

**A Survey of Public-Private Partnerships in Infrastructure:  
the Case of the United Kingdom, Canada and Australia**

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## **Abstract**

Over the past 20 years Public-Private Partnerships have been increasing in scope around the world as a means for providing large scale infrastructure projects. Our aim is to provide a survey of Public-Private Partnerships that outlines the various types of partnerships, their theoretical underpinnings, the institutional frameworks and networks which lead to their application and to underline how these projects are awarded.

Key Words: Contracts, Institutional Framework, Networks, Public-Private Partnership, Procurement Auctions.

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## **Section 1: Introduction**

The goal of this paper is to provide a survey of the concept of Public-Private Partnerships (PPPs). As they have risen in popularity over the last 20 years as a method for providing infrastructure we have found it a noteworthy topic to investigate. The idea of the government and private sector partnering together to offer a service is relatively unique in terms of economic literature. Most of the literature pertaining to government and private cooperation is based on contract theory and vertical integration. Although these theories may capture some of the basic concepts pertaining to PPPs, they fail to capture the diversity of players, interests and tasks associated with PPPs. In contrast to more primitive methods of infrastructure procurement, where private firms were simply contracted out by governments to design, build, operate or maintain a service, PPPs share these tasks with numbers of private and public partners, and with all parties sharing a vested interest in the project's success. PPPs have the potential to be extremely successful in the provision of infrastructure. As we will explore, however, they are not without their faults and complications.

For the purposes of this survey we consider Public-Private Partnerships and how they apply to infrastructure projects. Though they may be applied in other areas, their application to infrastructure, given its complexities, uncertainties, long life span, and various tasks involved, helps to truly distinguish PPPs from other forms of infrastructure provisions and display their uniqueness. To outline how PPPs operate, we focus on cases in the United Kingdom, Australia and Canada. The United Kingdom may be conceived as the birth place of PPP, while Australia and Canada utilize similar techniques in PPP implementation, with successes and failures, which help round out some of the fundamental aspects of PPPs in developed, democratic and federal systems. Though PPPs are being employed in developing nations as a means to provide infrastructure, these applications contain many complex issues of vested interests, corruption and political integration which are beyond the scope of this paper.

This paper is organized in 8 sections. In the second section we review several definitions of Public-Private Partnerships, consider types of infrastructure provisions and provide a summary of various methods of PPPs in practice. Section 3 covers the important theoretical underpinnings of PPPs. These include property rights, transaction costs, incomplete contracts and private provisions versus vertical integration. We also address the ideas of the cost of borrowing and risk as they pertain to PPPs. In Section 4 we review several fundamental PPP models, from the basic Grossman and Hart (1986) model of incomplete contracts, to the more PPP applicable model developed by Francesconi and Muthoo (2010). Section 5 addresses the institutional arrangements, how they foster the development of PPPs, and we draw several accounts of these arrangements in the United Kingdom, Canada and Australia. Section 6

considers PPP networks, which we utilize to identify the parties involved, how they are connected, and some important issues regarding competition and repeat collaboration within this setting. In section 7 we outline the selection process for PPP. This includes various selection criteria utilized in practice, and the potential areas of concern these process may have. Section 8 provides a summary and conclusion of our survey.

## **Section 2: Methods of Delivering Infrastructure**

It is important to make a distinction regarding public-private arrangements. As the focus of this paper is Public-Private partnerships (PPP), they are often lumped together with other forms of public-private arrangements, particularly traditional procurement which is the government practice of contracting out a private partner to provide provisions. The reason that the two are so often lumped together is that there are several definitions of Public-Private Partnerships. For example, the OECD considers a PPP as an arrangement in which “the government enters a long-term contract with a private partner to deliver a good or service, and the private partner is responsible for the building, operating and maintaining assets that are necessary for delivering a good or service to either the government or individuals” (OECD, 2008, p.3). While Engel et al. (2008) suggest that the important features of PPPs are that they involve “(i) the bundling of construction and operation, (ii) temporary ownership of assets and (iii) the intertemporal risk sharing with the public sector” (Engel et al., 2008, p.1). For a more robust distinction of PPP projects we draw on De Bettignies and Ross (2004) who break down the process into four tasks. “(1) defining and designing the project, (2) financing the capital costs of the project, (3) building the physical asset, and (4) operating and maintaining the object” (De Bettignies and Ross, 2004, p.137). Each of these tasks involves a complex procedure of choice and contract between the various private and government actors involved.

We can contrast these definitions with that of traditional procurement, which according to Saussier et al. (2009), is when “... the private operator is in charge of only one “task” instead of a bundle of tasks as in PPPs” (Saussier et al., 2009, p.4). One can make a significant distinction between simple contracting out and a PPP. The main factors within PPPs are temporary ownership, risk sharing and the bundling of tasks. From De Bettignies and Ross’ (2004) convenient break down of project stages it is clear that if only one of the four stages is contracted out to the private sector, it is a clear case of traditional procurement. If all four stages of the project are granted to the same private partner indefinitely, it is another example of contracting out or privatization. The idea is that a true PPP lies somewhere in the middle and is further shaped by temporary ownership. In what follows we document various methods of government service provisions.

**Privatization:**

According to Koser (2006) privatization is defined as “the use of the private sector in the provision of a good or service, the components of which include financing, operations (supplying, production, delivery), and quality control” (Koser, 2006, p.1). In the context of infrastructure, the private sector agent is responsible for the complete provision of the service which includes the design, building, operation, maintenance and financing of the project. The state has forfeited complete control over the asset, although it is common for the local authorities to impose regulations and restrictions on the private owner, they no longer hold any stake in the project.

**Nationalization:**

“Nationalization is the takeover of ownership and control of a privately owned enterprise by the State. States have traditionally taken private property for public purposes...”<sup>1</sup> In complete contrast to privatization the state or local authority abolishes private control of assets and absorbs the project completely within its operations. This includes resuming control of the design, building, operation, maintenance and financing of the project.

**Traditional Procurement:**

This is a means for the governmental authorities to utilize a private sector to provide one or several stages of a project. From the design and building phases to the maintenance, operation and financing the governmental authorities utilize a private entity, generally on a contract basis, to provide one of these provisions. The state maintains complete control over the project and asset. Provisions of these types are common with regional governments for garbage collection, processing and waste water removal. It is important to distinguish this type of procurement from any PPP as the application of traditional procurement pertains to only one stage of the project.

**Operations and Maintenance (O&M):**

A public entity (federal, state or municipal) establishes a contract with a private partner to provide and/or maintain a specific service. Under this scheme the public authority retains ownership and the overall management of the facility or system ([www.ncppp.org/howpart/ppptypes.shtml](http://www.ncppp.org/howpart/ppptypes.shtml)).

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<sup>1</sup>The Canadian Encyclopedia, [www.thecanadianencyclopedia.com/articles/nationalization](http://www.thecanadianencyclopedia.com/articles/nationalization).

**Operations Maintenance and Management (OMM):**

As with O&M a public entity establish a similar contract with a private partner granting them the rights to provide/or maintain a specific service. In addition the private partner is granted the authority to manage the product and thus allowed to allocate their own capital and investment to the project. The public authority retains ownership of the project and therefore these types of investment must be screened through them ([www.ncppp.org/howpart/ppptypes.shtml](http://www.ncppp.org/howpart/ppptypes.shtml)).

**Design-Build (DB):**

A model in which a private partner provides both the design and construction of a project to a public agency. The public authority maintains ownership of the asset and is responsible for the maintenance, operation and financing of it ([www.ncppp.org/howpart/ppptypes.shtml](http://www.ncppp.org/howpart/ppptypes.shtml)).

**Design-Build Maintain (DBM):**

Similar to the DB model whereby the private partner is contracted to design and construct the project, they are also required to provide the required maintenance of the project for a designated interval of time. The public agent still retains ownership of the asset and is responsible for its operations ([www.ncppp.org/howpart/ppptypes.shtml](http://www.ncppp.org/howpart/ppptypes.shtml)).

**Design-Build Operate (DBO):**

Much like the DBM model a DBO contract is awarded to a private sector partner to design and build a project, but rather than providing the maintenance of the project the contract grants them the rights to operate the project for the agreed upon time interval. The public partner again retains ownership and is responsible for the maintenance of the project ([www.ncppp.org/howpart/ppptypes.shtml](http://www.ncppp.org/howpart/ppptypes.shtml)).

**Design-Build Operate Maintain (DBOM):**

This is an integrated partnership, whereby the private partner retains the responsibilities of the design and construction elements of the project as well as the responsibility to operate and maintain the project over the course of the contract. It is the public authorities' responsibility to finance the project and they retain ownership and oversight of the project which are outlined in the terms of the agreement ([www.ncppp.org/howpart/ppptypes.shtml](http://www.ncppp.org/howpart/ppptypes.shtml)).

**Developer Finance:**

A private party is contracted to finance the construction or expansion of a public facility. The public authority awards the private contractor the right to reinvest in the facility. This type of investment can take the form of building residential housing, commercial stores or industrial facilities. The public authority retains oversight of the facility but they may allow the private contractor to allocate additional capital while utilizing the facilities or charge user fees ([www.ncppp.org/howpart/ppptypes.shtml](http://www.ncppp.org/howpart/ppptypes.shtml)).

Regarding the previous list, we have chosen to consider the various design and build style of provision as a method of contracting out and not a Public-Private Partnership. As Vining and Boardman (2008) suggest that these types of projects rarely involve “project aggregators and financiers” as the major private sector partner.

**Design-Build Finance Operate Maintain (DBFOM):**

This model utilizes the DBOM as a fundamental framework in that the private partner is responsible for the design, construction, operation and maintenance of the project. In addition it becomes the private partner’s responsibility to finance the project. Such financing may occur in the forms of user-fees, or with the aid of the public partner through licensing, shadow pricing or the leveraging of revenues to issue bonds or other in-kind payments to the private partner. As with the DBOM the public authority retains some form of ownership and oversight of the project which is outlined in the agreement ([www.ncppp.org/howpart/ppptypes.shtml](http://www.ncppp.org/howpart/ppptypes.shtml)).

**Design-Build Finance Operate Maintain Transfer (DBFOMT):**

This model is identical to the DBFOM in every way with the exception that under this agreement the private sector partner is granted ownership of the asset. This ownership is granted for a defined time interval and it is often coupled with specific price and quality requirements which must be maintained by the private partner ([www.ncppp.org/howpart/ppptypes.shtml](http://www.ncppp.org/howpart/ppptypes.shtml)).

**Build-Operate Transfer (BOT):**

The private partner builds a facility to the specifications of the agreement with the public partner and operates the facility for the agreed upon period of time. At the end of the period the private partner transfers the ownership of the facility to the public authority. The public authority may then assume operations of the facility, contract the operations out to the original private partner or award a new contract to an alternative private organization. Often it is the private partner’s responsibility to finance

the project and therefore the duration of the contract is established to enable some kind of returns on investment for the private partner ([www.ncppp.org/howpart/ppptypes.shtml](http://www.ncppp.org/howpart/ppptypes.shtml)).

**Build-Transfer Operate (BTO):**

This scheme works the same as the BOT arrangement. The only difference is that the transfer of ownership to the public sector occurs after the construction of the facility. Once in the hands of the public authority, it is again their choice to maintain ownership, contract the ownership of the facility back to the original organization or award the facility to a new private partner ([www.ncppp.org/howpart/ppptypes.shtml](http://www.ncppp.org/howpart/ppptypes.shtml)).

**Build-Own-Operate (BOO):**

The private partner is contracted to build and operate the facility by the public authority. Unlike BOT or BTO there is no transfer of ownership back to the public authority and the private partner retains legal title to the facility ([www.ncppp.org/howpart/ppptypes.shtml](http://www.ncppp.org/howpart/ppptypes.shtml)).

**Buy-Build Operate (BBO):**

BBO maintains the same structure as BOO, but generally concerns the sale of a pre-existing state asset. The asset is sold to the private sector so that they may invest in it to rehabilitate or expand the facility to improve it in a profitable manor ([www.ncppp.org/howpart/ppptypes.shtml](http://www.ncppp.org/howpart/ppptypes.shtml)).

The National Council for Public-Private Partnerships considers all the listed arrangements to be PPPs ([www.ncppp.org/howpart/ppptypes.shtml](http://www.ncppp.org/howpart/ppptypes.shtml)). While Saussier et al. (2009) regard any “bundle of tasks” to be considered a PPP. Noteworthy from this list is that there is a great deal of diversity of public-private agreements and that within those there are even more distinctive forms of Public-Private Partnerships. It is inaccurate to refer to the concepts of nationalization or privatization as means to provide any real insight into public-private arrangements. It is even becoming increasingly difficult, outside of a theoretical framework, to isolate “pure contracting out” of government services as it is likely that they emulate one of the traditional procurement models. This will become more apparent when we analyze the network dynamics of these institutional arrangements.

### **Section 3: Theoretical Frameworks**

In this section we outline the theoretical underpinnings of PPPs. Beginning with a consideration of property rights, as they provide some basic insight into the control and incentives parties have prior to, and during the negotiation process. Following, we review the literature on property rights, transaction costs and the notion of “incomplete contracts”. We also consider the trade-off between a government’s decisions to contract out or vertically integrate. This is often the first stage in the process of committing to a PPP, as the government must determine if they can offer the service more effectively, through vertical integration, than a private provision, or if they should seek private procurement. Finally, we move to recap several models which document the incentives and efficiencies of PPPs.

