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The Effectiveness of Using a Public-Private-Partnership Model for Urban Rail Transit: The Vancouver Case

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Executive Summary

PPP (or P3s), an abbreviation for Public-Private-Partnership, has become highly popular in Canada in recent years. As a new co-operative model between public and private sectors, PPP has the potential to satisfy the public's demand for the efficient delivery of high-quality policy outputs. Municipalities often use this method for public infrastructure delivery because of its potential benefits, such as improving the efficiency of projects, transferring risks to private sector, engaging the general public, and so forth. P3s for Canadian transportation involve the private sector in designing, building, financing, and operating the facilities. Since public transit is an essential part of people's daily life, it is important to examine the effectiveness of using P3s for this type of infrastructure.

This paper provides a specific evaluation of the benefits of P3s by comparing a DBFO project and two non-DBFO projects in Metro Vancouver. I used this public transportation case study to analyze the potential benefits of P3s based on three variables: efficiency, fulfillment of original purposes, and procedural transparency. Ultimately, there were very few apparent merits of P3s in the Vancouver case because the political context limited the impact of P3s. This finding is related to the PPP projects in the Chinese context; under its top-down political system, PPP practices in China experienced similar political constraints as the Vancouver case. This paper concludes that although P3s will realize their potential benefits in some circumstances,

the actual effects of local governments using P3s for public transit depends on the broader political context.

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Introduction

In recent decades, public-private partnerships have become a globally accepted tool for public service delivery. In Canada, P3s have been used for major infrastructure projects, including transportation, water and wastewater, hospitals, and other facilities. Proponents of P3s typically emphasize its benefits, including improved financing from private sectors and higher efficiency through private ownership or market competition (Ho, Levitt, Tsui & Hsu, 2015). The co-operation between local governments and private sectors often emerges because of the public sector's financial constraints. Private sector actors' ability to innovate and its managerial efficiency are also a key incentive for municipalities to work with private parties rather than use conventional public procurement methods. In addition, P3s have become an increasingly popular solution in developing countries, such as China, to provide public infrastructure within a limited governmental budget.

However, because some PPP projects have failed to achieve their potential benefits, a contentious debate has emerged about whether the PPP model is a useful public service delivery method for municipalities (Vining, 2008). The application of P3s for public infrastructure has important social, political, and economic implications. Public transportation not only plays an essential role in people's daily life, but also helps to develop local economies because new public transit options attract new business opportunities. This report examines the effectiveness of using P3s for public transportation infrastructure by focusing on two main research questions. First,

compared with traditional public procurement, is the PPP model an effective method to deliver public infrastructure projects, especially transportation infrastructure? Second, which factors have the most impact on the potential benefits of P3s? Answering these two questions will provide valuable information about public service delivery and will provide a valuable information for municipalities attempting to structure P3s for public infrastructure projects.

Specifically, this research evaluates the potential benefits of the PPP model by conducting a case study of public transit in Vancouver. Through a comparison of the Canada Line, the Expo Line, and the Millennium Line, this report will demonstrate that the unique municipal and provincial political context has a huge impact on the effectiveness of P3s. Chapter One provides a detailed review of literature about the PPP model, including the driving forces of P3s, different PPP models, potential benefits and drawbacks of P3s (especially the impacts of the political context), and PPP practices in Canada. Chapter Two describes the research methods and some basic information about the case study. As the most important part of the report, Chapter Three has two essential parts. The first is a comparison of three projects according to three variables: efficiency, fulfillment of original purposes, procedural transparency, and public involvement. The second part analyzes the impact of Vancouver's specific political context on these projects. Chapter Four compares the results of the Vancouver case to the Chinese context. Ultimately, the report concludes that the political context might shape the potential benefits and drawbacks of the PPP model.

Chapter One: Literature Review

Since the 1990s, the PPP model has been a heated research topic for scholars in several academic areas, especially in political science. Most of this research has involved empirical analysis and case study. E.S. Savas (1999), the great master of privatization, was invaluable in the dissemination of the concept, development, and practice of PPPs.

Generally, PPPs have two conceptual aspects: generalized and narrow. Generalized PPPs include various contractual and co-operative partnerships based on particular negotiated terms between public and private sectors to deliver and finance public services and infrastructure, such as Build-Operate-Transfer (BOT), Build-Own-Operate-Transfer (BOOT), and Design-Build-Finance-Operate (DBFO). Narrow PPPs are a series of project financing models. In a narrow concept model, both public and private sector maintain a co-operative relationship, emphasizing risk-sharing mechanisms and "value-for-money" (VFM). This paper refers to a variety of generalized cooperative partnerships and models.

