilde{\theta} = \theta_i$, with $\theta_i > \theta_e$ and $\Delta\theta \equiv \theta_i - \theta_e$.The demand curve q is a continuous, and continuously differentiable function. $q_e = q(\theta_e)$, $q_i = q(\theta_i)$

[101] See Bentz, Grout and Halonen (2005), p. 15

[102] A "refined" contract is defined as a contract which provides precise specifications of the project and thus reveals G's private information, while a "generic" contract doesn't reveal this information.

and $\Delta q \equiv q_e - q_i$. The service set up cost is denoted as $\tilde{f}$, $\tilde{f} \in \{0, f\}$, with $\Pr(\tilde{f} = 0) = \pi$ and $\Pr(\tilde{f} = f) = 1 - \pi$.

The distribution over $\tilde{\theta}$ is known to be $\{(\theta_e, p), (\theta_i, (1-p))\}$, where p can either be p_0 or p_1. depending on whether the investment was made.

The G's objective is the maximization of net consumer surplus $v(q(k)) - kq - s - t$, where $v(.)$ denotes gross consumer surplus $v(q) = \int_0^q q^{-1}(x)dx$, s denotes subsidies to the private consortium and t denotes other net transfers from the government.

Under PPP, the government designs a refined contract, a schedule of subsidies (s_e, s_i) for the PC so as to solve the following problem.

$$\max_{s_e, s_i} p[v(q_e) - q_e\theta_e - s_e] + (1-p)[v(q_i) - q_i\theta_i - s_i]$$

s.t.

(1)	$s_e \geq q_i\theta_i - q_i\theta_e + s_i$	*incentive compatibility constraint (low cost type provider)*
(2)	$s_i \geq q_e\theta_e - q_e\theta_i + s_e$	*incentive compatibility constraint (high cost type provider)*
(3)	$s_e \geq 0$	*participation constraint (low cost type provider)*
(4)	$s_i \geq 0$	*participation constraint (high cost type provider)*

As id explained standard, constraints (1) and (4) are binding in equilibrium, while (2) and (3) are unbinding.

The second-best subsidies are thus characterized by

$$s_i = 0 \text{ and}$$

$$s_e = q_i\Delta\theta,$$

where $q_i\Delta\theta$ is the amount of information rent extracted by SP if the unit cost is low.

The government's payoff in this case is:

$$V(p) \equiv p[v(q_e) - q_e\theta_e - q_i\Delta\theta] + (1-p)[v(q_i) - q_i\theta_i]$$

Subsidies (more precisely, the difference $(s_e - s_i)$) control the incentive to make the efficiency enhancing investment. Thus G may find it optimal to increase s_e beyond $s_e = q_i \Delta\theta$, if the loss from increased rent is outbalanced by the gain due to an increased probability of obtaining an efficient asset. Increasing s_e doesn't distort incentive compatibility, as long as $s_e \leq s_i + q_e \Delta\theta$. As augmenting s_i does not increase the investment incentive, we know that $s_i = 0$. Thus the highest subsidy G can give to PC is $s_e = q_e \Delta\theta$. G's payoff from raising information rent up to $\tilde{s}_e$ is

$$V^I(p, \tilde{s}_e) \equiv p\left[v(q_e) - q_e\theta_e - \tilde{s}_e\right] + (1-p)\left[v(q_i) - q_i\theta_i\right]$$

Now, they ask how far the government is prepared to raise information rent if that increase causes investment. The information rent, which is paid with probability p_1, above the standard information rent $q_i \Delta\theta$, which is paid with probability p_0, is profitable if it is less or equal to the expected gain in net consumer surplus $(p_1 - p_0)\left[v(q_e) - v(q_i) - (q_e\theta_e - q_i\theta_i)\right]$.

In conclusion, Bentz, Grout and Halonen (2005) developed their main proposition about investments in the public-private partnership model:
If the government chooses the PPP model then it wants to generate investment up to an investment cost of

$$c = \frac{p_1 - p_0}{p_1}\left[v(q_e) - v(q_i)\right] - \frac{p_1 - p_0}{p_1}\left[q_e\theta_e - q_i\theta_i\right] + \frac{p_0}{p_1} q_i \Delta\theta$$ [103]

Iossa and Martimort (2008) developed a multi-task moral-hazard model to study the conditions under which bundling of the project phase, in other words, undertaking a PPP, is optimal. In distinction from Bentz, Grout and Halonen (2005), within their model, two alternative *externality scenarios* are particularly analyzed.[104]

[103] See Bentz, Grout and Halonen (2005) for the formal proof and further explanations.
[104] In the id model, Bentz, Grout and Halonen (2005) differentiate equilibria with high and low set up costs.

In the case of a *positive externality*, $\delta > 0$, a quality improvement of the asset also reduces the operational costs. This can be for instance that the design of a prison with better sightlines for staff that improves security may also reduce the required number of security guards. In contrast, a *negative externality,* $\delta < 0$*,* occurs when improving the quality of the asset increases operational costs. For example, innovative design of a hospital may lead to better clinical outcomes (due to e.g. improved lighting and air quality), but may also increase maintenance costs.[105]

Unbundling:

The operator receives a linear cost-reimbursement in the form of $t(C) = \alpha - \beta C$[106]. $\beta = 1$ holds for a fixed price, while $\beta = 0$ is equivalent of a cost-plus contract which gives no incentives for cost reduction. It is assumed that the builder obtains a fixed payment.

Thus, the builder does not exert any quality-enhancing effort:

$a_u = 0$

The operator maximizes the certainty equivalent[107] of his expected utility. Given the builder's effort, Iossa and Martimort (2008) write the operator's incentive constraint as:

$$e = \arg\max_{\tilde{e}} \alpha - \beta(\theta_0 - \tilde{e}) - \frac{\tilde{e}^2}{2} - \frac{r\sigma^2\beta^2}{2} = \beta$$ [108]

A power increase of the incentive scheme β boosts cost-reducing effort, but also causes an increase of the risk premium $\frac{r\sigma^2\beta^2}{2}$ since more operational risk is then

[105] These differenciation is interesting to compare to Hart (2002)'s productive and unproductive investment.