#### **3.1 Property Rights**

Property rights have always been a significant underlying concept within the field of economics and define the very concept of ownership. As we will explore, property rights theory sets about some fundamentals for theories regarding contracts. The fact that property rights over an asset grant the controller the right to exclude other parties from that asset’s use gives rise to such concepts as exchanges, bargaining and incentives. Given that PPPs are strongly conceived and constructed through a negotiation process, property rights become important in this field as they grant ownership of an asset and the maintained control of it. This may be employed to prevent another party from using it if negotiations break down. The application of property rights in a contract based setting is what Grossman and Hart (1986) refer to as residual rights.

To highlight the importance of residual rights we draw on an example outlined by Grossman and Hart (1986). They consider a contract between a publisher and a printer. If the contract has no provision for an additional print run, but the publisher gains some information that makes it profitable for another run of the press, it is clear that the right to decide whether or not to run belongs to the printing press. Thus, the owner of the asset has the residual rights of control of that asset. Regarding a contract based framework these residual rights act to grant the owner of that asset an advantage or bargaining power with regards to a contract. De Bettignies and Ross (2004) refer to this advantage as ex post bargaining power. They define it as the “ability of an owner of an asset to maintain control of it in the event that negotiations with another party breakdown” (De Bettignies and Ross, 2004, p.141). In this regard, it is implied that property rights increase one’s alternative relative to that of the trading partner.

To help underline this situation, we consider an example provided by De Bettignies and Ross (2004). A private organization is contracted by a government to build and maintain a bridge. The private

party gains the property rights to the bridge and it trades directly with the government, who in this example acts as the customer. The private provider has bargaining power with their trading partner in renegotiation since they maintain access to the bridge if the trade between the two parties breaks down. The property rights allocated to the provider grant the party an “attractive outside alternative” which is the maintained control of the asset. While the government has no such attractive alternative, less it be the costly process of negotiating with an alternative party to construct a similar asset, or seeking legal action against the current provider. The alternative example is that of the government maintaining control of an asset, and utilizing a private partner to construct or maintain the asset, the government maintains the property rights in this case. In the absence of a robust contract it may be possible that the government, the owner, can just fire the partner. Thus in this case the private firm, which does not maintain the property rights, has a less attractive outside alternatives, and is in a significantly weaker bargaining position.

Bargaining power and asset ownership as extensions of the property rights argument are important for understanding the motivation behind the negotiation between parties and the management of PPPs. As ex post bargaining power is established through the allocation of property rights, De Bettignies and Ross (2004) point out that this ex post bargaining is extremely important for the development of an asset and within initial negotiations. They suggest that the more ex post bargaining power the provider anticipates the less likely they will be “held-up” in negotiations. This allows them to extract a larger fraction of the surplus they may appropriate and thus they have a greater incentive to make relationship specific investments. The trade-off in the government as a customer and private partner provider case is that inevitably the greater the bargaining power of the provider, the less incentives for the government, as a customer, to make relationship specific investments.

### **3.2 Transaction Costs**

Given that one of the fundamental characteristics of PPPs is the underlying contracts involved, we now turn our attention to the importance of transaction costs. Aptly put, “... if transaction costs are negligible, the organization of economic activity is irrelevant, since any advantages one mode of organization appears to hold over another will simply be eliminated by costless contracting” (Williamson, 1979, p.233). It is transaction costs which give rise to additional arguments and theories regarding PPPs, particularly the move from a “complete” contract approach to modeling PPPs to the “incomplete” contract approach, which we will explore in more detail later. Vining and Boardman (2008) summarize some key elements of transaction cost theory that contracting costs tend to be high when projects exhibit high asset specificity, high complexity or uncertainty, low competitiveness and low government contract management skills. According to them high asset specificity pertains to the social goals or quality

standards imposed by government partners. Complexity and uncertainty are common elements of large infrastructure projects as a result of their size and duration. Low competitiveness naturally arises as a result of the monopoly power granted to the private partner and the low government contract management skills summarize the inefficiencies of government relative to the private sector alternative. High transaction costs in infrastructure may also come from the fact that design work for a project is not usable for any other project, and thus sunk, the exception may be knowledge and expertise that had been acquired which may be used for a similar project in the future.

Another aspect of high transaction costs which Vining and Boardman (2008) suggest is that the value of infrastructure in other uses is very low and often negative. Particularly pertaining to PPPs, Vining and Boardman (2008) outline some reasons as to why transaction costs may be high. Since the public and private sectors have conflicting goals, that is the public sector seeks social goals such as reallocation of wealth and non-wealth based accessibility, and the private sector generally seeks profit and market share, it is the divergence of these goals that is likely to raise transaction costs and lead to negative externalities or reductions in quality. In other interorganizational contexts with conflicting goals Vining and Boardman (2008) outline that the result is often high bargaining costs, opportunistic behavior by one or both sides, the failure to achieve goals, and the dissolution of partnerships. They also outline two circumstances that raise the probability of high transaction costs. The first is that when the government initiating the project has poor contract management skills. Governments with weak contracting ability do not have the skills or experience to anticipate contracting problems or write the appropriate contract provisions before the agreement is finalized. Second is when a public sector leader gets caught up in an escalation of commitment cycle and becomes determined to deliver the project as a PPP.

### **3.3 Incomplete Contracts**

In addition to the concept of properties rights and transaction costs, an essential underlying theory regarding PPPs can be found in the literature about contracts. A great deal of contracting literature deals with parties who must weigh their options of vertical integration against contracting with an alternative party. To explore this concept we turn our attention to an analysis conducted by Hart (2003). In his analysis he considers two firms, A and B. Where A represents a car manufacturer and B supplies car-body parts. In this analysis one assumes that there is a reason for both firms to maintain a long-term relationship such that both A and B are enticed to make relationship specific investments. There are thus two ways in which this relationship can be conducted. Either A and B can maintain a contract between one another and operate as independent firms, or A and B can merge and carry out the transaction as a single firm. Though this stream of thought is appropriate for underling some of the basic characteristics

of PPPs, particularly a governments choice to seek a partnership, more recent literature on the theory of the firm has evolved more along the lines of an “incomplete” contracting perspective (Hart, 2003).

The notion of incomplete contracts has not only become increasingly popular regarding theories of the firm, but is an essential consideration when analyzing PPPs. A contract is “incomplete” in the sense that inefficiencies arise because it is costly to foresee all contingencies to include within the contract. Vining and Boardman (2008) clarify this concept from the perspective of a private sector agent. They suggest that since private sector participants seek to maximize the net present value of their contracts over their lifespan and that profit maximization is not a one period phenomenon, the private sector will seek to capture new profit opportunities throughout the course of the project. If the contract is “complete” this behavior would have been anticipated, and they would have no opportunity to do so. The concept of an “incomplete” recognizes the fact that firms in these circumstance will engage in opportunistic behavior. Hart (2003) suggests that “in a complete contracting world the government does not need to own a firm to control its behavior: any goals – economic or otherwise – can be achieved via a detailed contract” (Hart, 2003, p.C70). Thus if contracts are “incomplete”, as they are in most real world cases, there is a case for government to own an asset, as this ownership grants them special powers in the form of residual control rights. Pertaining to PPPs it has been suggested that often the costs and objectives of PPPs are large and wide and as such PPPs require long-term contracts to lay the ground work for their organization (Rausser and Stevens, 2009). The difficulty here is that due to the complexities and uncertainty of the trade relationships involved, it is impossible to account for every potential contingency or that they be predicted, this reality brings to focus that the long-term contracts involved within PPPs are themselves, “incomplete” contracts. Further complicating the formation of contracts is the “hold-up” problem, whereby the initial allocation of property rights can lead to ex post bargaining power for one of the parties involved (De Bettignies and Ross, 2004). The unequal distribution of bargaining power can lead to a contract being more favorable to the party who has the initial property rights, and this may result in the contract being incomplete. Given that long-term contracts, in a perfect sense, are infeasible, contracts must be constantly revised and renegotiated as time goes on. The process of modifying contracts generates ex post inefficiencies in the relationship specific investments committed by the parties involved (De Bettignies and Ross, 2004). In other words “... a long-term contract has to evolve through time in order to fit with changing circumstances, and this adaptation is costly” (Saussier et al., 2009, p.8).

### 3.4 Cost of Borrowing

Another noteworthy topic on the issue of PPP is the literature on the cost of borrowing. It is often suggested that governments face a lower cost of borrowing, which in turn lowers the opportunity cost of financing major infrastructure projects relative to that of the private sector. As Sawyer (2009) suggests that “it is widely recognized that the cost of financing involved in a PPP will not be less than the cost of finance involved for the government in undertaking ‘conventional’ public investment” (Sawyer, 2009, p.8). His justification for this is that there are a variety of reasons government bonds are almost free of default and thus the rate of interest on government bonds will be lower than the rate of interest on other bonds, or loans. Heald (1997) contributes to this line of argument, as he suggests that a key obstacle to the use of private sector financing in public projects is that private sector financing is always more expensive. Thus he concludes that private financing is considered a viable option only when it brings with it efficiency gains whose present value exceeds the present value of the additional financing costs.

Though these are valid arguments, others have suggested the contrary to cheap government borrowing. De Bettignies and Ross (2004) put forth several arguments in favor of cheaper private sector financing. For one, the authors suggest that when a private firm borrows, it acquires a put option with its loan. This put option is a contract between the two parties, the private borrower and the lender, to exchange an asset, the loan, at a specified price, the lending interest rate, by a predetermined date, usually monthly payment installments. The authors’ consideration is that when a government borrows, for example at a the risk free rate of interest of 5 per cent over 20 years, and a private lender secures a loan contract, say at 7 per cent with the option to “put” the remaining portion of debt back to the lender. On the other hand the government is not granted this “put” option, the option to sell or transfer their loan, and must pay back the 5 per cent back in full, no matter what.

De Bettignies and Ross (2004) also suggest that when a long-term contract is awarded by a government to a private firm through a PPP, it is likely that the contractor can secure a very good interest rate from private lenders. This stems from the contracting government’s reliability as a purchaser of goods which may substitute for their reliability as a borrower, in the case where they fund the project through their own means of borrowing.

Another benefit a private borrower has, which De Bettignies and Ross (2004) suggest, is that the borrower may often deduct interest payments on its loan against the income they receive from the operation, maintenance or construction of the project and thus reduce their tax burden. This circumstance is heavily dependent on the tax code of the associated region in which the partnership takes place. “In

Canada for example, the tax savings come, in part, at the expense of the federal treasury, while the public sector partner might be a provincial or local government” (De Bettignies and Ross, 2004, p.147). They suggest that from the perspective of national wealth these are not real resource savings as some portion of this tax saving comes in the form of a subsidy from another level of government only if the project is privately financed.

De Bettignies and Ross (2004) also point out that governments may also face an upward sloping supply of capital curve, such that the more they borrow the higher the rate of interest they must pay. Their consideration for this is that as a provincial government increases its borrowing, it runs the risk of having its debt-rating downgraded, and thus may have to pay a higher rate of interest on all of its borrowing. This circumstance implies that it is possible, for a public partner, that the cost of borrowing for the next project may be higher than simply the interest rate they may face for financing that project, as the interest rate may rise on all of the government’s debts. Thus the full marginal cost of a project may be much higher for a government even if it has access to a lower rate of interest on borrowing.

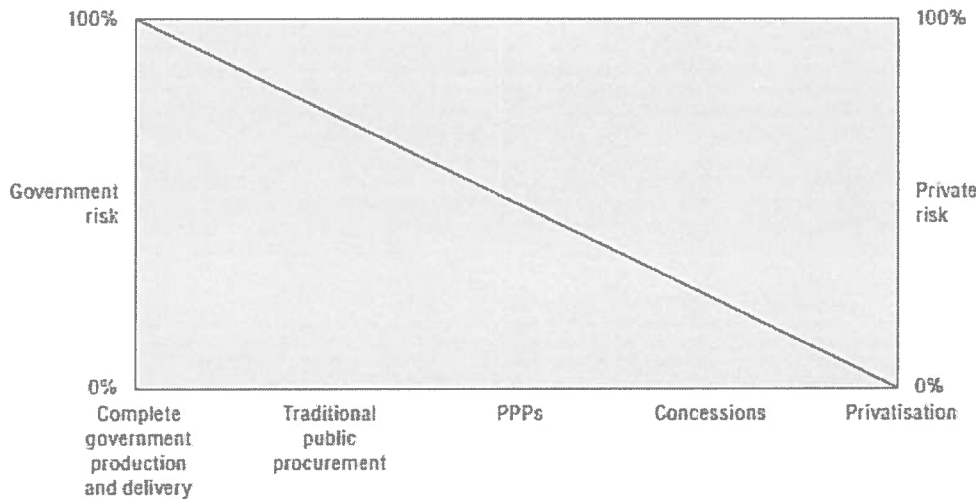
Finally, regarding the cost of borrowing, De Bettignies and Ross (2004) suggest that there are complementarities between the financing and other tasks involved within a project. This stems from the effects that being a debtor have on one’s incentives for high-level performance. A private party charged with the construction of a facility and who is required to provide their own financing, for example, must also cover the costs associated with delays. Since it is the builder who has the greatest control of “time-to-completion”, they have the strongest incentive to finish the project on time and on budget. Although there may be temptation on the builder’s part to reduce costs using lower grade materials, or omit elements of the construct to reach their time and budget requirements, it does stand as a concern that in this circumstance quality may be compromised. De Bettignies and Ross (2004) suggest that, in contrast to the private partner’s incentives, since the government utilizes tax payer dollars for financing, they are far removed from these time and budget objectives and as such do not share the same high powered incentives as a private partner.