Following Savas' research, other scholars have continued to research the reasons for the emergence of the PPP model as a new method of public service delivery and its corresponding advantages and disadvantages. Academics have conducted specific research on the strengths and weaknesses of DBFO models in different contexts.

Driving Forces of the PPP Model

Following the failure of the "Welfare State" and "Keynesian economics", Western countries have tended towards smaller government; in general, residents prefer smaller and more efficient governments to deliver public goods and services (Savas, Osborne & Gaebler, 1992). Consequently, privatization has become a global trend in which the government invites the market to help secure the delivery of public goods and services.

In *Privatization and Public Private Partnerships*, Savas (1999) identified the following driving forces of the PPP model: political pressure; economic, ideological and business force; and populism. Savas assumed that, owing to economic growth and expansion of government size, residents would like to reduce government intervention and have more influence on public service delivery. Similarly, Fourie and Burger (2001) assumed that the main catalyst for the PPP model is insufficient government management capacity. While public agencies generally self-fund public goods, they may adopt the PPP model when there are limited financial resources or high levels of public dissatisfaction. However, in some cases, PPPs have become part of official policy for ideological reasons. For example, the Conservative federal government under Stephen Harper (2006-2015) required that all projects with eligible costs over $100 million undergo a PPP assessment to qualify for federal infrastructure funding (Garcea, 2015).

Grimsey and Lewis (2002) also find that insufficient funding for fundamental

infrastructure is the main reason for governments to invite private sectors to participate in project financing, construction, and operations. Other scholars (Hammami, Ruhashyankiko & Yehoue, 2006) have found that countries with governments carrying a large debt burden are more likely to practice the PPP model.

The Characteristics of Different PPP models

There are several kinds of PPP models for public infrastructure delivery, varying in terms of the public and private distribution of tasks along different variables, including: design, construction, financing, ownership, and operation (Figure 1).

Variable / Type	Design	Construction	Financing	Ownership	Operation
Design-Bid-Build	PU	PR	PU	PU	PU
Private Contract Fee Services	PR	PR	PU	PU	PU
Design Build	PR	PR	PU	PU	PU
Build Operate Transfer	PR	PR	PR	PU	PR
Design Build Finance Operate	PR	PR	PR	PU	PR
Build Own Operate	PR	PR	PR	PR	PR

Figure 1: Types of PPP model
Note: PR refers to the private sector; PU refers to the public sector.

Traditionally, public infrastructure projects have been delivered through a variant of the design-bid-build approach in developed countries, such as the private contract fee services and the design-build model. The design-bid-build approach works as follows: the responsible public agency designs a scheme to address a social problem, then organizes a bidding process for a private sector concessionaire to build the public

infrastructure (World Bank, 2015). The public sector provides specifications for the technology the private sector uses for the project and then operates the system after construction is finished.

During the 1980s to 1990s, governments across the developed world encouraged the private sector to take a larger role in the financing and operation process of public sector infrastructure in order to reduce public sector expenditures and increase the rationality of project by adding competitive conditions,. The public sector used the Build-Operate-Transfer (BOT) approach to deliver public projects, in which private sector entrepreneurs were selected depending on their ability to meet the public interest and generate profits; the private sector then designed, financed, and operated the new infrastructure (Gatti, 2007). With the Build-Own-Operate (BOO) approach, the private sector often owns the infrastructure and does not return ownership rights to the public utility until after a specified contractual period of time.

Beginning in the 1990s, the Design-Build-Finance-Operate (DBFO) model became the most popular mechanism for delivering large public infrastructure. It has been used for transportation projects in many countries (Debande, 2002). In the DBFO model of project delivery, the private-sector concessionaire is responsible for designing a technological solution that best meets the public objectives at the lowest cost. The private sector concessionaire is also invited to finance and operate the project. Once the contractual time is completed, the public-sector agency can then either retender or operate the system using public-sector employees (Pekka, 2002).

Figure 2 illustrates a brief flow diagram of a DBFO project. However, as this paper will later discuss, this is not applicable to all cases because each PPP project has its own uniqueness and a specific political context that will affect its success.

This paper mainly focuses on the DBFO method, in which government maintains ownership rights, to examine the advantages of the PPP model. Due to the long-term nature of infrastructure project arrangements, this model is useful in determining how government can balance public interest with cost-efficiency and also provide enough space for technical innovations.