[106] C stands for the operation costs.

[107] Definition:"The amount of payoff (e.g. money or utility) that an agent would have to receive to be indifferent between that payoff and a given gamble is called that gamble's 'certainty equivalent'. For a risk averse agent (as most are assumed to be) the certainty equivalent is less than the expected value of the gamble because the agent prefers to reduce uncertainty)."(See http://economics.about.com/cs/economicsglossary/g/certainty.htm)

[108] Notation: $\frac{\tilde{e}^2}{2}$ and $\frac{\tilde{a}^2}{2}$ are the quadratic disutility functions. Service cost to the firm are $C = \theta_0 - e - \delta a + \varepsilon$, where ε is a random variable with variance σ^2 and mean of zero which denotes operational risk that the firm faces while managing the asset. θ_0 is the inborn cost of service. e denotes cost-reducing effort.

transferred to the agent. The fee α is just set to cover the risk premium that a risk-averse operator has to receive so that he bears some operational risk.

The government maximizes social welfare factoring in both incentive constraints and the total benefit and cost of effort, including the risk premium. [109]

Bundling:

The consortium jointly selects both types of efforts in order to maximize its expected payoff.

$$(e,a) = \arg\max_{(\tilde{e},\tilde{a})} \alpha - \beta(\theta - \tilde{e} - \delta\tilde{a}) - \frac{\tilde{a}^2}{2} - \frac{\tilde{e}^2}{2} - \frac{r\sigma^2\beta^2}{2}$$

The incentive constraints (assuming that $a \geq 0$) depend on the sign of the externality:

$$e = \beta$$

$$a = \begin{cases} \beta\delta & \text{if } \delta > 0 \\ 0 & \delta \leq 0 \end{cases}$$

Their results are intuitionally easy to understand:
Under a negative externality, the consortium never chooses to make a quality-enhancing effort because it receives no direct reward for doing so and it raises its own operating cost. In this case, bundling and unbundling yield the same welfare. There is no quality enhancing effort and the cost reducing effort is less than optimal. With a positive externality, however, the private consortium internalizes the impact of building a high quality asset. A fixed price contract also raises incentives on infrastructure quality enhancing. Thus, in this case, bundling strictly dominates unbundling (in terms of social welfare). In equilibrium, there is a positive quality enhancing effort and an increase in cost reducing effort.

[109] See Iossa and Martimort (2008), pp. 9-10

Iossa and Martimort (2009) have a slightly different purpose, comparing to their previous paper. They deal with contractual and incentive issues, concerning PPPs in the transportation sector, by means of Theory of Incentives. Regarding task bundling they show how a PPP can induce quality-enhancing effort and a long-term perspective of the contractor as well as how task bundling is linked with risk transfer.

The Model:

The demand of the transportation service is stochastic and influenced by infrastructure-quality and by the consortium's effort at the provision stage. For example, the benefit of highway users is contingent to the rout safety and hence depends on quality of the asset and also on the exerted maintenance effort. Transport projects are affected at the operation stage by e.g. technology risks, traffic/revenue risks, interest rate and foreign exchange risks. These risks can be predicted, but even though the forecasts are credible, there are some other factors that can hardly be prognosticated, like e.g. competition from other facilities, changing user needs, and general macroeconomic circumstances.

It is assumed that the users have an inelastic demand up to a price level p_0:

$D(p) = \begin{cases} d_0 + da + e + \eta & \text{if } p \le p_0 \\ 0 & p > p_0 \end{cases}$ where a denotes the infrastructure quality-enhancing effort and e is the effort in service quality. The marginal benefit of teh agent's efforts are positive: $d \ge 0$. $d_0 \ge 0$ is the demand obtained without any effort.

The quality-enhancing efforts have disutility terms of $\frac{a^2}{2}$ and $\frac{e^2}{2}$, without (dis)economies of scope between the two kinds of effort.
To simplify matters, marginal costs of providing the service are assumed to be zero.

Although in fact service quality of transportation is largely observable and verifiable by third parties, the authors concentrate on non contractible quality. The government is assumed to be risk-neutral[110] and to maximize expected social welfare, defined as

[110] This assumption makes most sense where the transport project is relatively small in comparison with the entire budget share of the transportation agency.

the social benefit of the service minus its costs and of the payment mad to the consortium. The private partner maximizes his expected profit and is risk-averse.[111]

At the first-best, the government fully insures the firm. Both efforts are observable and contractible, and the firm exerts first-best efforts:

$$\left(a^{FB}, e^{FB}\right) = \arg\max_{(a,e)} p_0(d_o + d_a + e) - \frac{a^2}{2} - \frac{e^2}{2} = (dp_0, p_0)$$

Unbundling:

As in Iossa and Martimort (2008), described above, the operator receives a linear payment in the form of: $t(C) = \alpha - \beta C$. The possibility that the builder receives an incentive payment that depends on the observed demand D is excluded from analysis.[112]The builder obtains a fixed payment and thus does not make any effort: $a_u = 0$

The operator then, considering the builder's effort, faces an incentive constraint of:

$$e = \arg\max_{\tilde{e}} \alpha - \beta p_0(d_0 - \tilde{e}) - \frac{\tilde{e}^2}{2} - \frac{r\sigma^2\beta^2 p_0}{2} = \beta p_0$$

Similar to Iossa and Martimort (2008), a power increase of the incentive scheme β boosts demand-enhancing effort, but also causes an increase of the risk premium $\frac{r\sigma^2\beta^2}{2}$ since more operational risk is then transferred to the agent The fee α is just set to cover the risk premium that a risk-averse operator has to receive so that he bears some operational risk.

The government maximizes social welfare, which is its objective in this model, factoring in both incentive constraints and the total benefit and cost of effort, including the risk premium:

[111] Assuming risk-adversity of the firm accounts for the fact that a PPP-project may represent a large share of this firm's activity.

[112] This is for simplicity and also because it corresponds to empirical observations of the transportation sector.

$\max_e p_0(d_0 + e) - \frac{e^2}{2} - \frac{r\sigma^2\beta^2 p_0}{2}$ subject to the operator's incentive constraint.