### **3.5 Risk**

When one hears about the proposition of PPP, it often contains the ideals of reducing or sharing risk. In the context of PPPs we utilize the definition of risk as “the uncertain possibility of... something going wrong that can result in increased cost or cause delay” (Hardcastle and Boothroyd, 2003, p.42). Morillos and Amekudzi (2008) suggest that PPPs are particularly attractive for governments as they allow these public agencies the ability to transfer a significant amount of project risks to the private

sector. Further, they suggest that PPPs optimize risk allocation by transferring the risks to the party best able to manage them (Morallos and Amekudzi, 2008, p.115). The idea of risk within a PPP framework is drawn from various factors such as the vastness of the project, the life of the project, the project's costs, project projections and many other uncertainties involved. Generally, what propels the anti-risk argument is that the private sector is naturally averse to risk. Vining and Broadman (2008) for example, suggest that private sector participants are risk adjusted profit maximizers. This means that these participants are willing to forego some level of expected profits if they can be guaranteed to reduce risk significantly. The argument goes that the private sector is considerably more risk averse than the public sector, at least ex ante, and thus in this regard they are better suited to undergo large scale infrastructure projects. Vining and Broadman (2008) point to evidence from Canada which shows that the willingness of the private sector to bear user risk radically declines with the level of risk involved. According to Vining and Broadman (2008) the reason why the private sector does not take on many risks, is that private sector managers and equity investors typically bear the consequences more directly and personally if risks turn bad. Thus private partners, who are unfamiliar with the risks involved with government projects, require greater premiums to accept risk.

Another level of risk is related to the government itself. As Vining and Broadman (2008) suggest, ex post manipulation by political partners, or their successors could lead to additional risk, and private partners have little control over many factors that drive demand, such as transportation policy. The idea that the private sector is more risk averse and therefore better suited to undergo these projects is but one part of the argument. The other issue which arises is how a government can actually transfer this risk to a private partner. The authors state that evidence from the United Kingdom and Australia has shown that governments have not been successful at shifting risk to the private sector. One example of this is the Cross City Tunnel in Sydney which went into receivership a year after its opening because motorists refused to use it due to its high price. Chung et al. (2010) suggest that as this incident demonstrates that the government was able to transfer out the project's financial risks to the private partner, but they failed to transfer the risks associated with social responsibility and public accountability.



**Figure 1. Distribution of Risk According to Method of Delivery (OECD, 2008)**

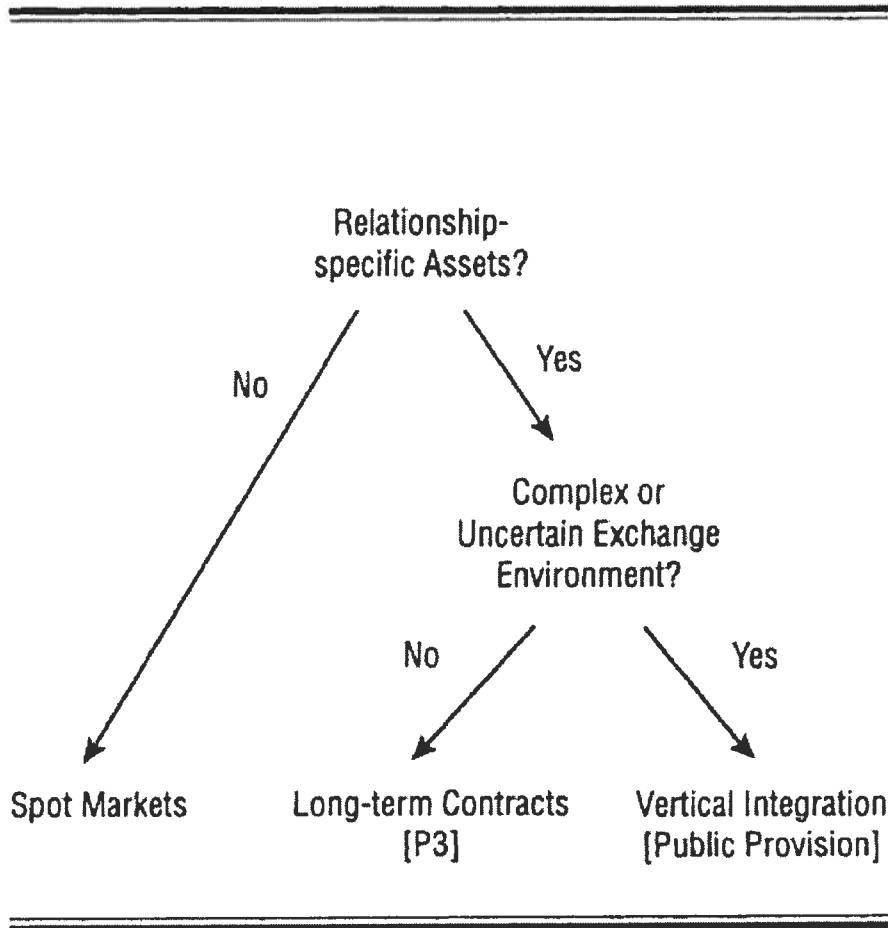
Figure 1 illustrates how risk may be allocated between the public and private sectors. Along the left axis, we can see that if the government takes on the project they absorb 100% of the risk involved, while the private sector maintains 0% of the risk. As we move right along the figure, one can see that traditional procurement, which is the government utilizing a private partner to provide some stage of the project, maintains higher governmental risk than private risk. In the middle of the figure we find PPPs, as they share the levels of risk relatively equally between the two sectors. Concessions in this example, is when a government directly buys a service from the private sector, thus making it more risky for the private partner, in terms of governmental demand, and political stability. Finally, along the right axis we find Privatization, where the private sector is in complete control of the project and thus absorbs 100% of the project's risks.

### 3.6 Public versus Private Provisions

There is a great deal of literature which compares the provisions between the private and public sector. Although a PPP may not adhere fully to the conclusions of a private or public provision, some of the conclusions regarding these trade-offs have been cited by critics and supporters alike. Here we underline several cases which adhere to some of the common conclusions inferred by this field of analysis.

Hart et al. (1997) suggest that, regarding provisions, the private sector offers more production efficiency, but a lower quality of service. The primary reason is due to incomplete contracts and the

positive relationship between the cost of service provision and the quality of service. The trade-off in this regard is that the private firm fails to internalize the negative effect of cost reduction and thus there is too much of an incentive to reduce costs which is what leads to a reduction in the quality of service. De Bettignies and Ross (2004) acknowledge the environment of incomplete contracts, and have adapted a comparison between long-term contracts and vertical integration in the context of franchise bidding verses regulation developed by Croker and Masten (1996) to fit their view of PPPs.



**Figure 2. Optimal Procurement of Public Services (De Bettignies and Ross, 2004)**

Figure 2 provides a decision tree for our consideration. Without relationship-specific investments, there are no transaction costs, and spot market provision is the best solution. The reason is that the spot market allows for more flexibility relative to long-term contracts and it permits the efficiencies associated with competition and private provision. An example of this scenario, provided by De Bettignies and Ross (2004), is food stamps, where the government provides a product (food) that requires no specific

investment via the spot market (supermarkets). When there are switching costs, two sub-possibilities arise: long-term contracts offer the best alternative when the relationships remain relatively simple (building a bridge) and as such writing contracts is possible. “When the complexities make the ex post inefficiencies too large, then vertical integration may be necessary” (De Bettignies and Ross, 2004, p.141).

When a government awards a service provision to a private organization, it essentially grants the awarded party a bilateral monopoly, in that the government is the soul purchaser of the good or service provided by the awarded party and this circumstance generates a surplus from trade. “When contacts are incomplete the trading parties behave opportunistically in an attempt to appropriate this surplus” (De Bettignies and Ross, p.140). The ability of a specific party to behave opportunistically depends on their respective level of ex post bargaining power.

#### **Section 4: PPP Models**

In this section we outline some of the fundamental models that pertain to PPPs. Beginning with the more primitive contractual model, developed by Grossman and Hart (1986), we move to more complex and applicable models to PPPs. The theory around PPPs has come a long way in the last 20 years and by addressing these models we can see how the insight into the dynamics of PPPs has evolved.

##### **4.1 Grossman and Hart (1986)**

One of the founding models in the PPP literature was conceived by Grossman and Hart (1986). As a basis their model utilizes the theories of transaction costs, residual rights and a primitive form of incomplete contracts, and was constructed to analyze the cost and benefits of integration between two firms. The authors outline a two period model involving two firms engaged in a relationship.

Date 0: The two firms, 1 and 2, sign a contract and make relationship-specific investments  $a_1$  and  $a_2$ , respectively.

Date 1: Further actions are taken by the respective firms  $q_1$  and  $q_2$ , which represent the rights of control over firm  $i$ 's assets and are assumed to be ex ante non-contractible. The gains from trade are realized and as a result the manager of firm  $i$  receives the net benefit:

$$B_i[a_i, \theta_i(q_1, q_2)].$$

Thus the optimal contract must maximize the total ex ante net benefits of both managers:

$$B_1[a_1, \theta_1(q_1, q_2)] + B_2[a_2, \theta_2(q_1, q_2)].$$

Grossman and Hart (1986) essentially outline two cases to make their point. In the first case there is no integration between the firms, which implies the management decisions are made independently. In the second case they consider an integration of the two firms whereby the investment decisions are made by one firm.

Case 1: Both managers 1 and 2 chose  $q_1$  and  $q_2$ , respectively, simultaneously and non-cooperatively to maximize their respective net benefits. The conclusion that the authors arrive at is that the optimum  $q_1$ , though it maximizes  $B_1[a_1, \theta_1(q_1, q_2)]$  for firm 1, is unlikely to maximize  $B_2[a_2, \theta_2(q_1, q_2)]$  for firm 2, given that  $a_1$  and  $a_2$  are chosen independently. This is also true for the optimum  $q_2$ , which is not likely to maximize  $B_1[a_1, \theta_1(q_1, q_2)]$ , and thus the net benefit for both firms is not optimized. Given this inefficiency, the parties can both benefit from writing a new contract at date 1, which specifies  $q_1 = q_1(a_1, a_2)$  and  $q_2 = q_2(a_1, a_2)$  which would maximize each manager's benefit, and thus maximize the total net benefits. However, the problem arises when there is a cost to renegotiation. Grossman and Hart (1986) suggest that this cost acts as a deterrent for the cooperative outcome, even though it does not actually occur, but the incentives are distorted nonetheless due to the choice of  $a_i$ , the ex ante investment level. So from this case, the authors point out some interesting theories.

In the case of costless renegotiation, the ex ante investment levels are essentially irrelevant since the contract may be renegotiated. When there is a cost to renegotiation, however, the relationship-specific investments firms make are inefficient. In the second case, Grossman and Hart (1986) suggest one firm owns the other. As such, at Date 1, the owning firm chooses both  $q_1$  and  $q_2$ . Similar to the previous case, this choice of investment maximizes the respective manager's benefit, but not the joint benefits, although it raises the owning manager's utility, it still has the same inefficiencies associated with the first case, in that the  $a_i$  decisions do not yield efficient results. Rausser and Stevens (2009) make some important points regarding this model, in that if one firm's first-period investment has a larger effect on the partnership's value than the other firm, the contract should assign the firm with the more valuable investment full control over the decision making in the second period. Thus the allocation of control in the first period provides the firm with the strongest incentive to invest optimally and the result is that the partnership value is maximized. Regarding a joint venture concerning a pure private good, the problem of under investment may be mitigated if the contract assigns control rights of the assets to the agent who is dependent upon that asset for production.

## 4.2 Hart (2003)

A later contribution to the stream of PPPs was again from Hart (2003) who developed a model based upon his previous works, Grossman and Hart (1986) and Hart and Moore (1990), Hart (1995) and Hart et al. (1997), which intended to bring to light the costs and benefits of PPPs. He ignores the choice of public and private ownership, and assumes that all provisions are private. In his model he bundles the construction and service provision of a facility, such that the government contracts a “builder” to construct, operate, and maintain the facility. The model considers 3 dates, 0, 1 and 2. The government and builder contract at date 0, the facility is constructed between the dates 0 and 1, and operated between the periods 1 and 2. The contract specifies the characteristics of the facility to be constructed, which pertains to the congenital provision, and the basic service that should be provided between the dates 1 and 2, which pertains to a PPP. The contract in this model is assumed to be “incomplete”, in the sense that the builder may modify the nature of the facility or the service without violating the initial contract. The builder may make two investments,  $i$  and  $e$ , which have consequences for the costs and benefits of operating the facility between the dates 1 and 2.

$$B=B_0+\beta(i)-b(e),$$

$$C=C_0-\gamma(i)-c(e).$$

Here  $B$  represents the unverifiable benefits to society (measured in money) of operating the facility and  $C$  represents the unverifiable costs born to the operator. The builder’s total investment cost is  $(i+e)$ . One can interpret  $i$  as a productive investment that makes the facility more attractive and easier to run, as it raises  $B$  and lowers  $C$ . This could be a higher quality building or better construction materials which reduce maintenance costs. The other investment,  $e$ , is the unproductive investment which reduces total costs and quality. In the case of a prison this may be the installment of an electric fence to reduce the possibility of inmates escaping. This would reduce prison operating expenses since fewer guards are required, but may not meet the social objectives of the government. The investment decisions,  $i$  and  $e$ , are chosen to maximize the net benefit,  $B-C-i-e$  according to the equation:

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

The first order conditions are:

$$\beta'(i^*)-\gamma'(i^*)=1$$

$$c'(e^*)-b'(e^*)\leq 1 \text{ with equality if } e^*>0.$$

To ensure that  $e$  is socially unproductive, Hart (2003) assumes  $c'(0)-b'(0)\leq 1$ . This ensures a corner solution  $e^*=0$ . Hart (2003) next proposes a circumstance where the builder's investments are non-verifiable and cannot be contracted on. In this circumstance Hart (2003) separates it into two cases for comparative purposes, case 1: separate contracts to build and operate (unbundling) and case 2: a Public-Private Partnership (bundling).