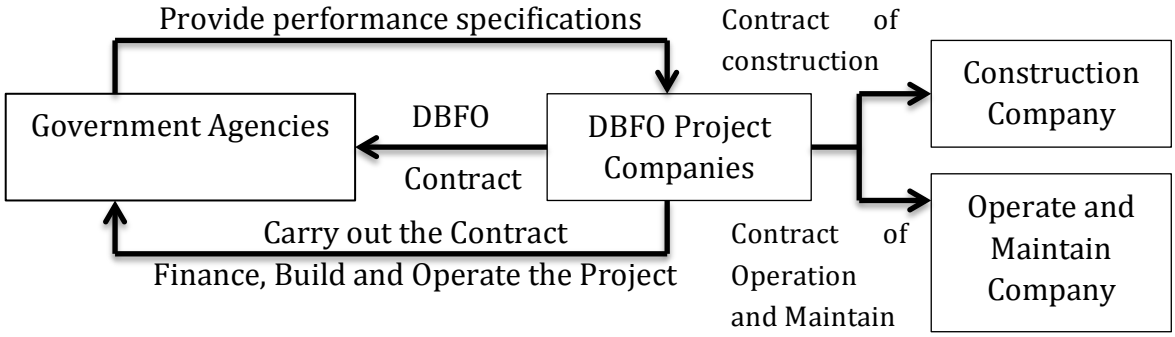

Figure 2: The Process of DBFO Project

Advantages and Disadvantages of DBFO

Advantages

As one of the common types of PPP model, the DBFO method shares the general advantages and disadvantages of other PPP models. Savas (1999) argues that various models of PPP could be used to coordinate public sectors and private sectors to deliver public infrastructure. Across PPP models, the benefits are similar: (1) update fundamental infrastructure to meet the demands of increasing population; (2)

minimize the cost of infrastructure construction to avoid high fees that could result in the dissatisfaction of the general public; (3) raise funds for other projects by charging private companies for accessing concessions; and (4) reduce the government's financial burden and minimizing risks for taxpayers. Vining, Boardman, and Poschmann (2008) concluded similar rationales for PPP models, finding that the private sector has the ability to deliver infrastructure at lower cost due to more experience, better incentives, and greater innovation.

According to Flyvbjerg, Bruzelius, and Rothengatter (2003), the DBFO method has three main benefits. First, it transfers risks to the partner who can better manage it. As public and private sectors can manage different types of risks, the process of allocating and transferring risks is different from the conventional public sector procurement model. Second, the rationality of projects will be improved because the design and construction process respects technical specifications. The government provides performance specifications to the private sector, which requires them to meet public interests with a lower cost. Third, DBFO can improve procedural accountability and the financial responsibility of the projects. The greater private involvement can improve transparency and legitimate public participation, which promotes greater accountability for public sector investments. Since private contributors risk personal loss if the project does not produce a profit, this promotes the incentive to design a more realistic design proposal.

In addition to the above three benefits, the separation of capital financing of a DBFO project from its ongoing funding does not add to public debt (Ferlie, Lynn & Pollitt, 2005). Consequently, this benefit will be treated as accidental to the project's output and will not be reflected on the public balance sheet. Additionally, the DBFO model helps to balance the advantage of government control over the protection of public interests and the benefit of inviting competitive forces into public service delivery in order to increase efficiency (Siemiatycki, 2006). This model can also accelerate construction, deliver infrastructure on time and on budget, save costs, and enable the public sector to focus on outcomes and core business (Murphy, 2008). Moreover, DBFO is suitable for mega-projects and the delivery of public transportation. If governments apply the model properly and projects are carefully designed based on value for money, feasibility analysis, and life-cycle analysis, total costs for the project should be reduced (Altshuler & Luberoff, 2003; Brown et al., 2009).

Ultimately, the DBFO method has three main advantages according to the literature review: (1) it transfers risks to the partner best able to manage them, which maximizes cost-savings and prevents time delays; (2) it balances the advantages of government control and the benefit of competitive forces to improve the efficiency of project delivery—the private sector must follow the specifications provided by the responsible public agency while using the best technical method to achieve the objectives at the lowest cost—; and (3) it improves procedural transparency and accountability, which improves the efficacy of private involvement and public engagement.