The resulting second-best effort and marginal reward is written as follows:

$$e_u^{SB} = \beta^{SB} p_0 = \frac{p_0}{1 + r\sigma^2}$$

The second-best effort is less than the first-best effort. This is due to the socially costly additional risk the agent is induced to accept by incentivizing him.

Social welfare is defined as:

$$W_u^{SB} = p_0 d_0 + \frac{p_0^2}{2(1 + r\sigma^2)}$$

It is important to notice that an increase in demand risk - σ^2 rises – results in a lower second-best effort incentives and in a lower social welfare. One of Iossa and Martimort's results is that the optimal payment mechanism tends to be based on user charges when risk-aversion and demand risk are small, when incentives are powerful, respectively. In contrast, the payment mechanism is prone to be based on availability when risk-aversion and demand risk are large (low-powered incentives). If demand risk is transferred to the contractor, he is incentivized to raise demand and consumer surplus. On the other hand, transferring risk to the operator raises the government's cost (risk-premium).

Bundling:

In this case, a consortium builds and operates the asset. The consortium chooses efforts a and e to maximize its expected payoff:

$$(e, a) = \arg\max_{(\tilde{e}, \tilde{a})} \alpha + \beta p_0(d_0 + d\tilde{a} + \tilde{e}) - \frac{\tilde{a}^2}{2} - \frac{\tilde{e}^2}{2} - \frac{r\sigma^2\beta^2 p_0^2}{2}$$

Non-negativity constraint: $a \geq 0$

Incentive constraints: $e = \beta p_0$

$$a = \beta p_0 d = de$$

The incentive constraint for e is the same as in the unbundling-case. However, the effort a is now greater than under unbundling because the consortium internalizes the positive externality of building a high quality asset.

The government now maximizes a social welfare-function, which includes the non-negative a:

$\max_{(a,e)} p_0(d_0 + da + e) - \frac{a_2}{2} - \frac{e^2}{2} - \frac{r\sigma^2\beta^2 p_0^2}{2}$ subject to the id incentive constraints.

The resulting level of welfare $W_b^{SB} = p_0 d_0 + \frac{p_0^2(1+d^2)}{2(1+d^2+r\sigma^2)}$ is greater than W_u^{SB}.

Thus bundling strictly dominates unbundling.

The equilibrium values of effort show that under PPP, the incentives are more powerful and there is more operational risk transferred (risk-premiums are higher) to the private partner than under traditional public procurement:

$e_b^{SB} = e_u^{SB}$

$a_b^{SB} = \beta_b^{SB} p_0 d > a_u^{SB}$

Asymmetric information and financing of public-private partnerships

Concerning the aspect that many public-private partnerships are of the DBFO- type (design-build-finance-operate), it is interesting to concentrate on private sector financing[113]. The question is: What are the effects of private funding on incentives?

Dewatripont and Legros (2004) discuss positive and negative effects of external financing of PPP-project. Their reference point is traditional corporate finance

[113] See also id considerations on this topic from de Bettignies and Ross (2006).

literature, as for example, Jensen and Meckling (1979) and Myers (1977), which states that large outside equity or debt can lower incentives to exert effort because the external investors profit of parts of the effort.

Starting from the result that because the builder does not internalize the effect of his effort on the consumers' willingness to pay, traditional procurement does not lead to the optimal effort $e*$, while by bundling and private ownership of the asset, the consortium can be induced to choose the optimal effort $e*$.[114]

Now they examine the case where bundling also concerns the financing of the PPP-project. The consortium has to buy and finance the project. In order to do so it has to find a external financiers (unless it has sufficient funds), which means that part of the project's return will flow to the external investor. Adding a third partner thus introduces a new agency problem, which exists between the consortium and the outside investor.
This can have the negative effect that the consortium, seeking external financing, may not choose the socially optimal effort $e*$. Outside financing can undo the desirable incentive effect that can be obtained by bundling of building and operation of the asset. A more precise explanation of this effect is provided by Iossa and Martimort (2008), as demonstrated below.

Regarding the performance of PPPs, if the consortium is financially limited, the risk of bankruptcy is not internalized in the contract award process. At the auction stage, this can result in aggressive bidding, success of the consortium, and government/sponsor's responsibility for the consequences.[115]

Iossa and Martimort (2008) state two important characteristics.

First, PPP projects are attractive for financiers because those investments are noted for providing stable returns, which are largely uncorrelated with the market.

[114] They consider the most favourable situation for a PPP; the existence of a positive externality and the absence of multitask problems like e.g. cost-cutting efforts that have a quality-reducing effect (Hart 2002).
[115] See Dewatripont and Legros (2004), pp. 136-139

Second, public-private partnerships are able to introduce the expertise of outside financiers in evaluating risks.

To account for these possible advantages of private financing, the authors focus on the benefit of bundling operation and financing. They build on their basic moral hazard model[116] and assume that there are no social benefits of designing a better infrastructure: $b = 0$

In order to model transaction costs that may arise when the operator seeks outside finance, it is assumed that financiers have expertise to get access to some informative signal y on the contractor's effort: $y = e + \eta$, where e denotes the agent's effort in cost reduction activities and η is a random variable which is assumed to be normally distributed with variance σ^2_η and a mean of zero.

Under public finance, the government doesn't observe the informative signal y and makes only the second-best effort.

Under outside finance the operator has full control over his access to the financial market and over operations. The operator receives the same payment scheme as before: $t(C) = \alpha - \beta C$. The contract between the private partner and the government is observable by outside financiers and thus the contractor and those financiers concur on risk-sharing of the remaining risk.

A possible general linear scheme for repayment to the outside financiers is determined:

$z(C, y) = E + (1 - \gamma)(\alpha - \beta C) - \xi)y$, where ξy, with $\xi > 0$, is bonus in case that y is high enough and γ is the part of the firm's reward that remains with the operator. E is a fixed payment in the amount of the equity the competitive financiers hold in the project net of investment cost

[116] This basic model, accounting only for bundling of building and operating, is described above in the previos chapter.