#### Case 1: Unbundling

According to Hart (2003), in this example the government contracts with a private builder at year 0 to build a basic facility for price  $P_0$ . At year 1 the government auctions off the contract to operate the facility. In the case where there is a competitive supply of contractors, the government will pay the facility operator a price equal to their operating cost  $C=C_0-\gamma(\hat{i})-c(\hat{e})$ , where  $\hat{i}$  and  $\hat{e}$  are the builder's equilibrium choices of  $i$  and  $e$ . The initial decision resides with the builder at time 0, whereby the choice of  $i$  and  $e$  solve the function:  $\text{Max}(P_0-i-e)$ . According to Hart, the solution is  $i=e=0$ , such that the builder constructs the cheapest facility possible (within the confines of the contract). Although these investments affect the operating contract price which the government has to pay, the builder does not internalize this externality. The government's net pay off is  $B-C-P_0=B-C-i-e$ , evaluated at  $\hat{i}=\hat{e}=0$ .

#### Case 2: Bundling (Public-Private Partnership)

In this case, Hart (2003) outlines a situation where the government offers a contract at date 0 which specifies the basic quality of the service that is to be provided between periods 1 and 2, and a price  $P$ . In this case the builder internalizes the cost of the service provision since the builder either provides the service themselves or subcontracts the service. In the subcontracting case, assuming there exists a competitive market of subcontractors, the builder will pay a price equal to the subcontractor's cost,  $C=C_0-\gamma(i)-c(e)$ . At date 0, the builder chooses  $i$  and  $e$  to solve:

$$\text{Max } P-C-i-e=P_0-C_0+\gamma(i)+c(e)-i-e.$$

The first order conditions are:

$$\gamma'(\hat{i})=1,$$

$$c'(\hat{e})=1.$$

Again assuming a competitive supply of builders, the government's net payoff is:  $B-P=B-C-i-e$ , evaluated at  $i=\hat{i}$ , and  $e=\hat{e}$ . Hart (2003) found that the trade-off between bundling and unbundling was that

under unbundling, the builder fails to internalize the social benefit,  $B$ , and the operating cost,  $C$ . Given the investment decisions  $\hat{i} = 0$ , the builder invests too little productive investment,  $i$ , but the right amount of unproductive investment,  $e$ . Under the PPP situation the builder still fails to internalize  $B$ , but does internalize  $C$ . The result is that he invests more of the productive investment, although too little, and more of the unproductive investment. Hart's (2003) model leads to the conclusion that simply contracting out a provision (unbundling) is good if the quality of the facility can be well specified while the quality of the service cannot be. This is due to the fact that the underinvestment in  $i$  may not be a serious issue. In contrast, a PPP is a more ideal option if the quality of the service may be well specified in the contract, while the quality of the facility may not be. The practicality of Hart's (2003) model is how it captures the choice between PPPs or conventional provisions and that the choice between these two projects is conditional on whether it is easier to write contracts on service provisions or on building provisions. To outline the equilibrium values of the investments we turn our attention to Figure 3.

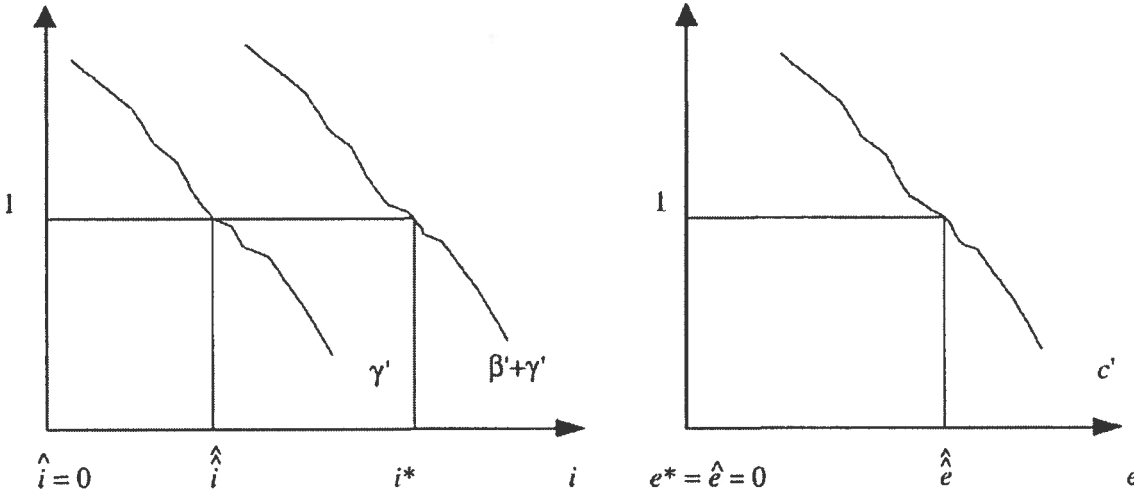


Figure 3. Illustration of Equilibria (Hart, 2003)

4.3 Besley and Ghatak (2001)

Besley and Ghatak (2001) acknowledge the earlier contributions made by Grossman and Hart (1986) and Hart and Moore (1990) within the field of incomplete contracts for understanding the importance of ownership of firms. The major distinction regarding Besley and Ghatak's (2001) approach is that they extend this analysis to consider public goods, rather than the case of private goods analyzed by the earlier works. The question these authors seek to explore is whether the government or a private partner should own public projects. The model they develop is composed of a single time period in which

the public project can be carried out. The two players,  $n$ , the non-governmental organization, and  $g$ , the government, can undertake human capital investments, through improved quality, which will increase the benefits generated by the project. The authors interpret these investments as knowledge or project-specific skills which are not fully transferrable and could include; specialized training, information acquisition, and developing a trusting relationship between staff and beneficiaries. The key factor about these investments is that they are project specific and lose value if assigned to alternative projects. The vector of investment decisions is denoted by  $Y=(y_g, y_n)$ . The benefit of the project depends on the investment level and is denoted by  $b(Y)$ . It is assumed that  $b(y_g, y_n)$  is a smooth, increasing and concave function which satisfies the Inada endpoint conditions. The investments are weak complements, suggested by  $\partial^2 b(y_g, y_n) / \partial y_g \partial y_n \geq 0$ . The respective project payoffs are:

$$\theta_g b(y) - C_g, \text{ and } \theta_n b(y) - C_n.$$

$\theta_g > 0$  and  $\theta_n > 0$  are the valuation parameters for  $g$  and  $n$  respectively, and  $C_g$  and  $C_n$  are  $g$ 's and  $n$ 's respective contribution to the project's costs. In the absence of any contracting problems, the parties will choose the level of investment to maximize the joint surplus:

$$(\theta_g + \theta_n) b(Y) - y_g - y_n.$$

The authors denote  $y_i^*$  as the joint surplus maximizing level of investment by party  $i$  which solves the following problem:

$$(\theta_g + \theta_n) b_k(y_g^*, y_n^*) = 1 \text{ for } k \in \{1, 2\},$$

$b_k(\cdot)$  is the derivative with respect to the  $k^{\text{th}}$  argument. Due to the authors' assumptions that  $y_g^* > 0$ ,  $y_n^* > 0$ , and  $(\theta_g + \theta_n) b_k(y_g^*, y_n^*) - y_g^* - y_n^* > 0$ , it is optimal to go ahead with the project when both parties' valuations are taken into account and the joint surplus maximizing investments are implemented. The authors outline the fact that in this case, where there are no limits on contracting between the parties, one would expect a partnership to achieve the previously mentioned joint surplus maximization. As with the previous models Besley and Ghatak (2001) utilize the concept of incomplete contracts, which suggests that investment decisions are made ex ante. Their choice to utilize incomplete contracts is due to their reasoning that it is natural in the context of public goods, as investments are extremely complex, and that better quality is difficult to contract on. The goal of the following model is to characterize under whose ownership the project provides the largest joint surplus. To modify the original model, the authors assume that the owner of the project has some residual control rights, and that these control rights represent a form of bargaining power. In this case, bargaining power allows the owner of the project to

exclude any party from working on the project at any stage, should a dispute arise. The game is outlined as follows;

Stage 1:  $g$  and  $n$  decide who should own the project, and therefore to whom the residual control rights should be assigned. The owner takes over the design of the project.

Stage 2: If a partnership is formed,  $g$  chooses  $y_g$ , and  $n$  chooses  $y_n$ , which are sunk and cannot be changed.

Stage 3:  $g$  and  $n$  bargain over whether or not to continue with the project. Transfers are allowed at this point.

$B^i(y_g, y_n)$  represents the benefit of the project if bargaining breaks down where  $i$  is the owner, such that  $i \in \{g, n\}$ , with  $B^i(y_g, y_n) \leq b(y_g, y_n)$ . These functions are assumed to be increasing and concave with  $\partial^2 B^i(y_g, y_n) / \partial y_g \partial y_n \geq 0$  and  $B^i(0, 0) > 0$ , for  $i = g, n$ . The marginal investment returns under different ownership structures satisfy:

$$b_1(y_g, y_n) \geq B_1^g(y_g, y_n) > B_1^n(y_g, y_n) \text{ for all } y_n,$$

$$b_2(y_g, y_n) \geq B_2^n(y_g, y_n) > B_2^g(y_g, y_n) \text{ for all } y_g.$$

These conditions state that the marginal return to a given type of investment is highest in the event of a disagreement when the party who made the investment is the owner (Besley and Ghatak, 2001). This implies that a part of the return on investment made in resource is retained within that resource even in the event that it is not employed. The default payoffs of  $g$  and  $n$  are denoted by  $\bar{u}_g^i(Y)$  and  $\bar{u}_n^i(Y)$  respectively. It is this ownership which determines what party will go ahead with the project in the event that bargaining breaks down. After the investments have been made, if the two parties are able to reach an agreement, then  $(\theta_g + \theta_n)b(Y)$  is the ex post joint surplus. They apply the Nash bargaining solution which results in the net of transfer ex post payoffs for  $g$  and  $n$  respectively:

$$[(\theta_n + \theta_g)b(Y) + \bar{u}_g^i(Y) - \bar{u}_n^i(Y)]/2$$

$$[(\theta_n + \theta_g)b(Y) + \bar{u}_n^i(Y) - \bar{u}_g^i(Y)]/2$$

Besley and Ghatak (2001) note that the payoffs for  $g$  and  $n$  are respectively:

$$v_g^i(y_g, y_n) = [(\theta_n + \theta_g)b(y_g, y_n) + (\theta_g - \theta_n)B^i(y_g, y_n)] / 2 - y_g,$$

$$v_n^i(y_g, y_n) = [(\theta_n + \theta_g)b(y_g, y_n) + (\theta_n - \theta_g)B^i(y_g, y_n)] / 2 - y_n.$$

Thus the players maximize the listed payoffs with respect to their own investment levels, taking the investment of the other party as given. At any Nash equilibrium, investment levels are below their joint surplus maximizing levels. Thus, giving ownership to the party with the highest valuation of the project improves investment incentives for both parties and results in the highest possible level of joint surplus. They also note that even if the investment of one party is more important for the project than the investment of the other party, as long as they have a lower valuation they are not optimally the owner, and that in the limit, if there is only one investing party, they are not optimally the owner if the valuation of the other party is higher. The key insight to this model is that granting ownership to the more caring party raises the marginal return to invest for both parties. The rationale for this conclusion is that since the project produces a pure public good, each party receives a pay-off from this good even if they are not involved with it.

#### 4.4 Francesconi and Muthoo (2010)

The final model we consider is the recent contribution of Francesconi and Muthoo (2010). The reason we have chosen to consider their model, is that it incorporates the notion of incomplete contracts and the allocation of authority principles underlined by Grossman and Hart (1986) and Hart and Moore (1990), and in addition it incorporates the principles of public goods, listed previously by Besley and Ghatak (2001). Francesconi and Muthoo (2010) offer a balanced and complementary approach to the previous work through their notion of “complex partnerships”. According to the authors “complex partnerships are partnerships which produce goods that are neither purely private nor purely public” (Francesconi and Muthoo, 2010, p.2). They underline three reasons why they deemed it important to address the idea of “complex partnerships”. The first reason is that many public goods, such as highways, airports, courts and possibly national defense and police service are subject to congestion, and as such these goods are rival but non-excludable to varying degrees. Other public goods, such as schools, universities, televisions, waterways, parks and transportation facilities are excludable, in the sense that individuals may be excluded by the price mechanism. Second, Francesconi and Muthoo (2010) point to the fact that the expansion of private-public partnerships over the last twenty years has produced a variety of impure public goods. The final point they suggest, is that by “exploring impure public goods they can better assess the robustness of Grossman and Hart (1986), Hart and Moore (1990) and Besley and

Ghatak's (2001) results when they are perturbations away from the pure private and pure public world" (Francesconi and Muthoo, 2010, p.3).

The model developed by Francesconi and Muthoo (2010) includes two players, a government,  $g$ , and a Non-Governmental Organization (NGO),  $n$ , who are involved in a group project. The authors suggest three critical dates in which the parties interact.

Date 0: the players jointly select an allocation of authority, or control rights between themselves. To denote the share of authority, the authors utilize  $\pi$  to represent the allocation to  $g$ , such that  $\pi \in [0,1]$ , and  $1-\pi$  represents the allocation to  $n$ .