Disadvantages

There are also critics and suspicions against PPP models raised by some academics. Because governments must respect long-term contract requirements and obligations, project management is less flexible; it is difficult for governments to change the content or method for service delivery when new circumstances emerge (Ross, Yan, 2015). However, while one of the drivers for the use of the PPP model is that the private sector is better able to provide both infrastructure and services at lower cost due to more experience, better incentives, and greater ability to innovate, P3s cannot minimize the government expenditures (Vining, 2008). No matter how a project is financed, the government can only spread its cost obligations over a longer time period through using PPPs and still has to pay for its construction at the end.

According to Murphy (2008), the private sector may become a competitor in the market when it delivers public services and infrastructure due its inherent focus on profits. Accordingly, it can become difficult for the government to control the price when they assign the concession agreement. This could result in poor quality of public services and higher transaction costs.

In addition to those general disadvantages, the DBFO style of the PPP model has further weaknesses. Pekka (2002) argues that DBFO is not suitable for long-term relationships because political changes will affect previously-signed commitments. Owing to the long-term nature of arranging infrastructure delivery, the construction cost of projects might escalate during the planning process of public infrastructure

delivery. In these situations, the DBFO method might be unable to prevent cost escalations and government intervention during the planning process (Zheng, Roehrich & Lewis, 2008).

Tradeoffs

Overall, these disadvantages and advantages depend on the precise structure of the PPP agreement. In some cases, the potential benefits of P3s are outweighed by transaction costs. Transactions costs are likely to be high when asset specificity, construction complexity, and revenue uncertainty is high, while contract management effectiveness is poor (Vining, 2008). Additionally, private-sector participants are risk-adjusted profit maximizers (Vining, 2008), which mean they are willing to give up some profits if they can bear fewer risks - especially revenue risks. This is because private sector organizations will bear risks more directly than the public sector, which can lead to negative consequences. Consequently, the private sector may enact high premiums before accepting use risks. For example, the Alberta Special Waste Management System PPP project was finally terminated because of enormous contracting costs, which far exceeding the potential benefits of P3s. BOVAR，the responsible private company, asked for a high guaranteed rate of return because its profits were a function of its capital investment rather than its cost-efficiency (Vining, 2008).

The Impacts of the Political Context

In addition to the “tradeoffs” mentioned above, the theoretical advantages and

disadvantages of different PPP models may be affected in practice by elements of the specific political context. I also need to clarify the conception of "politically interference" and "politically driven" in this paper: PPP projects that are often driven by political elements, such as popularity, re-election concerns, or elite interests, rather than sound public policy judgments. Also, governments may interfere with the planning process to ensure that the project will proceed as originally planned.

Some academics argue that politicians influence privatization attitudes. Even when the private sector is capable of delivering public services, governments still generally consider themselves the main supplier of some inherent "public" services and will often insert themselves unnecessarily into the planning process of PPPs (Pomeroy, 1998). Some literature suggests that if a project is politically driven, the government may then fail to structure a PPP optimally or remain committed to the PPP if it is not delivering desired results (Erie, Kogan, and MacKenzie, 2010).

Asquith, Brunton, and Robinson (2015) also emphasize the significant impact of the political context on PPP projects, which threatens to undermine the project's effectiveness potentially. Under the transitory political process, parties tend to think of themselves as vulnerable when entering into long-term P3s contracts because they may only be in power for a short period of time. Other literature suggests that the perception of controversial infrastructure projects among the broader public may affect the extent to which both public and PPP models remain open to public input. For example, decision-makers tend to insulate controversial projects from the public,

which might result in too much government involvement in PPP projects (Asian Development Bank, 2008). As these situations demonstrate, the broader political context can enact a significant influence on the effectiveness of P3s.

Canadian Practices of the DBFO model

As one of the first countries to use the PPP models, Canada began to apply the PPP model in the 1980s, although it was not until the mid-1990s that PPPs really began to take hold (Vining, Boardman, 2008). Government failure is the main reason for the use of PPP models in Canadian public services delivery. Since Canada's infrastructure has been neglected for many years, resolving this problem exceeds the capacities of governments—especially at municipal level. Therefore, in order to maintain effective governance, governments invite market forces to partner with them to deliver public infrastructure (Euromoney Publications PLC, 2002). In 2008, the federal government established PPP Canada, a Federal Crown Corporation, which acts as the leading expertise on PPP matters.