The new operator's incentive constraint is written as:

$$e = \arg\max_{\tilde{e}} - E + \gamma(\alpha - \beta(\theta_0 - \tilde{e})) + \delta\tilde{e} - \frac{\tilde{e}^2}{2} - \frac{r\sigma^2\gamma^2\beta^2}{2} - \frac{r\sigma_n^2\xi^2}{2} = \beta\gamma + \xi$$ [117]

This constraint shows, first, that only a part of the incentives given by the government turns out to promote effort (due to the risk-sharing), and, second, that financiers can enhance incentives by stipulating the repayment of the operator on the observed informative signal on the operator's effort.

Iossa and Martimort's result is that *bundling private financing and operation is optimal when outside financiers can observe some informative signal on the operator's effort level. The incentive power increases and welfare improves in comparison with public finance*.[118]Intuitively, this result can be explained easily: Outside financing causes the operator to be less risk-averse. The financing contract is made under a better information structure and thus making an additional contract with financiers has more benefits based on improved incentives than costs related to modified risk-sharing.[119]

[117] In the id basic moral hazard model the operators incentive constraint was $e = \beta$

[118] See Iossa and Martimort (2008), p. 27

[119] See Iossa and Martimort (2008), pp. 25-27 also for further formal explanations

Summary of results

Task bundling

Probably the most important advantage of providing public service by means of a public-private partnership is that the consortium may internalize the positive externality of building a high quality asset on the operation stage. This is due to the fact that under PPP the same firm/consortium builds and operates the asset. Under which circumstances, however is public service provision by a PPP, task bundling, respectively, preferable?

Authors have dealt with task bundling using two different approaches – asymmetric information and incomplete contracts.

An incomplete contracts model, distinguishing two kinds of investment the builder can make, shows that under unbundling the amount of productive investment is too low, but the unproductive investment has the right amount. On the other hand, under bundling the builder spends more (but still too little) on the productive investment, but also more on the unproductive investment.
The conclusion is that unbundling is preferable if the quality of the building can be well specified in the initial contract, but service quality cannot be. In contrast, public-private partnership is beneficial if service quality can be well specified, or more generally if performance is easily measurable (which makes it possible to reward or penalize the service provider), and quality of the facility cannot be.[120]

From the asymmetric information point of view, it is clear that under traditional procurement, the government has to give different incentives to the builder and the service provider, while under PPP the private party has an incentive to build the best asset possible as this maximizes information rent at the service provision stage.

[120] See Hart (2002)

Consequently, a PPP is the best policy if quality-enhancing investment cost at the build stage is low.
Once it becomes too expensive to incentivize the PPP only through the revelation mechanism, traditional procurement becomes superior
However, carrying out a PPP when government costs are high will not lead to lower costs.
This indicates that comparisons between the traditional procurement model and PPPs can suffer from sample selection bias.[121]

A further model, which analyzed two alternative externality scenarios, concerning the effect of quality improvement on operational costs, yields the following results:
Under a negative externality, the consortium never chooses to make a quality-enhancing effort because it receives no direct reward for doing so and it raises its own operating cost. In this case, bundling and unbundling yields the same welfare. There is no quality enhancing effort and the cost reducing effort is less than optimal. With a positive externality, however, the private consortium internalizes the impact of building a high quality asset. A fixed price contract also raises incentives on infrastructure quality enhancing. Thus, in this case, bundling strictly dominates unbundling, in terms of social welfare.[122]

Regarding to the payment mechanism of public-private partnerships, it can be said that the optimal payment mechanism tends to be based on user charges when risk-aversion and demand risk are small, when incentives are powerful, respectively. In contrast, the payment mechanism is prone to be based on availability when risk-aversion and demand risk are large (low-powered incentives).[123]

A further asymmetric information model also shows that bundling strictly dominates unbundling, based on social welfare. According to the equilibrium values of effort, under bundling, the incentives are more powerful and there is more operational risk

[121] See Benz, Grout and Halonen (2005)
[122] See Iossa and Martimort (2008)
[123] See Iossa and Martimort (2009)

transferred (risk-premiums are higher) to the private partner than under traditional public procurement.[124]

An incomplete contracts model, concerning the comparison between public and private ownership and alternative externality scenarios, reveals that private ownership always dominates public ownership, regardless of choosing bundling or unbundling. Further it explains that public-private partnerships (private ownership and bundling), strictly dominate traditional contracting (private ownership and unbundling); if and only if there is a positive externality between the design and the operation phase.
If the externality is negative (compared to the case of public ownership, which has no effect on efforts) bundling leads now to strictly lower efforts than unbundling under private ownership. The incentives of the owner to invest in asset quality are lowered if the builder has to internalize the negative externality that asset quality has on operational cost.[125]

Private Financing

The typical public-private partnership contract is a DBFO-type (design-build-finance-operate), where task bundling also includes financing of the project. What are the effects of private financing and under which circumstances is privatization of project-financing advisable?

Compared to the task-bundling topic, there are significantly less papers concerning the private financing aspect of public-private partnerships.

From the asymmetric information perspective it was stated that the consortium has to find an external financiers (unless it has sufficient funds), which means that part of the project's return will flow to the external investor. Adding a third partner thus

[124] See Iossa and Martimort (2009)
[125] See Iossa and Martimort (2008)

introduces a new agency problem, which exists between the consortium and the outside investor.
This can have the negative effect that the consortium seeking external financing may not choose the socially optimal effort. Outside financing can undo the desirable incentive effect that can be obtained by bundling of building and operation of the asset.[126] Due to the risk-sharing between the consortium and the private financier only a part of the incentives given by the government turns out to promote effort.

Bundling private financing and operation is optimal when outside financiers can observe some informative signal on the operator's effort level. The incentive power increases and welfare improves in comparison with public finance. Intuitively, this result can be explained easily: Outside financing causes the operator to be less risk-averse. The financing contract is made under a better information structure and thus making an additional contract with financiers has more benefits based on improved incentives than costs related to modified risk-sharing.[127]

An incomplete contracts model reveals that private financing (PPP) is ex post superior to public financing because it leads to efficient ending of bad projects, whereas public managers may continue such projects in order to avoid political costs. Private funding may be preferred since it hardens the project's budget constraint. However, on the other hand, projects with lower expected returns can only be financed by public administrations, which can commit to larger debt repayments than private developers. Private financing (PPP) is ex ante inefficient.[128]

Empirical evidence

In order to complete the picture of public-private partnerships it is interesting to see which observations are made of existing public-private partnership projects and how they perform in comparison to traditional public sector procurement.