Date 1: At least one of the players has an opportunity to undertake an investment which increases the benefits generated by the project. They denote this investment level by  $y_i$ , such that  $i=g, n$ . The cost of investing  $y_i$ , incurred by  $i$ , is the function  $C_i(y_i)$ . After the investments are sunk, the parties then face a bargaining situation. The authors denote two separate project benefits; when the decisions are taken through the allocation of control rights,  $\pi$ , the project's benefit is denoted by  $B(y,\pi)$ , and when the decisions are taken cooperatively the project's benefit is denoted by  $b(y)$ , such that  $b(y) > B(y,\pi)$ . Thus  $b(y) > B(y,\pi)$  implies that both parties can mutually benefit by making decisions cooperatively.  $B_i(y)$  denotes the project's benefit when  $i$  has sole authority.  $B$  may be expressed as a linear function of  $\pi$ :

$$B(y,\pi) = \pi B_g(y) + (1-\pi) B_n(y)$$

Date 2: The players negotiate over whether or not to cooperate in decision-making and over the level of monetary transfers from  $n$  to  $g$  or vice versa. If an agreement is reached, the payoffs to  $g$  and  $n$  are respectively:

$$(1) u_g(y) = \theta_g b(y) + t, \text{ and}$$

$$(2) u_n(y) = \theta_n b(y) - t,$$

Where  $\theta_i > 0$  is  $i$ 's valuation parameter of the project's benefits, and  $t$  is the monetary transfer from  $n$  to  $g$ , which may be positive or negative. If the two parties fail to reach an agreement, the project operates under the allocated control rights and the default payoffs for  $g$  and  $n$  respectively are:

$$(3) \bar{u}_g(y,\pi) = \theta_g [\pi B_g(y) + (1-\alpha)(1-\pi) B_n(y)], \text{ and}$$

$$(4) \bar{u}_n(y,\pi) = \theta_n [(1-\alpha)(\pi B_g(y) + (1-\pi) B_n(y))].$$

Where  $\alpha \in [0,1]$  is a parameter which captures the degree of impurity of the goods generated by the project. Thus  $\alpha=0$  represents a pure public good, while  $\alpha=1$  implies a pure private good. The key statement suggested by Francesconi and Muthoo (2010) is that  $b(y) > B(y, \pi)$  implies that  $u_g(y) + u_n(y) > \bar{u}_g(y, \pi) + \bar{u}_n(y, \pi)$ , and thus it is mutually beneficial for both players to negotiate an agreement and make decisions cooperatively at date 2. The Nash-bargained payoff for any  $\pi$  and  $y$ , gross of investment, for player  $i$  is:

$$V^i(y, \pi) = (1/2)(\theta_g + \theta_n)b(y) + (1/2)[\bar{u}_i(y, \pi) - \bar{u}_j(y, \pi)], \text{ for } j \neq i.$$

The payoff,  $V_i$ , is composed of one-half of the gross surplus, the first term, plus a factor which captures the difference in the players' default payoffs, the second term. After substituting (3) and (4) for the default payoffs, each agent's respective payoff is:

$$(5) V^g(y, \pi) = (1/2)(\theta_g + \theta_n)b(y) + (1/2)(\theta_g - \theta_n)B(y, \pi) + (\alpha/2)[\theta_n \pi B^g(y) - \theta_g(1 - \pi)B^n(y)]$$

$$(6) V^n(y, \pi) = (1/2)(\theta_g + \theta_n)b(y) - (1/2)(\theta_g - \theta_n)B(y, \pi) - (\alpha/2)[\theta_n \pi B^g(y) - \theta_g(1 - \pi)B^n(y)].$$

Francesconi and Muthoo (2010) suggest that this investment game has a unique Nash equilibrium solution,  $y^c(\pi) = (y_g^c(\pi), y_n^c(\pi))$ , and they utilize this to characterize the optimum value of  $\pi$ . This maximizes the players' date 0 equilibrium net surpluses and the solution to this problem results in:

$$(8) S'(\pi) = V_2^g(y^c(\pi), \pi)[\partial y_n^c / \partial \pi] + V_1^n(y^c(\pi), \pi)[\partial y_g^c / \partial \pi].$$

According to Francesconi and Muthoo (2010) the effect of a marginal change in  $\pi$  on the players' respective equilibrium investment levels depends on the signs of the cross-partial derivatives which capture the effects of a marginal change in  $\pi$  on the players' respective marginal returns on investment. The respective cross-partial derivatives for  $g$  and  $n$  are:

$$(9) V_{13}^g = \partial[\partial V_g / \partial y_g] / \partial \pi = (1/2)[(\theta_g - \theta_n)(B_1^g - B_1^n) + \alpha(\theta_g B_1^n + \theta_n B_1^g)],$$

$$(10) V_{23}^n = \partial[\partial V_n / \partial y_n] / \partial \pi = (1/2)[(\theta_g - \theta_n)(B_2^g - B_2^n) + \alpha(\theta_g B_2^n + \theta_n B_2^g)].$$

Regarding equation (9), Francesconi and Muthoo (2010) decompose the right hand side into two segments. The first term they denote as the Besley and Ghatak (BG) effect, from Besley and Ghatak (2001), which may be positive or negative depending on whether  $g$  values the projects benefits more or less than  $n$ . The second term in the equation they refer to as the Grossman and Hart, and Hart and Moore (GHM) effect, from Grossman and Hart (1986) and Hart and Moore (1990). The GHM effect is strictly positive when there exists some degree of impurity ( $\alpha > 0$ ) and zero in the case of no impurity ( $\alpha = 0$ ).

The author's conclusion in this regard is that the  $g$ 's investment incentives are driven by two potentially opposing forces: preferences and technology. To outline this conclusion, they point to a case where  $n$  places a relatively higher value on the project than  $g$ . In this case the BG effect is negative for  $V_{13}^g$ , and the GHM effect is positive. Given that  $\theta_n > \theta_g$  and  $B_1^g > B_1^n$ , the BG effect arises because  $n$ 's marginal return to investment is higher when  $g$  has the sole authority than when  $n$  has sole authority. Further they state that this is the key reason why  $g$ 's relative bargaining power is higher when  $n$  has sole authority than when  $g$  has sole authority. The GHM effect comes about from the intuition that allocating more authority to an investor increases their relative bargaining power. Regarding impure public goods ( $0 < \alpha < 1$ ),  $g$ 's aggregate relative bargaining power is the sum of these two opposing effects. What is interesting about this model is that it incorporates both the conclusions made, regarding PPPs, by the works of Grossman and Hart (1986), Hart and Moore (1990), and Besley and Ghatak (2001). The BG effect is consistent with the conclusions made by Besley and Ghatak (2001), in that control rights should be allocated to the player who values the project the most. In the other instance, the GHM effect captures the conclusions made by Grossman and Hart (1986), and Hart and Moore (1990), such that the investor should be granted the sole authority of the project. In this circumstance, each partner's investment is equally important. "Given that the high value partner already has an incentive to invest because they will enjoy some of the benefits of the impure good without having the decision making authority, the low value partner should have sole authority and the bulk of the control rights as it will edge them to invest more resources" (Rausser and Stevens, 2009, p.78).

This section was intended to help outline the development and diversity of PPP theories. We note that as PPP started to become more utilized by governments around the world, the current literature began to move further away from the standard contractual approach and government provision concepts, towards the bundle of tasks, (Hart, 2003), and the complex partnerships, (Francesconi and Muthoo, 2010). From the models listed we summarize some important conclusions. From Grossman and Hart (1986) and Hart (2003), the models concluded that the optimum allocation of control rights should be assigned to the firm with the most valuable investment. In the case of Besley and Ghatak (2001), the control rights should be assigned to the firm with the highest valuation of the project. Francesconi and Muthoo (2010) found that if the good is more of a private good, the control rights should be assigned to the firm with the most valuable investment, but if the good is more of a public good, the control rights should be assigned to the firm with the highest valuation of the project.

## Section 5: Institutional Arrangements

Institutions are defined as “the symbolic elements that create shared meanings and controls that provide order to social action” (Jooste et al. 2011, p.12). These elements include regulatory and legal frameworks, norms and value systems and cultural elements such as schemas and beliefs (Scott, 1995, p.2008). Unarguably one of the fundamental aspects of a PPP is the underpinning institutional arrangements and the nation’s capacity. Jooste et al. (2011) further suggest that it is this capacity that sets about the rules, procedures and endowments in the society in which PPPs are conceived, enacted and operated, and that a fragile capacity such as political or economic uncertainty or corruption threatens the success of PPPs.

Bovaird (2004) outlines some of the typologies which he applies to PPPs. These classifications may be helpful in understanding the context of the institutional arrangements in which PPP function.

- Sectorial basis: partnerships with third sector organizations and civil society associations, with private business, with both business and the third sector.
- Relationship basis: loose network, collaborative, power-sharing, contractual.
- Economic basis: supply-side, demand-side or mixed demand/supply-side partnerships.
- Policy area: policy objectives of partnerships (e.g. promoting economic productivity, empowering clients and the disadvantaged, tackling social inclusion).
- Scope: vertical, horizontal and mixed partnerships.<sup>2</sup>

He further suggests that each of these types of partnerships has a different rationale behind them, and that their attractiveness depends on the priorities of the government. Concerning the priorities of government, Bojović (2006) suggests that due to the dissatisfaction of large and ineffective government lead toward an inclination to include the private sector and as early as the 1980s a new way of thinking called “New Public Management” was the solution. This form of thinking included some fundamental ideological changes, such as: greater disaggregation of the public sector, increased competition between public sector organizations and the public and private sector, more of a private sector style of management and more efficiency with regards to resource use (Bojović, 2006). This was not the driving force for establishing PPPs, but rather a prior condition for governments which would enable PPPs.

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<sup>2</sup>Bovaird, 2004, p.203.

A change in government sentiment alone is not enduring enough to propagate PPPs, they also require an organizational field. An organizational field is defined as “those organizations that in the aggregate constitute a recognized area of institutional life: key suppliers, resource and product consumers, regulatory agencies, and other organizations that produce similar services and products” (DiMaggio and Powell, 1983, p.148). We utilize this concept as it has a great deal of significance in the formation and development of PPPs as DiMaggio and Powell (1983) suggest it directs our attention to not only competing firms or networks, as we will explore later, but to the totality of relevant actors. Jooste et al. (2011) have extended this intuitional concept to clarify what they refer to as the PPP-enabling field. The PPP-enabling field is “a network of PPP-enabling organizations which include Sponsoring Departments, PPP Units, Transaction Advisors, Transaction Auditors, Public Regulators, Non-Public Regulators, Advocacy Associations and Local, Regional and Multinational Development Agencies” (Jooste et al. 2010, p.12). Before we turn our attention to these networks of PPP-enabling organizations it is important to outline the arrangements within the PPP-enabling field as they act to draw broader attention to the political and societal environment affecting the design and conception of PPP programs.

Next we outline the institutional arrangements which brought about the development of the PPP-enabling field in three countries of interest: the United Kingdom, Australia and Canada. In the three preceding cases, reforms which enable PPPs where generally a result of two main factors: the perceived inefficiencies of the public sector and the adoption of neo-liberal ideologies. As well, the three examples share some commonalities with regards to the form that their PPP take, which may help isolate the institutional arrangements. Binza (2008) outlines these common elements as:

- The metropolitan government defines the service by specific outputs or outcomes and key performance indicators or criteria, which the private partner must adhere to for the duration of the project (10-30 years).
- The provisioning government must receive the asset or service before making the payment.
- The private sector designs, operates and owns the project for the duration of agreed upon term.

## **5.1 United Kingdom**

In the case of the United Kingdom, according to Jooste et al. (2011), the government’s initial approach to addressing the previous sentiment was initially excessive selling off of state assets. With the goal of alleviating public sector constraints the UK moved to a new method of developing assets through

partnerships with the private sector. These partnership initiatives were introduced through varying intensities prior to 1992, but the establishment of the Private Financing Initiative (PFI), launched in 1992 by the Conservative leadership of John Major, is acknowledged by Jooste et al. (2011) as the birth place of systematized programs aimed at enabling PPPs. The next year the Private Finance Panel was established, which was composed of high-ranking public and private officials whose role was to encourage more PFI arrangements. Not much progress had been made in the PPP field for the next several years until Tony Blair's Labour government came to power in 1997. Blair's government added a much needed improvement to the institutional arrangements supporting PPPs.

The most notable development from this initiative was the establishment of the Treasury Taskforce, which was a PPP unit located within the Treasury. The Treasury Taskforce was the first step to the decentralization of PPP initiatives and 3 years later was evolved and replaced by Partnership UK (PUK). PUK was and remained, until 2011, the agency responsible for establishing PPPs and Private Financing Initiatives to deliver public services and infrastructure. In its initial development PUK was composed of 51 per cent private ownership through the Public Limited Company and 49 per cent through government. Jooste et al. (2011) suggest that the importance of PUK as an institutional arrangement was that it not only provided the PPPs with a functional and decentralized framework to operate within, but it also represented an ideological shift in the understanding and promotion of PPPs which would, as an institutional arrangement, help to propagate the establishment of new and evolving PPPs.

In their analysis of the institutional arrangements involved in PPP networks in Canada, Australia and South Africa Jooste et al. (2011) suggest that the birth of the PFI in the United Kingdom "...was a symbolic system that emerged as an archetype for PPP implementation," and that it formed a "seedbed of ideas that [was] carried through material systems to each of [their] three case regions" (Jooste et al. 2011, p.15).

## **5.2 Canada**

To understand the development of the PPP network in the case of British Columbia it is important to first consider the political landscape. As noted by Jooste et al. (2011) The New Democratic Party's (NDP) leadership in British Columbia in the 1990's had seen rapid increases of tax payer debt. Due to the fiscal problems and the controversy over the ferries project and union influence the NDP government was crashed in the next election and Gordon Campbell's Liberal party won an overwhelming 77 out of 79 seats in the provincial legislature. The authors suggest that this outlined a clear picture that voters were not content with the previous government's fiscal exercises or their co-operation with unions as a means

to deliver infrastructure. Once elected, Campbell's government who was unconstrained by political opposition, set out extensive fiscal reforms, which included the sales of various state assets, tax cuts and significant cutbacks to the size and budget of the civil service and the inclusion of PPPs for large infrastructure projects. Jooste et al. (2011) note that as early as 1994 representatives from British Columbia's provincial treasury had investigated the UK's PFI and conducted a more comprehensive study after Campbell came to power and that this momentum was further enhanced by a local advocacy group, the Canadian Council for PPP, who flew in specialists from the UK to aid ministers in developing pilot projects.