PPP development in Canada can be divided into two waves. The first wave of PPPs were planned and delivered in the 1990s and the early 2000s when governments were motivated by similar PPP rationales. Chief among these rationales included the fact that P3s can save government expenditures and transfer demand risk to the private sector partner. Furthermore, PPP projects involve greater competition and public participation, leading to lower costs and greater efficiency. Although there are some successful examples of PPP projects during this time, many projects have been

heavily criticized. Common criticisms include: projects were politically driven; there was no effective assessment to evaluate the benefits of using P3s rather than traditional public procurement methods; governments lacked the expertise to manage the contract; and governments failed to maximize the public interests. In response to these criticisms, Canada has been developing a second wave of PPPs since the mid-2000s. During this second wave of projects, Canada's provincial governments have been the leading users of PPPs to deliver public infrastructure (Siemiatycki, 2010).

Several research publications suggest that PPP projects in Canada have failed to maintain the balance between public interests and private profits (Iseki, Houtman, 2012). Furthermore, according to Siemiatycki, (2010), PPPs in Canada have been treated as a procurement strategy. First, PPP projects follow the same prioritization and selection processes as traditional public procurement projects. Second, Canadian governments tend to apply the PPP model to design, construct, finance, and maintain the hard physical asset rather than operate the core public service itself. Scholars still need to do more research to find out why Canadian PPPs have these special characteristics.

The DBFO type of PPP as a delivery mechanism of public infrastructure is a new phenomenon in Canada (Siemiatycki, 2006). By inserting competition and free-market accountability into project planning and operational processes, procedural transparency and transfer risk between public and private sectors can be improved.

Many scholars find that this is especially important for mega-projects, such as public transportation and power generation, which are extremely important for the social welfare but less attractive to private investment (Siemiatycki, 2010; Siemiatycki, 2012). Other scholars argue that there is minimal difference between DBFO projects and traditional public projects. The willingness of private sectors to bear user risk decreases with the level of user risk; private sectors will generally not participate in a DBFO project if they need to bear a large revenue risk. Consequently, the DBFO model is only beneficial for governments if the private sector bears cost risks, rather than revenue risks (Vining, Boardman, 2008). Otherwise, the private sector could ask for exorbitant premiums to accept revenue risks, which would then outweigh the potential benefits of P3s.

It is necessary to evaluate the effectiveness of the DBFO method both because public infrastructure delivery is an inevitable part of governance and because there is minimal academic research on DBFO projects in Canada. Based on the above research, the DBFO type of PPP model has become a popular mechanism for mega-projects such as urban transportation. Past research relied primarily on single case studies or broader surveys, and tended to focus exclusively on the contract design and planning process of infrastructure projects. This paper will compare the practices of the DBFO method with conventional public procurement models throughout the entire contractual time period. One suitable case study is the comparison of the Canada Line with the Expo and Millennium Lines in Vancouver. All of these three lines belong to the same metro network and were built in the same

jurisdiction area. However, while the Canada Line is a DBFO project, the Expo and Millennium Lines were constructed using the public sector delivery model.

Based on the analysis of previous literature, this paper will use three variables to examine the benefits of the DBFO method: (1) the efficiency of the projects (on time and on budget); (2) fulfillment of original purposes; and (3) procedural transparency and effective public engagement. The next chapter will discuss these variables in both detail. More generally, by examining the factors that prevent DBFO projects from meeting their intended purposes, this paper will consider how the political context limits the potential advantages of P3s.

Chapter Two: Methodology

Research Design

In this paper, I will use an in-depth case study based on the on-going public transportation investment in Greater Vancouver. I will build on the lessons learned from earlier studies on P3s, particularly with respect to the advantages of this public infrastructure method. My intent is to evaluate the effectiveness of using P3s rather than traditional procurement methods for developing urban rail transit. By comparing three rail transit lines in Vancouver—the Canada, Expo and Millennium Line—, I hope to connect theories with practical examples. As this paper will demonstrate,

despite state-of-the-art delivery mechanisms, Vancouver's specific political context has significantly shaped the efficacy of PPPs.