[126] See Dawatripont and Legros (2004)
[127] See Iossa and Martimort (2008)
[128] See de Bettignies and Ross (2006)

The author's evaluating statements are highly contrary. Some authors conclude PPP-project's performance as better in comparison to traditional public sector procurement while others can not find any empirical evidence of the expected advantages of public-private partnerships.

According to Hodge and Greve (2007), an encompassing evaluation of public-private partnership projects would call for assessments of all the different types of PPPs. Their paper, as well as e.g. the Mot Mac Donald Report, focuses on PPP-projects of the PFI type. So as to find out if PPP-projects have been internationally successful, they start from the two main advantage-expectations of public-private partnerships: First, through private financing it should be possible for the government to move resources to other (more important) policy areas. Second, PPPs yield better value for money than traditional procurement.
Regarding to the first promise the empirical evidence shows a negative result. Empirical papers from the 1990s show that there was neither a reduction of public budget pressure nor an increase in provided infrastructure. Only in the case where users/citizens pay directly for the use of the infrastructure, pressure on public budgets is reduced. Concerning the second expected advantage, Hodge and Greve (2007) picture extensively the opposing international research results. On one hand PFI projects are stated to be "delivered on time", to "deliver construction risk successfully", and to "cause considerable design innovations". Proponents of PFIs also detect "cost savings of 10 to 30 percent, due to the calculus of risk transfers from the public to the private sector". On the other hand, many authors state that PFI-projects are more expensive than conventionally financed projects. Further they mention e.g. a lack of accountability which makes it difficult to learn from past experiences and moreover the difficulty of capturing transaction costs in comparisons between PFIs and traditional project delivery. Thus, in principal we can say that the anticipated economic and financial benefits of public-private partnerships are not approved and are still to be analyzed, respectively. Despite everything, empirical evidence suggests that PPP-projects in some sectors like roads and bridges have

performed better than projects in other sectors and that PPPs are not suitable for sectors like information technology. [129]

Regarding transaction costs, it was found out that PPP-projects tend to have a longer procurement process and are marked by higher bidding-costs than traditional procurement. Bidding costs were estimated to be about 5-10% of the project costs[130] and the average duration of the bidding process is about 34 months (for PFI-projects that closed between 2004 and 2006).[131] As these transaction costs are largely independent of the project-size, public-private partnerships are not suitable for small projects. These costs and risks of bidding for PPP-projects, in many cases is an obstacle for small construction companies to participate.

Vining and Boardman (2008) made a case study of 10 projects [132](from different areas like highways and bridges but also schools and wastewater treatment facilities) in Canada. They tested whether PPPs have lower total costs, which is the appropriate test from a social perspective. Total costs are composed of production costs and all transaction costs and externalities associated with managing external suppliers. The main result of this study is that transaction cost associated with ex ante or ex post contracting is regularly the cause for the government's inability to reduce total costs. Further, in many cases governments were not able to reduce their budgetary risk exposure by service provision through PPP. Their results suggest that the social desirability of the widespread use of PPPs for public infrastructure provision has to be questioned. However, they found some circumstances under which PPPs in Canada have performed acceptably. First, when governments have not tried to transfer demand-risk or revenue-risk to the private partner. The second circumstance is that projects have required specialized knowledge or means that are only possessed by private firms, and third, when governments were able to transfer construction risk at an almost fixed price. These circumstances, however,

[129] See Hodge and Greve (2007), pp.548-553
[130] See Yescombe (2007), p. 107
[131] See NAO (2007), p 16
[132] They do not characterize this sample as unbiased.

substantially describe a classic design-build-transfer or build-transfer contract rather than a PPP-contract.[133]

A report by order of the Treasury Taskforce, concerning the value for money of PFI-projects shows positive results: Anderson Arthur and Enterprise LSE (2000) estimated that the average percentage estimated 17% savings for a sample of British PFI projects comparing to traditional procurement projects. Thus the PFI appears to offer excellent value for money.

A rather dark picture of PFIs in Great Britain is communicated by Pollock, Price and Player (2007). More precisely they examine the cost and time overrun data that has been used as evidence base for five different studies which form the basis of the UK government procurement policy. According to the Treasury, the PFI has decreased cost and time overruns in public provision projects. Reviewing the empirical studies they find some important methodical shortages concerning the way they have been conducted. The first "source of error" is overlooking significant differences between the subjects in the comparison, which could account for observed cost and time overruns. As examples for these significant differences they mention diverging project-type sample structure, and time periods in which projects were carried out. Further problems occurring in these empirical studies are: Representativeness of sample, sample size (the sample has to be large enough), and measurement bias[134]. The authors claim that only one[135] of the five studies provides comparative data that serves to analyze the relative performance of PFI and traditional procurement. This study, however, suffers the id measurement and sampling shortages, which makes the results impossible to interpret. Thus Treasury guidance is biased towards recommending PFIs.[136]

[133] See Vining and Boardman (20008), pp.11, 34-39
[134] This emerges when different baselines are used for the comparison between the two groups
[135] They refer to Mot MacDonald (2002), Review of Large Public Procurement in the UK (Treasury, London)
[136] See Pollock, Price and Player (2007), pp. 127-133

Blanc-Brude, Goldsmith and Välilä (2006) compared the ex ante construction costs of PPP-projects (DBFO-type) with traditional procurement. Their sample consists of road projects in the EU-15 countries (and Norway), financed by the EIB between 1990 and 2005. Their estimations show that, on average, ex ante construction cost of a European road-PPP-project is 24% higher than conventional public procurement of roads.
Further they mention some explanations of what this difference can represent:

- Higher investment of the PPP-consortium in the construction phase to obtain cost savings in the operation phase.
- Increased price because of the construction risk, which is transferred to the private sector partner.
- Necessity to recover higher bidding costs by PPP- contractors.
- Lower competition in the PPP-market.
- Corruption in the award procedure of PPP-projects.[137]