British Columbia continued to rely on the UK model as a means to guide and design their partnership enabling organization Partnership BC. They note that a significant difference in the BC PPP model however was a heavy reliance on the top-down approach for implementation. The guiding PPP legislation in British Columbia, the Capital Asset Management Framework, gave priority to PPPs as a means of infrastructure delivery. If for example a public official wished to implement another form of public service delivery it was their responsibility to show why a project should not be done as a PPP. It has been suggested that the Campbell administration's centralized approach to the promotion of PPPs is a result of their direct opposition to organized labour (Jooste et al., 2011). As recent as of 2009 the PPP debate continues to be a polarizing issue within BC politics, with the NDP as their opposition.

Mylvaganam and Borins (2004) provided a very detailed account of the institutional setting for the establishment of the 407 toll highway in Ontario, although the project ended up being privatized under a 99 year lease, the bulk of its design, constructing and finance came about through public-private arrangements. Initially the routine tendering process for the construction of the highway were enacted, as small construction contracts were granted on a yearly basis, which fell in line with the provincial budget, and the expected completion date of the project was 2020. During this period, it would be more accurate to consider the 407 construction as case of traditional procurement. The authors suggest that it was the coming to power of the New Democrats in 1990 that set the stage for a new policy consideration regarding service delivery, whose objective was to offer faster and more efficient services. Regarding road construction, this would mean employing larger work packages for construction and utilizing experts from the private sector in designing and building contracts. They also suggest that what further fueled the drive toward a PPP framework was the onset of a deep recession within the province, the talk within the government of hitting a "borrowing wall" where the provinces debt rating would be downgraded and thus significantly raise the costs of capital projects. This meant that an alternative method of stimulus and job creation would have to be explored. In February 1993, the NDP Premier Bob Rae publically announced

that the Highway 407 would be accelerated from its current schedule and would be constructed as a toll facility. One of the contributing factors for this choice was that Rae believed strongly that private sector involvement would lead to innovation and efficiencies that were less likely under the current system, and openly invited them to participate with the government to entertain new ways of constructing the highway.

To enable this project, the government took several steps to create the organizational capacity for the contracting process. First, the Premier set about an extensive reorganization of his cabinet, which included the retirement of the Deputy Minister of Transportation, Gary Posen, and the assignment of George Davies, who was the former Deputy Minister of Energy and had a successful reputation as a results-oriented executive. Before Davies' arrival, a streamlined policy development and decision-making structure had been established by the MTO. The approach to outsourcing the project had its consequences, in that the management planning process had to move beyond the MTO to a new inter-ministerial team, the Highway 407 inter-ministerial committee, established in March 1993 (Mylvaganam and Borins, 2004).

The community, in this example, became the forefront enabling organization and was composed of others such as the MTO who took the lead, and was supported by the Finance, Treasury Board, Cabinet Office and the Ministry of Economic Development and Trade (MEDT). The preceding government agencies would also act as supporting enabling organizations to help bring to life the PPP project. Private sector advisors which would contribute to the enabling field included Goldman Sachs and CIBC Wood Gundy, as financial advisors, Wilbur Smith and Associates (WSA), who was recognized for their expertise in developing traffic and revenue forecasts, IBI Consultants to work alongside them to enable Ontario expertise in the field, and Price Waterhouse was brought in to provide advice on the management of the entire process. Throughout the planning process the government consulted a number of affected interest groups. This consultation took the form of opinion surveys, focus groups and contacts with interest group leaders. The process was transparent enough to keep elected officials within the effected municipalities informed, and was widely supported by those affected. Although the enabling field in this case had its opposition, the lack of opposition of the ruling party, much as with the Victoria case, was a key factor in ensuring a strong enabling field for the development of the 407 PPP project.

### 5.3 Australia

Important to the PPP enabling field in Australia, as Regan et al. (2011) note, is that the countries constitutional arrangements assigned the roles of most infrastructure projects to the State or local governments. This meant that the need for infrastructure projects must be met by the capacities of local governments. Jooste et al. (2011) account that from the 1980s to 1992 the Australian Labour party of Victoria employed PPP-type arrangements to achieve off-balance sheet financing to circumvent the limitations set out by the Australian Loan Council, similar to the case in British Columbia. The rising public debt levels of the government eventually lead to their defeat and a landslide victory for the Liberal party in 1992.

From 1992 to 1999 the Liberal party, led by Jeff Kennett, implored a wide variety of budget cuts and fiscal reforms. These included the privatization of many state assets, such as gas and electronic utilities and the construction of large scale infrastructure projects under the early PPP arrangements. The Kennett government implemented three major reforms to the earlier Australian PPP model. First the Victorian Auditor General revised the tax treatment of PPPs recognizing debt commitments as “on balance sheet”. Second, projects would entail a full transfer of services from the public to private sector. Third, asset ownership for social infrastructure was transferred to the private sector for the length of the contract. The policy and framework employed by the Liberal government to bring about these reforms was the Infrastructure Investment Policy of Victoria. One of the main critiques with the operation of PPP under the Kennett government was the lack of transparency regarding government procurement. Another critique of Kennett’s government, which may have led to them being ousted by John Brumby’s Labour Party in the 1999 election, was the drastic reforms he had implemented during his leadership. Under Brumby’s government, the PPP approach would again undergo reforms as Brumby’s government sought consultants from the UK to aid in the redesign of PPPs.

Regan et al. (2011) suggest that by 2001 PPP policy frameworks and guidance materials were put in place in most jurisdictions within Australia. This would lead to the development of Partnerships Victoria (PV) in 2001 which would establish a clear PPP-policy and make it freely available (Jooste et al., 2011). The authors further suggest that in order to retain the support of labour unions the Labour Party set out a more balanced contracting-out of services which retained core clinical and custodial services in hospitals and prisons in the hands of the government. To ease tensions of privatization PV would transfer ownership of assets under PPPs back to the public sector. The last major change was the reformation of the PPP unit within the Treasury. Unlike the unit utilized by the Kenneth administration, the Brumby

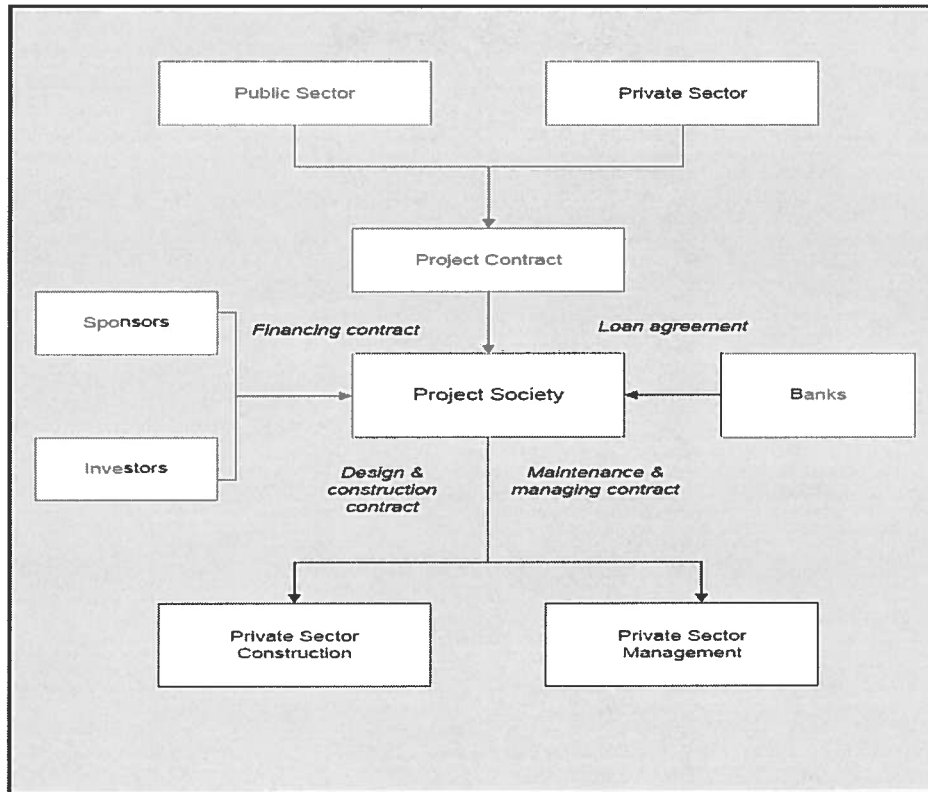
PPP unit took a much less hands-on approach to project implementation and was mainly tasked with overseeing PPP implementation.

Regarding the three previous cases, the common motivating factor for developing PPP seems to stem from constraints on government budgets. High government deficits and privatization stigmas bore by the public appear to be necessary conditions for the exploration of PPP as an alternative to infrastructure delivery. The success and continued reliance on PPPs appears to be consistent in institutional frameworks where governments are relatively decentralized. As highly centralized PPP enabling organizations may bring about public distrust in a government or generate public sentiment of government subjectivity and favoritism. As was the case in Victoria this distrust weakened the institutional arrangements that fostered PPP and as such they were destroyed in their existing form.

## **Section 6: Networks**

The nature of PPP, particularly in the areas of infrastructure, may be perceived as schemes that “...are discrete initiatives with defined deadlines, produced by temporary networks of governmental agencies and firms that come together to deliver each project” (Siemiatycki, 2011, p.311).

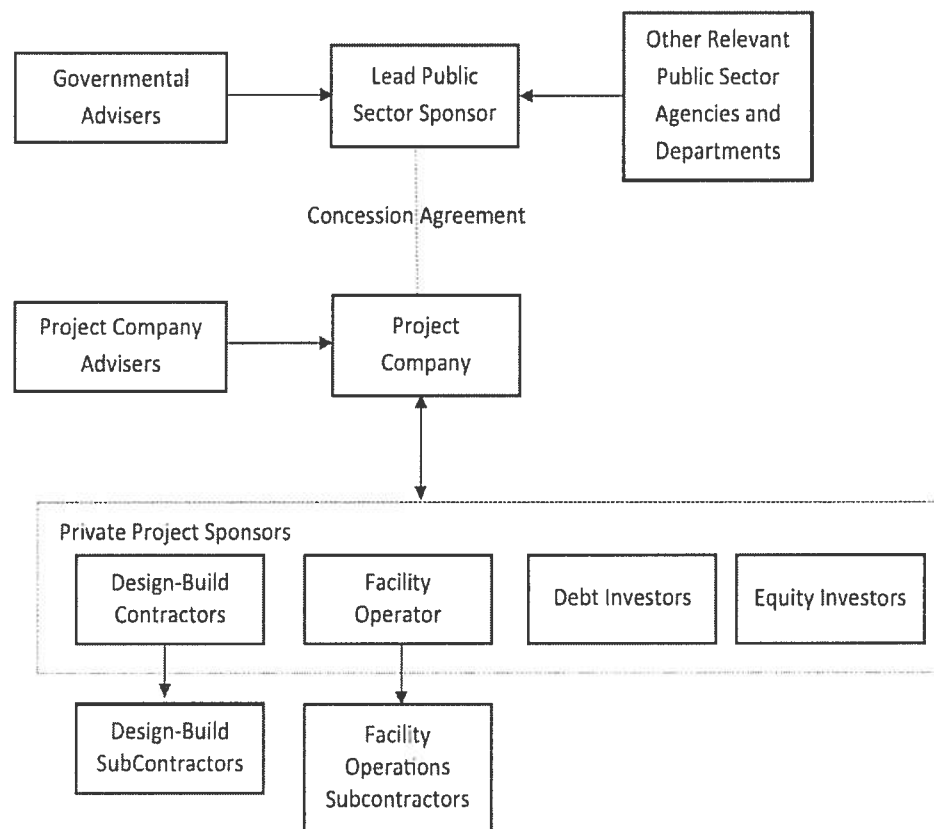
With the aid of Figure 4 one can gain some insight into how a PPP network is organized. From this figure one can see that the PPP networks are complex and diverse arrangements of actors, with different areas of expertise. It is this diversity in conjunction with the various contracts that tie the parties together which make PPPs distinct from any other form of procurement. The public and private sectors are tied together through the use of a service contract. The private sector construction is tied to the process through a design and construction contract, and the private sector management enters the agreement through maintenance and managing contracts. On the financial side, equity provided by sponsors and investors enters the project through financing contracts, and funds from banks are provided through loan agreements. It is these parties and the various agreements they share with one another that make up the project society. In reality it is common to find these players forming a consortium which usually takes on the construction and management tasks simultaneously.



**Figure 4. General Model of PPP-Participants and PPP-Project Financing (Sajko, 2008)**

The nature of project-oriented environments requires firms to develop new project teams, submit bids on short notice and select bidders on the basis of imperfect information about future outcomes. These facts underline the importance of firms who wish to be successful in this area to lock in past clients for repeat business through the development of interpersonal trusting relationships, to cultivate their brands, build a positive reputation and exchange tacit knowledge to learn of the real time standing of firms in the industry. This general model provides a basic overview of the actors involved within PPP networks. In many real world cases, these actors are not simply connected through various contracts and agreements but rather they aggregate themselves and their interests within a consortium. In the case of Ontario's 407 toll road, a private consortium, the Ontario Road Development Corporation (ORDC) had been formed prior to the announcement of the streamlining of the project. Mylvaganam and Borins (2004) note that the ORDC was composed of leading consulting engineers and road builders, which included McCormick Rankin and Warren Paving within the province and included the participation by leading banks. Marshall Macklin Monaghan was the consulting engineers within the consortium and had been actively involved in the promotion of design-build projects.