Choosing the Vancouver Context

There are several reasons to choose the Vancouver context for my research. First, Vancouver has an important global position and a long history of urban transportation development. Although there is no "one-size-fits-all" in PPP projects, the research in Vancouver could provide useful information for other municipal Canadian governments, or even other countries, seeking to structure P3s in public transit agreements. Second, past research on the effectiveness of P3s was often a single case study or broader survey. However, in the Vancouver context, there are three different transit lines—or cases—to aid in the comparison of potential benefits of the PPP model. While the first two lines were constructed and operated using the public procurement process, TransLink used the DBFO model to build the Canada Line. All three lines belong to TransLink's SkyTrain rapid transit system and use fully automated trains on grade-separated guideways. Furthermore, since they serve passengers in the same urban area, they have similar targeted users and the same revenue source. All three lines were developed under the same political system; thus, all three lines have similar political stakeholders and were developed under the same institutional framework. Since the same external factors influenced the planning process of these three mega-transit projects, this comparison strongly illustrates the effectiveness of the DBFO model.

Measurements

To measure the potential benefits of the DBFO style of the PPP model, it is necessary to use reasonable variables to compare the three transit lines. According to the literature review chapter, there are three main benefits of P3s: (1) it transfers risks to the partner that can best manage it; (2) it improves the rationality of projects because the design and construction process respects technical specifications; and (3) it promotes the projects' procedural accountability and financial responsibility. However, my project does not simply use these three benefits as variables, but instead combines theory with practice to compare one DBFO project and two non-DBFO projects.

Considering the real condition of three cases, my research considers the following three variables to examine the effectiveness of the DBFO type of PPP model:

(1) *Efficiency (time and budget).* Although the key point of "transferring risk" is to promote cost-savings and time saving, this is not reliable to measure the three Metro Vancouver transit lines since they were built according to different methods and in different time periods. To prove that the PPP model could improve the efficiency of public transit delivery, I will measure whether the three lines were delivered on budget and on time. Since these two indicators are not sufficient to prove the efficiency of P3s, I will also calculate the cost of construction per kilometers for each of the three lines. Finally, since some project teams changed the scope of infrastructure to meet the schedule and budget, I will match the final product of each

line with the original plan.

(2) *Fulfillment of original purposes.* Each project was designed to fulfill its unique and specific purposes, such as a public request to improve services or to facilitate the hosting of world event. Thus, it is important for the project to realize its original purposes and desired outcomes—the basic condition of a successful public service delivery. In other words, the responsible public agencies or private concessionaires should be able to deliver public infrastructure according to the original plan.

(3) *Procedural transparency and effective public engagement.* All public projects, whether DBFO project or not, should effectively engage the public and ensure procedural transparency. Residents' concerns and opinions are essential parts of public service delivery. Thus, decision makers should respect public interests and try to implement public input in promoting sufficient governance. For example, local governments can hold public meetings and consultations to give residents the opportunity to participate in the decision-making process, potentially using these public opinions to modify construction and delivery plans.

I will compare and discuss these three lines according to these measurements in Chapter 3.

Data Sources

In general, this report used secondary data from public documents to analyze the effectiveness of P3s for public transportation delivery. Public books, online news, and

journal articles were the main sources of my literature review. As one example, Flyvbjerg, Bruzelius, and Rothengatter's *Megaprojects and Risk: An Anatomy of Ambition* (2003) provided useful information about the benefits of P3s and public mega-projects.

I gathered all of my statistical data from official documents gathered from TransLink and British Columbia's Ministry of Transportation. These two institutions are public agencies responsible for regional and provincial transportation networks. Government documents, such as official reports made available on the official website of the City of Vancouver, were also important statistical data sources. This data provides reliable information about the budget, overall cost, and construction time of these three lines. Since the Canada Line was constructed and operated by SNC-Lavalin, a private company, I collected data about this DBFO project from official documents and news releases available on the SNC-Lavalin website. Finally, Siemiatycki has written several important reports on the effectiveness of P3s and transportation development in Vancouver, respectively, which provide two valuable insights: first, whether PPPs deliver valuable transportation infrastructure; and, second, how specific political contexts shape governments' decisions on transportation investment.

History and Governance of Transportation Development in Vancouver

This section will provide a discussion of the history and governance of transportation development in Vancouver. For over one hundred years, urban transportation has been a heated issue in Vancouver and a top public priority. In particular, urban

transportation has gathered such considerable political attention and public investment because of its importance to the city's local economy and social inclusion. In response to a mega-congestion problem in Metro Vancouver, local governments continually need to develop action plans and approaches to improve urban transportation and ease traffic congestion.