Concerning the effects of ownership structure, there is a study by Oum, Adler, and Yu (2006), which have investigated the effects of forms of ownership and management structure on the performance of airports. Their sample consists of 116 airports all over the world of different sizes, ownership and governance structures. The dependent variable is a Variable Factor Productivity (VFP) measure, which is the ratio of total aggregate output over aggregate variable input.
Surprisingly they found that entirely public (by a single government) owned airports are more efficient than the PPP-airports, where a government keeps majority ownership and control.
Airports with a government majority and/or with multiple government involvement have significantly lower operating efficiency on average than airports of all other ownership forms.[138]

[137] See Blanc-Brude, Goldsmith and Välilä (2006), pp.12-29
[138] See Oum, Adler, and Yu (2006)

Conclusion

In my thesis I have pictured the most important incentive issues between the two parties forming a public-private partnership. I have focused on two of the main characteristics which distinguish public-private partnership arrangements from conventional contracting-out: task bundling (building stage and provision stage), and private project financing.
Public-private partnerships are evaluated with means of two different theoretical approaches. On one side, PPP-arrangements are stated to face the problem of incomplete contracts, while on the other side, the agency-theory focuses on informational asymmetries between the contractors.

In summary, it can be said that economic theory gives no clear answer to the question of efficiency. Only under certain circumstances service provision through public-private partnership is more efficient than traditional public sector procurement.[139] There exists no universal recipe for the application of PPPs. Dependent on project type/features, area of application, and prevailing market conditions, the applicability of PPP has to be considered separately for every project. Thus, cross-section comparisons between traditional procurement projects and PPP-projects can suffer from sample selection bias.

Empirical studies on the efficiency of public-private partnerships are not scarce, but unfortunately do not show any uniform picture. Empirical findings are very contrary regarding the efficiency gains of public service provision through PPP-arrangements, which is partly due to measurement- and data problems. Further as a result of the long duration of PPP-projects a conclusive performance measurement is not achievable yet.

Apart from the topics I elaborated, there are some further contractual issues in public-private partnerships, dealt with sparsely in economic literature. The first issue, due to the typical long duration of PPP-projects (about 20-35 years), is the trade-off

[139] See the id summarization of results.

between investment and maintenance. Since the quality of durable infrastructures may decrease significantly, the contractor may not want to make quality-enhancing investments in order to improve the infrastructure in the long-run, but rather prefers to maintain project-costs low in the short-run.
The second issue are regulatory and political risks which may affect contract design.[140]

Iossa and Martimort (2008 and 2009) mention three suggestions for future research. Firstly, an analysis of the procurement process for public-private partnership projects. As above-mentioned, empirical findings show that the procurement process for PPPs is costly and time-robbing. Since a typical PPP-contract covers design, building, financing and operation of the asset, the award procedure requires communication between the procurement authority and the bidders, and a sophisticated valuation system for quality and cost dimensions.
Secondly, the internal organization of the public sphere and its consequences on the composition of the public entities involved deciding on public demand. The third issue is the possible collusive behavior between the government agency and the firm.

De Bettignies and Ross (2006) bring up two, often mentioned, important characteristics of PPPs that they have not taken into account in their model concerning private funding of PPP-projects. First, the private sector may be more innovative, and may have lower production costs. Second, the government may be confronted with a loss of control over decisions made by managers of the firm/consortium.

[140] See e.g. Iossa and Martimort (2008) and Iossa and Martimort (2009).

Bibliography

Anderson Arthur and Enterprise LSE (2000), *Value for Money Drivers in the Private Finance Initiative, London: The Treasury Taskforce, 2000*

Besley Timothy and Maitreesh Ghatak (2001)*, Government versus Private Ownership of Public Goods, Quarterly Journal of Economics, Vol 116, No. 4 (Nov. 2001), pp. 1343-1372*

Bennet John and Iossa Elisabetta (2005), *Delegation of Contracting in Private Provision of Public Services, Centre for Market and Public Organisation, University of Bristol, Working Paper No. 05/125*

Bentz Andreas, Grout Paul A., Halonen Maija L. (2005*), What Should Governments Buy from the Private Sector-Assets or Services?*

de Bettignies Jean-Etienne and Ross Thomas W (2004)*., The Economics of Public-Private Partnership, Canadian Public Policy – Analyse de Politiques, Vol. 30, No. 2 2004*

de Bettignies Jean-Etienne and Ross Thomas W. (2006), *Public-Private Partnerships and the Privatization of Financing: An Incomplete Contracts Approach, The UBC P3 Project, 2006-03*

Blanc-Brude, Goldsmith and Välilä(2006*), Ex Ante construction Costs in the European Road Sector: A Comparison of Public/Private Partnerships and Traditional Public Procurement, European Investment Bank, Economic and Financial Reports 2006/01*

Bös Dieter (1991), *Privatization-A Theoretical Treatment, Clarendon Press-Oxford, 1991*

Bös Dieter, Peters Wolfgang (1991), *Privatization of Public Enterprises, A Principal-Agent Approach Comparing Efficiency in Private and Public Sectors, Empirica – Austrian Economic Papers, Vol. 18, No.1, 1991*

Budäus Dietrich und Eichhorn Peter (ed.)(1997), *Public Private Partnership – Neue Formen öffentlicher Aufgabenerfüllung, Schriftenreihe der Gesellschaft für öffentliche Wirtschaft, Heft 41, 1997*

Budäus Dietrich und Grüning Gernold (1997)*, Public Private Partnership – Konzeption und Probleme eines Instruments zur Verwaltungsreform aus Sicht der Public Choice-Theorie, in Budäus Dietrich und Eichhorn Peter (ed.) 1997*

Budäus Dietrich(2006) *(ed.), Kooperationsformen zwischen Staat und Markt, Theoretische Grundlagen und praktische Ausprägungen von Public Private Partnership, Schriftenreihe der Gesellschaft für öffentliche Wirtschaft, Heft 54, 2006*

Bundesverband deutscher Banken (2004), *Public Private Partnership – Chance für die Modernisierung von Infrastruktur und Verwaltung, Berlin 2004*