Under the PFI within the UK the PPP model includes the tasks of the design, building, financing, operation and maintenance of facilities, which are bundled into a contract with a single concessioner. In return the contracted firm is paid an annual fee over the life of the project which is intended to cover the costs of capital, maintenance, operation expense and a margin of profit. The typical PPP arrangement for infrastructure, under the PFI model, involves several transactions throughout both the public sector partner and their relationships with various firms and the private sector partner and their relationships with various firms. For the public sector one agency or firm usually serves as the lead public sponsor, or commissioning agency which may receive input from other levels of government or departments. For the lead public sector sponsor who executes a PPP usually involves hiring multiple firms to serve as independent financial, insurance, legal and technical advisors throughout the procurement process.



**Figure 5. The Typical PFI Concession Structure (Siemiatycki, 2011)**

From figure 5 we can see a more applied formulation of a PPP network. The Lead Public Sector Sponsor refers to the front running agency, such as Ontario Road Development Corporation from our 407 example, in a broad sense this could also be the State or municipal government. The Other Relevant Public Sector Agencies and Departments could include the associated State Treasury, or Finance

Department, parties who are bound by the constitution to share an interest in the project. The Governmental Advisors may be private or public agents who propose interest in developing a PPP, or advocate for the particular need for that infrastructure. The Project Company represents the bidding consortia or firm, who propose the feasibility, offer their bids and establish a delivery method based on their Project Company Advisors. The Private Project Sponsors may be member companies of the consortia, or independent firms, who are responsible for the various elements of the project. Various subcontractors may be employed by the Private Project Sponsors to carry out the Design-Build or Facility Operations stages of the project.

The private sector structure is similar to that of the public sector arrangement in that it also involves a variety of companies organized through a complex set of arrangements. A project company is formed, which is composed of a verity of firms who have been the successful bidders of the project. The project company then enters into arrangements with the commissioning agency, key subcontractors and investors. Typically in the PFI model, the lead sponsor of the project company is a large construction-management or engineering firm and the consortium team is rounded out with sponsoring firms who have expertise in the operations and maintenance of similar facilities and project financing. To produce a bid and deliver the project the company hires, utilizes in-house or a combination of specialized legal, financial and technical advisors and an insurance broker. In some cases firms sponsoring a project may make an equity investment amounting to up to 10 per cent of the project's costs which helps tie them into the interests and success of the project. The remainders of the project costs are financed through debt investors or through the floating of bonds, organized by a series of bank arrangements. The independence of the actors involved is a result of the long-term contract in which the project is to operate within (Siemiatycki, 2011).

Analyzing the network dynamics of a PPP is important, as Siemiatycki (2011) suggests, as it helps to provide insight into "...the theory of network relationships in organizations that are engaged in project-based work..." (Siemiatycki, 2011, p.311). He further suggests that given the collaboration involved within PPP projects, client-contractor based relations are insufficient in exploring the nature and extent of embeddedness among key actors in these partnerships. Network theory suggests that "more durable partnership networks provide the opportunity to enhance trust, build reputations and better align the interests of project partners" (Siemiatycki, 2011, p.311). The importance of these relationships is that they may bring about the reduction in transaction costs, lower delivery costs, leads to fewer change orders and overall more productive relationships over the course of long-term projects. The United Kingdom recognizes the importance of these durable partnership networks, as they suggest from the HM Treasury

(2008) as they act as important drivers of value for money and for the provision. Tensions do arise regarding these collaborations. Siemiatycki (2011) claims that on one hand the extensive use of repeat partnerships can lower transaction costs, encourage innovation and support learning from past experiences, while on the other hand, a deep embeddedness within social networks which encourages repeat collaborations can reduce competition within the industry, contribute to higher delivery costs and the lower quality of public service delivery.

The question then becomes apparent, as to the extent in which the partnership networks which PPPs are composed of are of a beneficial nature, or hindrance. To explore this issue, we draw attention to two of the fundamental factors of PPP networks, competition, and repeat collaborations.

## **6.1 Competition**

According to the National Audit Office (2007) competition within PPP networks is important as it is necessary to drive down prices, stimulate technical innovation, and encourage the control and transfer of project risks. It has been suggested that “PFI schemes are characterized by a small number of very large firms competing for contracts; very few firms have the economies of scale and financial muscle to lever in funds, while the high bidding costs and tendering periods act as serious disincentives” (Pollock, 2009). From data compiled from the HM Treasury and Partnership UK for the period from 1987 to 2009 Siemiatycki (2011) documents the level of firm concentration in various aspects of infrastructure projects. It is apparent in the UK case that the market share of Financial Advisors to the government is highly concentrated with the top five firms contributing to 89 percent of the PFI within the transportation sector. These firms include: Price Waterhouse Coopers, KPMG, Deloitte & Touche and Ernst & Young, who participated as financial advisors to the central government, and regional and local authorities. Siemiatycki (2011) suggests that the prominence of these 4 firms within this area reflects the fact that few organizations have the technical expertise, staff capacity and past performance record necessary to conduct such evaluations. Regarding government legal advisors, there is also a high degree of concentration, with 73 per cent of the market share for the top 5 firms. He suggests that this could also be attributed to the same facts that support the high degree of concentration among government legal advisors. Siemiatycki (2011) acknowledges the fact that these technical explanations are not without their critique. He points to a critique put forward by UNISON (2003), the UK trade union, which suggested that the concentration of the Big Four accounting agencies who serve as financial advisors has been politically motivated. The argument here is that these firms provided favorable results to support the expansion of PFI. This is not an unwarranted claim Siemiatycki (2011) suggests, as for firms who provided financial, technical and legal support for the private partners the levels of concentration were

significantly lower at 40, 44 and 64 per cent respectively. The greatest level of concentration resided within the bank arrangements with private partners, which amount to 71 per cent of the market share residing within the top 5 firms.

Regarding the design-build partnerships there does also appear to be a high level of concentration for roads, transit and street lighting. Siemiatycki (2011) attributes the 89 per cent in street lighting to the fact that the project has the simplest project ecology in terms of project tasks which requires limited collaboration between clients and concessionaires. He further suggests that the more a project requires specialized construction, equipment-manufacturing and technical expertise, such as the case with roads and transit, the less likely it is that a few firms would dominate the industry. Siemiatycki (2011) also underlines that as the industry matures over time, less and less firms participate within the competitive bidding process, derived from the National Audit Office (2007), whereby between 2004 to 2006 one third of the projects attracted two or fewer bidders.

## **6.2 Repeat Collaborations**

“Understanding the importance of repeat collaborations within partnerships provides insight into important tensions within the theory of network relationships in organizations that are engaged in project-based work” (Siemiatycki, 2011, p.311). Siemiatycki (2011) further outlines the benefits and drawbacks of these repeat collaborations. The extensive use of repeat-partnership relations lowers transaction costs, encourages innovation, and supports learning from past experiences. The drawbacks of deep embeddedness within these networks can reduce competition within the industry and contribute to higher delivery costs and lower-quality public services. According to Siemiatycki (2011) the direct benefits of durable partnerships are that they provide the opportunity to enhance trust, build reputations and better align the interests of project partners. It is these factors which contribute to reduced transaction costs, lower overall project delivery costs, fewer change orders and more productive relationships over the course of the long-term operating contract. This is further promoted by the HM Treasury (2008) who view such long-term collaborations as key drivers of value for money and the provision of high-quality service.

Based on his observation of the PFIs within the UK from 1987 to 2009 Siemiatycki (2011) notes that repeat collaborations between governmental commissioning agencies and their private sector advisors and general construction contractors are relatively strong and enduring over time. He observed that four public sector sponsors, the Highway Agency, Transport for London, the Scottish Government and the Northern Ireland Executive, procured more than one PFI and that among these agencies there were

typically consistent clusters of financial, technical and legal advisors who collaborated repeatedly with the same sponsoring agency. Regarding the Highway Agency and Transportation London, who both procured over a dozen projects, repeat collaborations with firms were temporally enduring as they took place over 10 year periods. The observed trend was that national and regional agencies who procured more than one project were more likely to utilize the same cluster of advisors than did local and regional authorities who only procured one project. This pattern may be a result of the means by which government consulting contracts were awarded in the UK. According to the National Audit Office (2007) one half of government consulting contracts were awarded through competitive bids, one-third from sole source procurement and the remainder was assigned through on-going framework agreements, which specified services to be purchased from a single vendor over a determined period of time.

Regarding the design and build phase of PPPs, Siemiatycki's (2011) study of the UK revealed the fact that in most cases the private partner was one from a small number of firms who had past experience in the design and building projects for the same agency. The results were that 15 design-build contractors were involved in multiple projects for the same agency, while 6 were involved in 3 or more projects. The pattern typically included periods of intense collaboration with specific design-build contractors for several projects. Repeat collaborations were most intensive in projects that required relatively routine inputs such as road-related projects for the Highway Agency. This analysis showed that repeat collaborations were less likely in specialized projects such as railway construction and refurbishment projects carried out by Transport London.

The accounting partnerships involved with PFI in the UK are structurally guided by the federal government in circumstances where they are recorded off-balance sheet. To this end, in order for local authorities to maintain off-balance sheet records for their projects, they must abide by the borrowing limits and the accounting partnerships the federal government adheres to too obtain their support and meet borrowing limits set upon them by the national government. Given that one of the fundamental factors of risk sharing within a PPP is that it is important for project sponsors to hold some long-term equity stake in the project. As of 2009 Siemiatycki (2011) notes that at least one of the original project sponsors held equity stake in three-quarters of all transportation PPP within the UK. In addition, in 54 percent of the UK PFI the original contractors held half or more of the equity in the project. Although it is the intention of equity investments to foster mutual collaboration and vested interests within a specific project among the players, since only about one tenth of a PFI is funded through equity investment, the remainder through multiple layers of debt accessed through international capital markets The dynamics of

the PFI framework externalize a great deal of financial risk to international credit markets which can be very volatile (Jefferis and Stilwell, 2006).

As was noted earlier repeat collaborations are important to the efficiency of PPPs as they lower transaction costs by building trust among partners. Siemiatycki (2011) concludes that these repeat collaborations occur in short punctuated bursts when they offer the benefit of lowering transaction costs on similar projects with the same client. To this end he notes that of the 67 transportation projects he observed no design-build contractor partnered with the same firm to sponsor more than four projects. As well, less than one-third of Highway Agency PFIs and one-fifth of Transport of London PFIs were carried out by project companies containing the same cluster of two or more design-build contractors. Regarding the Scottish Government and the Northern Ireland executive each winning bidder on a project utilized an entirely different set of design-build contractors. The rationale here is that in the short-run the benefits of lower transaction costs among repeat collaborations are apparent, that is for projects whose duration is up to 3 years. For projects whose duration exceeds 5 years, it is less common to find these forms of repeat collaborations as it has been suggested that the benefits of repeat collaborations are lessened in the long-run due to staff turn-over which weakens these interorganizational relationships and that the specificity associated with each project requires a new set of skills.

There is a lot of criticism regarding bias in firms who act as advisors to both public and private sector partners. This stems from the suggestion that firms who are selected to function as advisors generally offer guidance in support and expansion of PPPs. In the case of the UK all the Big Four accountancies, in addition with other public-sector advisors, contractors and financiers are all members of the national PFI industry lobby group and promote their PFI services on their websites (Siemiatycki, 2011).

## **Section 7: Selection Process**

When selecting a private contractor, the public sector usually does so by means of public auctions or through negotiation. Doni (2004) suggests that the negotiation method of procurement is generally reserved for standard contracts and that it is characterized by the full objectivity of the awarding criteria. Regarding public auctions on the other hand, Saussier et al. (2009) suggest that public private partnerships can be awarded according to one of two criteria. Either the “lowest price only” or the “most economically advantaged tender”, and that the choice of the particular tender depends on the projects complexity and level of uncertainty.

The “lowest price only” is generally awarded for standard goods where it appears reasonable that the contract be specified accurately *ex post*. Since the 1950s, it was common practice for the Ministry of Transportation Ontario (MTO) to utilize a practice of this sort to award contracts for highway construction. Contractors were permitted to bid on projects up to their level of financial qualifications, and when there was no difference in the design and construction quality, the price was the only selection criteria (Mylvaganam and Boris, 2004). Saussier et al. (2009) suggest that this method may face problems when the need to alter the original project arises or if the project would face unforeseen complexities that were not specified during the formation of the contract.

Regarding the “most economically advantaged tender” case, various criteria may be utilized to consider potential winners. According to Saussier et al. (2009) these may include quality, technical merit, aesthetic and functional characteristics, environmental characteristics, running costs, cost-effectiveness, the delivery date, or the completion date. They suggest that in the case of multiple criteria, the public agency should specify the relative weight of each criteria through scoring auctions or implement sequential procedures. Existing theoretical developments on multidimensional auctions often deal with two dimensions: price and quality. In price and quality case, theory suggests that auctions perform poorly at producing the optimal mix of quality and price for complex products when quality is difficult to verify. It has also been shown that two-dimensional auctions provide high powered incentives for price reduction at the expense of quality (Saussier et al. 2009). The conclusion is that bargaining sequentially with individual suppliers may yield greater net benefits for the buyer than would auctions. Saussier et al. (2009) note a second argument against multidimensional auctions, in that they are often too complex to implement in practice because of their lack of transparency, their greater vulnerability to corruption and their sensitivity to moral hazard and renegotiation.