Urban transportation in Vancouver first began with the streetcar system, which commenced on 28 June 1890 and ran from the Granville Street Bridge to Westminster Avenue. The early set up of streetcars and transit stops shaped the city's land use development, which some scholars consider a significant determinant in the subsequent division of land between commercial and residential districts (Davis, 2006). No more than one year later, Canada's first inter-urban line began operation. From 1897 forward, the British Columbia Electric Railway (BCER) operated the urban and inter-urban rail system. In 1958, BCER developed "trackless" trolley and gasoline/diesel buses. Vancouver currently has the second largest trolley and bus fleet in North America (Snider, 2007).

Vancouver's transportation system was originally owned and operated by the private sector, but the public sector took over its ownership role when the private sector was no longer making enough profits to support further transportation development. Notably, Vancouver is the only Canadian city with falling rates of car ownership despite increased population growth—a statistic that has continued since the 1990s (City of Vancouver, 2007). Research suggests that Vancouver has the worst traffic

congestion in Canada; consequently, many people refuse to drive into the downtown core (Ferreras, 2013). Given public concern and interest in solving this congestion, local governments have sought to provide some useful solutions through transportation mega-projects.

In Metro Vancouver, TransLink (also called the Greater Vancouver Transportation Authority, or GVTA) is the statutory authority responsible for the regional transportation network, major roads, bridges, and public transport (Skelhorne, 2007). The SkyTrain automated rail transit system is owned by TransLink and has three different urban rapid transit lines: the Expo Line, Millennium Line, and Canada Line. Figure 3 is the whole map of SkyTrain system.

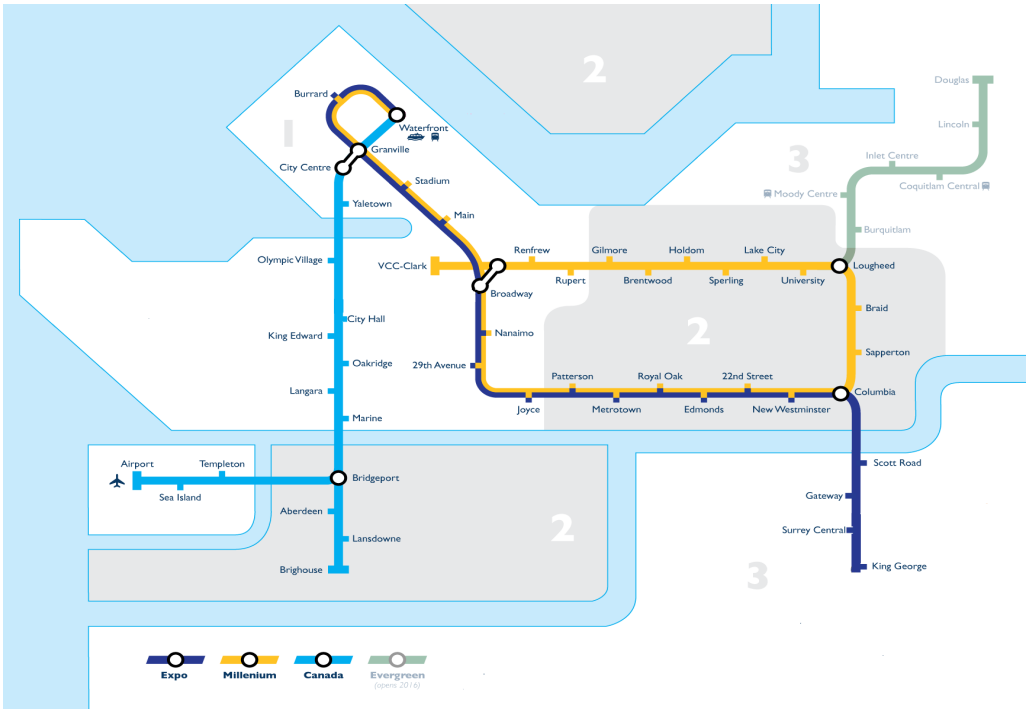

Figure 3: The Map of SkyTrain System
Source from: TransLink

TransLink was created as a public agency in 1998 and fully implemented in 1999 by the Government of British Columbia to replace BC Transit in the Greater Vancouver Regional Transit. Since Vancouver has two tiers of local government, the regional government and the lower tier municipality, Translink is a separate body that is responsible for transportation in Metro Vancouver, not just an agency of a single local government. TransLink provides a bus service, an automated rapid transit service called SkyTrain, and the West Coast Express commuter rail. Vancouver's SkyTrain system began in 1986 and is currently running on three lines: the Expo Line, the Millennium Line, and the Canada Line. Only the Canada Line was constructed and operated using a DBFO type of PPP model.