Collin Sven-Olof (1998)*, In the Twilight-Zone: A survey of PPP in Sweden, Public Productivity & managmente Review, Vol 21., No. 3, March 1998*

Dewatripont Mathias and Legros Patrick (2005), *Public-private partnerships: contrac design and risk transfer, European Investment Bank (EIB) Papers, Volume 10, No. 1, 2005*

Dewatripont Mathias and Roland Gerard (1999), *Soft budget constraints, transition and financial systems, ECARE, Universite Libre de Bruxelles and CEPR, September 1999*

Faulkner Keith (2004)*, Public Private Partnerships, in Ghobadian Abby et al, Public-Private Partnershisp:, Policy and Experience, Palgrave Macmillian, 2004*

Ghere Richard K. (1996*), Aligning the Ethics of Public-Private Partnership: The Issue of Local Economic Development, Journal of Public Administration Research and Theory: J-PART, Vol. 6, No. 4 (Oct. 1996), pp. 599-621*

Ghobadian Abby(2004) *(ed.), Public-Private Partnerships: Policy and Experience, Palgrave MacMillian, 2004*

Green paper (2004) *on public-private partnerships and community law on public contracts and concessions, European Commission, Brussels 30th April 2004*

Grout Paul A. (1997), *the Economics of the Private Finance Initiative, Oxford Review of Economic Policy, Vol. 13, No. 4, 1997, pp. 53-66*

Hammami Mona, Jean-Francois Ruhasyankiko and Etienne B Yehoue (1999*), Determinants of Public-Private Partnerships in Infrastructure, IMF Working Paper, 06/99*

Hart Oliver (2002), *Incomplete Contracts and Public Ownership: Remarks, and Application to Public-Private Partnerships, CMPO Working Paper Series No. 03/061*

Hart Oliver, Shleifer Andrei and Vishny Robert W. (1997), *The Proper Scope of Government: Theory and Application to Prisons, The Quarterly Journal of Economics, Vol. 112, No. 4 (Nov., 1997), 1127-1161*

Hodge Graeme A and Greve Carsten (2007), *Public-Private Partnerships: An International Performance Review, Public Administration Review, May/June 2007*

Holstroem Bengt (1979)*, Moral Hazard and Observability, Bell Journal of Economics, 10 (1), Spring 1997, pp. 74-91 in Jean-Jacques Laffont, The Principal Agent Model: The Economic Theory of Incentives.*

Iossa Elisabetta and Martimort David (2008)*, The Simple Micro-Economics of Public-Private Partnerships, CEIS Tor Vergata, Research Paper Series, Vol. 6, Issue 12, No. 139-December 2008*

Iossa Elisabetta and Martimort David (2009), *The Theory of Incentives Applied to the Transportation Sector, February 4, 2009*

Kooiman Jan (ed) (1993), *Modern Governance – New Government-Society Interactions, London 1993*

Kornai Janos (1986)*, The Soft Budget Constraint, Kyklos, Vol. 39 – 1986 – Fase. 1., pp. 3-30*

Kouwenhoven Vincent (1993), *Public-Private Partnership: A Model for the Management of Public-Private Cooperation, in: Jan Kooiman (ed), Modern Governance – New Government-Society Interactions, London 1993, p. 119-130*

Laffont Jean-Jacques und Martimort David (2002*), the Theory of Incentives: the Principal-Agent Model, Princeton University Press, 2002*

Laffont Jean-Jacques (Ed) (2003), *The Principal Agent Model: The Economic Theory of Incentives, The International Library of Critical Writings in Economics, Edward Elgar Publishing, 2003*

Maskin Eric, Tirole Jean (1999)*, Unforeseen Contingencies and Incomplete Contracts, Review of Economic Studies, vol. 66, n.1, Special Issue: Contracts, January 1999, p 83-114*

Macho-Stadler Inés, Pérez-Castrillo J. David (2001), *An Introduction to the Economics of Information: Incentives and Contracts, Oxford University Press, 2001*

Martiensen Jörn (2000)*, Institutionenökonomik, Verlag Franz Vahlen München, 2000*

Mattle Simona (2005), *Erfolgsfaktoren von Public Private Partnerships am Beispiel des PPP-Projekts "Ostregion" der Autobahnen- und Schnellstraßen-Finanzierungsaktiengesellschaft (ASFINAG), Oktober 2005*

Mühlenkamp Holgar (2006), *Public Private Partnership aus der Sicht der Transaktionskostenökonomie und der neue Politischen Ökonomie, in Budäus Dietrich (2006)*

NAO, National Audit Office (2007), *Improving the PFI Tendering Process. London: National Audit Office, HC149*

Pin José Ramón, Gallifa Angela (2008), *Public Private Partnerships in Labour Markets, IESE Business School - University of Navarra, 2008*

Puwein Wilfried (2004), *Modelle der „Public Private Partnership" im Lichte der theoretischen Diskussion und der empirischen Erfahrungen, Österreichisches Institut für Wirtschaftsforschung, 2004*

Pollock Allyson M, Price David and Player Steward (2007*), An Examination of the UK Treasury's Evidence Base for Cost and Time Overrun Data in UK Value-for Money Policy and Appraisal, Journal of Public Money & Management, April 2007*

Raganelli Biancamaria und Fidone Gianfrancesco (2007), *Public Private Partnerships and Public Works: reducing moral hazard in a competitive market, University of Tor Vergata, 2007*

Rügemer Werner (2008*), „Heuschrecken" im öffentlichen Raum, Bielefeld: Transcript-Verlag, 2008*

Salanié Bernard (2005), *The Economics of Contracts: A Primer, 2nd edition, 2005*

Schaeffer Peter V. and Loveridge Scott (2002), *Towards an Understanding of Types of Public-Private Cooperation, Public Performance & Management Review, Vol. 26, No.2 (Dec., 2002), pp. 196-189*

Schmidt Klaus M. (1996), *The Costs and Benefits of Privatization: An Incomplete Contracts Approach, Journal of Law, Economics & Organization, Vol. 12, No. 1 (Apr., 1996), pp. 1-24*