In the United Kingdom, for example, the government had devised selection procedures known as “competitive negotiation” and “competitive dialog” (Doni, 2007). The importance of these methods, according to Doni (2007), is that they are intended to take advantage of the merits associated with price competition without losing flexibility. It is these kinds of rules which allow the contracting authority to select a contractor not only on the basis of economic bids, but also utilize some discretionary evaluation. The idea of incorporating the reliability of a firm as a measurement for their potential award of a contract is that it encompasses many factors which are not objective, such as the record of their technical capabilities, financial standing, on the basis of past performances, their references and on their attitude toward team working and innovation (Doni, 2007). This method acknowledges that allowing public officials to choose a private contractor on the grounds of their discretion is vulnerable to corruption, and

that is why these new procedures try to combine the flexibility of negotiation along with certain characteristics of the standard auction (Doni, 2007).

To outline how a “most economically advantaged tender” method of selecting a successful private partner we turn our attention to the case of the 407 as outlined by Mylvaganam and Boris (2004). The initial stage in the competition for the 407 design, build and maintenance contract was the request for qualifications. The three consortia who submitted their qualifications and preliminary proposals on the 407 contract were ORDC, CHIC and Peter Kiewit Sons. Upon review, it was a proposed toll on the express lanes of the preexisting 401 as a means to fund the 407 project and a substandard performance on a previous Burlington Interchange contract that led to the expulsion of the Peter Kiewit Sons consortia from the running. On June 24, 1993, the Premier of Ontario announced that the two consortia ORDC and CHIC had been selected to compete for the Highway 407 contract. The next stage of the process was the “value engineering phase”. Under this phase, the consortia were required to submit their value engineering studies which identified potential savings while adhering to the MTO’s published standards for highways. These studies were submitted August 6, 1993, and identified potential project savings of \$200 million. Most of these savings came from the deferral of some interchanges that the traffic projections did not warrant at the time. Another area of savings was the reduction in the cost of certain structures. There was however some critique levied on the MTO for their high level standards, particularly pertaining to over-engineering of safety margins beyond actual formal requirements and an imperial to metric conversion that required entrance lanes to be rounded up to 500 meters, from 500 yards, as opposed to the more accurate 446 meters.

Prior to the next stage, the Ontario government was explicit in informing the consortia that they were looking for a partner who would finance, design, build and operate the highway, which included the tolling system, and turn it over in good repair to the government after the allotted period of time. This set the terms for the next stage in the process, the “request for proposals”. Each consortium would only be allowed to submit one proposal, though it could contain more than one business agreement, and these proposals were expected to be comprehensive, containing the details of the engineering, the design, tolling and finance.

Regarding the evaluation process, each component of the proposals was to be disaggregated so the evaluation team could analyze them separately. In addition a guaranteed maximum price was to be quoted for the design and build elements of the project. What the disaggregation of the proposal did was to allow the government to choose one or more components without necessarily accepting the entire proposal. The evaluation of the proposals would be attended too by a proposal review committee, formed

in October 1993. The committee would report to the MTO's Deputy Minister, and adhered to a mandate that would ensure the integrity of the evaluation and to synthesize the work of the evaluation teams. Their tasks included the recommendation and then institution of the evaluation process, the scrutinizing of the proposals for their financial and technical aspects and for compliance with the guidelines set out in the request for proposals (Mylvaganam and Boris, 2004).

Saussier et al. (2009) suggest that there are several factors which increase the attractiveness of PPP for potential private partners. The authors list several factors such as, bidding costs, tendering periods and coordination costs between contractors and subcontractors. If these costs at any point become too high, or the periods become too lengthy, they are likely to dissuade potential private partners from entering the auction.

Another important element of the auctioning process is the information structure. Elements such as asymmetries and incompleteness in information at the award stage and afterwards raise adverse selection and moral hazard issues (Saussier et al., 2009). When establishing an auction public agencies must choose the level of confidential details about a project which they disclose to potential partners. As well, the public agency must decide whether to inform bidders of the identity of other bidders prior to the auction, or of the identities of the current higher bidder during a multi-object auction. Milgrom and Weber (1982) showed that the provision of public information regarding the value of an item leads to more aggressive bidding behaviors.

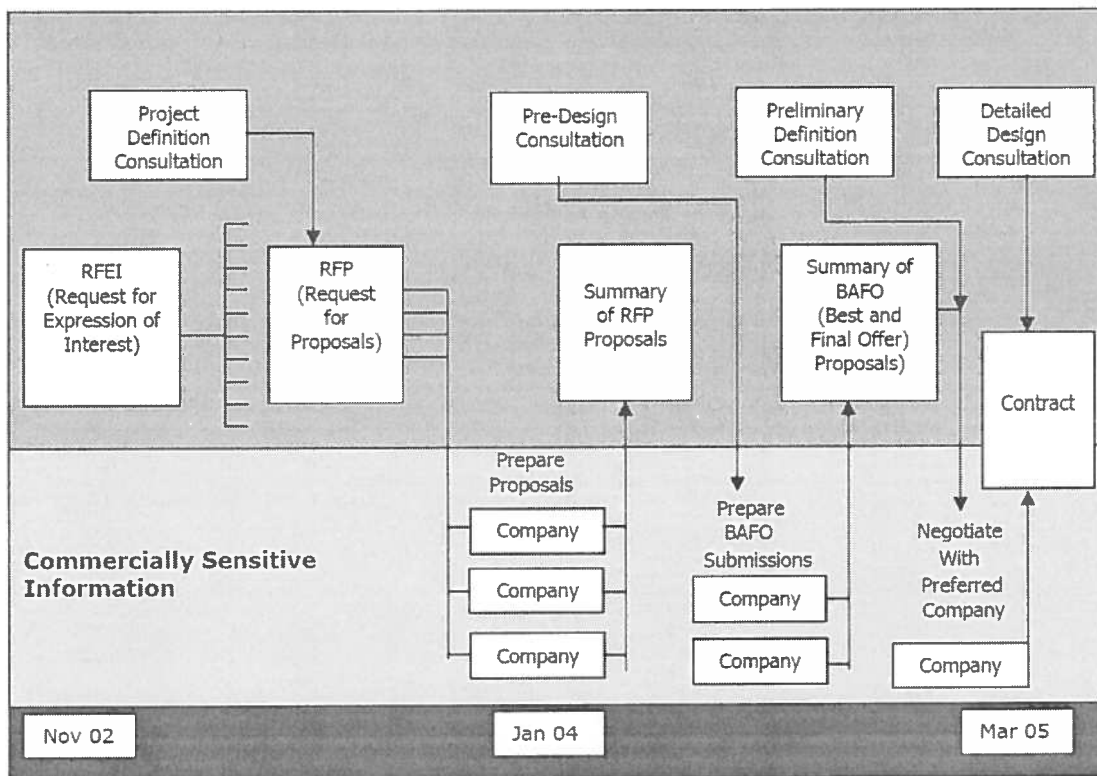
It has further been suggested that revenue will be enhanced by designing an auction that reveals as much information as possible during an auction (Saussier et al., 2009). The authors conclude that in order to ensure a competitive environment for auctions, it is essential to release information which intensifies this competition notably in common value auctions and does so by making values more predictable.

There is also the potential for bidding cartels to arise, as Marshall and Marx (2009) show that information about the identities of the participating bidders can affect an auction's susceptibility to collusion. If bidders did not have the information on the identities of other registered bidders, it would be highly unlikely that collusion could occur.

De Silva et al. (2008) showed that the average level of bids is lower after the release of confidential information about a project, such as the state's engineers' cost estimates. Despite the competitive pressure created by the release of information, the lower average bids do not result in statistically significant lower winning bids. Information release may also lower the relative value of a

bidder's own private information, thus reducing their rents. An interesting note is how this may pertain to reducing asymmetries between incumbents and entrants in a procurement auction, as entrants typically are less informed than incumbents, and have a tendency to bid more aggressively and that by releasing this information, it can help eliminate the discrepancy in bids between the incumbents and entrants (De Silva et al., 2008).

De Silva et al. (2008) also suggest some contrary effects to the release of information. In some cases some participants may have little interest in winning an auction, and may pose as bidders to acquire information that they may use to compete more effectively in other situations.



**Figure 6. Competition and Selection procurement model for the RAV line (Siemiatycki, 2006)**

From Figure6 Siemiatycki (2006) outlines the distinct process of the competition and selection for the Richmond-Airport-Vancouver (RAV) urban rail project in Vancouver. The four public stakeholders who initially agreed to fund the project were Translink (the representative of the local government), the provincial government, the federal government and the Vancouver International Airport Authority who formed a special project office known as RAVCO to coordinate the procurement, design, financing and implementation of the RAV project.

- Request for Expression of Interest: intended to establish proponent qualifications and interest.
- The Project Definition: included technical and financial reports and peer reviews to determine whether the project was feasible and if a DBFOM contract was appropriate.
- Request for Proposals: invited the four proponent teams to submit proposals for a 35 year contract to design build and partially finance the project and to operate and maintain it for 30 years.
- Pre-Design Consultation: key design elements of the project were reviewed with the public.
- Summary of Best and Final Offer: issued an invitation to submit a best and final offer to the two-short list teams.<sup>3</sup>

According to Mylvaganam and Borins (2004) the ORDC had approached the ministry about entering an exclusive partnership to design, build and operate the highway, but under the goal to deliver the best value for taxpayers, the MTO sought to explore competition within the selection process. A second Ontario-based consortium was formed, the Canadian Highways International Corporation (CHIC), under request to the President of Agra Monenco. By April 1993 the MTO had prepared a preliminary action plan and was ready to proceed with the request for qualifications by the consortia to carry out the project.

### **Section 8: Summary and Conclusions**

As we have explored Public-Private Partnerships they take many different forms. In the case of infrastructure procurement, they are more commonly found in a design-build, operate, maintain and finance arrangements. As we have seen many have chosen to incorporate the idea of private financing as a unique distinction for PPPs, but government guarantees to private partners can complicate this distinction. Much of the confusion regarding methods of traditional procurement and a PPP can best be settled when one incorporates the concept of the bundling of tasks, which best defines PPPs. With the exception of design-build, the bundling of tasks usually requires different areas of expertise which encourages the contributions of a more diverse group of private partners. The desire for governments to prefer off-balance sheet methods of service provision, and the common sentiment that private markets offer more in terms of efficiency, innovation and expertise appear to be two of the major driving forces which have fueled the trend towards PPPs as a method of service provision.

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<sup>3</sup>RAV Project Management Limited, 2004.

The theoretical underpinnings of PPPs have evolved significantly over the course of 20 years. Initially PPPs were conceived as purely contractual arrangements, applied to private goods. The question in the earlier literature was simply, is it more efficient to contract another firm or to vertically integrate? As the literature developed it began to consider the idea of the bundling of tasks, as with Hart (2003) and the consideration of public goods, as with Besley and Ghatak (2001). Recently, the literature we reviewed has integrated both works, and applied the idea of impure public goods. From an industrial organizational perspective, the PPP literature incorporates many fundamental ideas. These include property rights, which determine residual rights and the right to exclude, transaction costs, which pertain to inefficiencies associated with renegotiation of contracts, and incomplete contracts, which account for the failure to fully forecast and foresee all contingencies which are associated with long-term contracts.

We have revealed some interesting debates regarding public versus private methods of financing. Often it has been suggested that governments have access to lower interest rates. The cost of borrowing brings to light some strength that the private sector has when it comes to financing a project, such as the put option (their ability to resell the loan) and the security of a large government contract which may aid them in accessing a lower rate of interest. In contrast, a government, if it extends its debt too greatly, may run the risk of having their debt rating downgraded. As we identified the sharing of risk is another key element of PPPs. Many times when governments promote PPPs as a policy tool, they incorporate the concept of the sharing or division of risk. It is commonly accepted that the private sector is better equipped to handle risk, through the minimization of risk, and that risk may be shared when all parties involved have vested interest in the project's success. We also noted that it does remain an obstacle for governments utilizing PPPs, to effectively transfer the various risks to the parties involved.

Though the commonalities for government debt reduction and efficiency do promote PPPs, their continued use and development around the world is fostered by the institutional arrangements. These include regulatory and legal frameworks, norms and value systems and cultural elements such as schemas and beliefs. As we underlined, new governments often came to power, who utilized public beliefs that the private sector was more efficient, and run under the banner of reducing public debt. As PPPs gain success around the world, nations seek to emulate them, as we saw in the case of the United Kingdom. For nations ascribing to the PPP idea, they were encouraged to modify their regulatory and legal frameworks to encourage their development.

PPP networks are a complex arrangement of different organizations, which include regional, provincial and federal governments, construction firms, banks, equity providers and various consulting agencies. Their vested interest in the project's success is a key factor that gives strength to PPPs. Though

there are issues regarding competition, as firms gain more and more expertise in particular areas, they become more favorable to be selected for projects. Although their expertise may enhance the overall project, it may act to deter potential entrants from the selection process. Repeat collaborations may be another area of concern, although they may imply trust and efficiencies between various partners. In the case of consulting there may exist an element of government corruption, or subjectivity if these firms offer favorable PPP resolutions.

The selection process is another very sensitive area of concern. Regarding the multiple screening criteria, there exists an opportunity for governments to act subjectively. In addition there is the question of information. Revealing information, such as bids and parties involved can foster competition, but at the same time can open up avenues for collusion between competing parties, and lobbying of the government.

As we have explored, PPPs are not only diverse and useful in their composition, they are plagued with many areas of vulnerability. There is no universal method for the implementation of PPPs. Various governments have fostered and modified their PPP guidelines, but as long as the social objectives and situational circumstances vary, these remain guidelines at best. Experience, in the end, is the invaluable teacher for the success of PPPs. As governments continue to practice PPP, and learn from their successes and failures they may continue to propagate around the globe.

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