Siemer J. Philipp (2004**),*** *Vertikale Integration oder Kooperation, Gabler Edition Wissenschaft, 2004*

Spiegl M. (2002), *Ein alternatives Konzept für Risikoverteilung und Vergütungsregelung bei der Realisierung von Infrastruktur mittels Public Private Partnership und International Competitive Bidding. Mit Schwerpunkt auf den Untertagebau von Wasserkraftwerken. Innsbruck 2002*

Studiengesellschaft für Wirtschaft und Recht (2003*) (Hrsg), Public Private Partnership, Linde Verlag, Wien 2003*

Torres Lourdes and Pina Vicente (2001), *Public-private partnership and private finance initiatives in the EU and Spanish local governments, The European Accounting Review 2001, 10:3, 604-619*

Vining Aidan R and Boardman Anthony E. (2008), *Public-private partnerships in Canada: Theory and evidence, Canadian Public Administration Vol. 51, No.1 (March 2008), pp. 9-44*

Woessmann Ludger (2006), *Public-Private Partnerships and Schooling Outcomes Across Countries, CESifo Working Paper No. 1662, Category 1: Public Finance, February 2006*

Yescombe E.R. (2007), *Public-private partnerships, Principles of Policy and Finance, Yescombe Consulting Ltd, Elsevier 2007*

Web sources

The Canadian Council for Public-Private Partnerships**:** http://www.pppcouncil.ca/

The OECD Glossary of Statistical terms**:** http://stats.oecd.org/glossary/

Glossary of Economic Terms:
http://economics.about.com/od/economicsglossary/Glossary_of_Economics_Terms_Economics_Dictionary.htm

Appendix A: Abstract

Public-private Partnership (PPPs), a specific form of task fulfillment of administrations, has become increasingly popular over the last few years in many parts of the world as well as in Austria.
A public-private partnership can be seen as an alternative to conventional public sector procurement. The government specifies only the outputs, which are to be provided by the infrastructure facility, but does not specify how these outputs should be supplied. A private firm/consortium is contracted to participate at different stages in the project (design, build, operate, finance). It receives payments (set already ex ante) over the life of the PPP-contract, which are supposed to repay the funding costs and create a return for the investors. Risks, traditionally borne by the public sector, are transferred to the private partner.
Public administrations, naturally, expect advantages of this form of public service provision, but do PPPs really work better?
There are two theoretical approaches that can be applied to public-private partnerships, focusing on strategic interactions between the partners. On one hand the contract is likely to be incomplete and thus the relationship can be described by means of transaction costs theory and theory of *incomplete contracts*, respectively. On the other hand, assuming complete contracts, the partnership can be described as a classic Principal-Agent relationship where the existence of *information asymmetries* causes distorting phenomena like moral hazard and adverse selection.
Economic theory and empiric studies provide inconclusive results concerning efficiency gains through service provision by public-private partnerships. Only under certain circumstances service provision through public-private partnership is more efficient than traditional public sector procurement.

Appendix B: Zusammenfassung

Public-private partnership (öffentlich-private Partnerschaft) als besondere Form der öffentlichen Aufgabenerfüllung, erfreut sich, seit einigen Jahren, zunehmender Beliebtheit in vielen Teilen der Welt, sowie auch in Österreich.
Der große Unterschied zu herkömmlichen Formen der öffentlichen Auftragsvergabe ist, dass bei einem public-private partnership (PPP) eine einzige private Firma bzw. ein Konsortium für Planung, Errichtung, Betrieb und in vielen Fällen auch für die Finanzierung des Infrastrukturprojektes zuständig ist. Die öffentliche Verwaltung spezifiziert nur die Leistung die bereitgestellt werden soll und nicht wie dies erreicht werden soll. Das Konsortium erhält, schon ex ante festgelegte, Zahlungen über die gesamte Vertragsdauer, die Finanzierungskosten zurückerstatten und Gewinn für den privaten Partner erzeugen sollen. Auf den privaten Partner werden Risiken transferiert, die traditionellerweise der öffentliche Sektor trägt. Öffentliche Verwaltungen versprechen sich einige Vorteile von dieser Form der öffentlichen Aufgabenerfüllung. Führen public-private partnerships, jedoch, zu effizienteren Ergebnissen als herkömmliche Formen der öffentlichen Auftragsvergabe?
Die strategische Interaktion zwischen den beiden Vertragspartnern lässt sich mit Hilfe zweier theoretischer Ansätze dargestellt. Das sind zum einen die Theorie der unvollständigen Verträge und zum anderen die Incentivetheorie wo vollständige Verträge angenommen werden und die Existenz von Informationsasymmetrien zu verzerrenden Phänomenen wie moral hazard und adverse Selektion führen. Die ökonomische Theorie, sowie empirische Studien, liefern keine klare Antwort auf die Frage der Effizienz. Nur unter bestimmten Umständen ist die Leistungserbringung durch ein public-private partnership effizienter als durch traditionelle Formen der öffentlichen Vergabe.

Appendix C: Curriculum Vitae

Personal Information

First Name/Surname	Linda Lobner
E-mail	lindalobner@gmail.com
Date of Birth	2nd May 1985
Nationality	Austrian

Education

October 2004 – July 2009	*Master of Economics*	*University of Vienna*
	Master thesis: "How well do public-private partnerships work?	
Main interests	Public Sector Economics, Social Policy, Development Economics, Law & Economics, Econometrics	
Elective subject	Sociology	
March 2009-June 2009	*Visiting Scholar*	*University of British Columbia, Canada*
	Phelps Centre for the Study of Government and Business, The UBC P3 Project	
September 2006 - July 2007	*Exchange student*	*University of Alicante, Spain*
1999 - 2004	*Higher School of Tourism- and Hotel Management (Austrian Federal Economic Chamber)*	*Vienna*

Personal skills and competences

Mother tongue	German
Other languages	English: fluent Spanish: fluent
Computer skills and competences	ECDL (European Computer Driving Licence) • Word-processing (Word) • Databases (Access) • Spreadsheets (Excel) • Presentations (PowerPoint) Eviews (to perform econometric and statistical analysis, generate forecasts and model simulations)