Importantly, there are new plans in development for the SkyTrain System. The planned Evergreen Line is expected to link the cities of Coquitlam and Port Moody with the SkyTrain system by summer 2016 (British Columbia Ministry of Transportation, 2011). TransLink has also decided to extend the SkyTrain Millennium Line and the Expo Line to serve the increasing public need for public transportation.

The next section will provide a detailed comparison of the current three lines in the SkyTrain System to examine the effectiveness of using P3s for urban transit. Specifically, I will introduce the three cases in the specific context of Vancouver to determine whether or not these lines meet public interests.

Overview of Three Cases

Information / Lines	Overall Shape	Scale	Overall Costs	Construction Time	Daily Ridership
The Expo Line	**Termini:** Waterfront King George **Stations:** 20.	**Line length:** 28.9 km; 21.4 km (initial length) **Number of tracks:** 2 **Operating speed:** 80 km/h	**Budget of the original one*:** $854 million (1986 dollars); on budget	1981 – early 1985 (The original one/phase 1); on time	289,460 (June 2011)*
The Millennium Line	**Termini:** Waterfront via Columbia VCC–Clark **Stations:** 28 - stops at Commercial-Broadway twice (16 shared with Expo Line)	**Line length:** 20.3 km **Number of tracks:** 2 **Operating speed:** 80 km/h.	$1.2 billion; on budget	October 1999 - August 2002; on time	289,460 (June 2011)*
The Canada Line (a DBFO project)	**Termini:** Waterfront YVR–Airport & Richmond–Brighouse **Stations:** 16	**Line length:** 19.2km **Number of tracks:** 2 **Operating speed:** 80 km/h.	$1.9 billion; on budget	October 2005 – August 2009; On time	136,259 (June 2011)

Figure 4: Basic Information of Three Rail Transit Lines

Note: 1. Since the Expo Line has had several extension and reconstruction after its original construction, I am only considering the construction cost and construction time for Expo 86.

2. The daily ridership total of 289,460 is for both the Expo and Millennium Lines.

Source: Wikipedia; Translink, 2011

Figure 4 summarizes the basic information of three lines.

Expo Line

The Expo Line is the oldest line of the SkyTrain rapid transit system in Metro Vancouver. Originally, the line was simply known as "SkyTrain" as it was the only line on the system. It was given its present name following the development of the "Millennium Line", which launched in 2002 (Wikipedia, n.d.). The Expo Line was initially a demonstration project of the 1986 Vancouver World's Fair ("Expo 86"). The Expo Line's main original purpose was to demonstrate the newly developed linear induction propulsion technology to people across the globe who attended the World's Fair. As the main attraction of the event, the project was successfully designed and became the central line of rapid rail transit in Vancouver (Taggart, 2001).

Following the demonstration project in 1981, construction of the first phase of the Expo Line between Vancouver and New Westminster was completed in early 1985. It opened on schedule in January 1986 and was built on a budget of $854 million (1986 dollars) with an initial 21.4 km of guideway, 15 stations, and 114 SkyTrain cars. The final overall cost of the Expo Line was right under the budget (TransLink, 2011). The Expo Line is now 28.9 kms and has 20 stations from Waterfront to King George

Stations, travelling mainly through the Dunsmuir Tunnel. In 2001, the daily ridership of the Expo Line was 289,460 (TransLink, 2011); however, this number is shared with the Millennium Line because these two lines have the same the same track alignment from Waterfront Station in Downtown Vancouver to Columbia Station in New Westminster.

Despite these recent extensions (phase II and phase III), this papers focuses only on the original development of the Expo Line in order to more clearly discuss the project's overall costs and construction timeline.

Millennium Line

Following the increasing need of the urban rapid transit to solve the congestion problem in Metro Vancouver and improve air quality, provincial and local governments in the Greater Vancouver Area decided to extend the route of the Expo Line, which became a new rail line called "Millennium Line". The total length of the Millennium Line is 20.3 km and it has 28 stations, 16 of which are shared with the Expo Line from Waterfront to Columbia Stations. The Millennium Line then loops back into Vancouver via a new route and terminates at VCC–Clark Station (Wikipedia, n.d.).

The construction of the Millennium Line, including phase I and II, began in October 1999 and finished on time in August 2002 (TransLink, 2001). The Millennium Line was completed at a cost of $1.2 billion, approximately $40 million under budget (Wales, 2008).

As previously discussed, the Millennium Line shares daily ridership figures with the Expo Line. Therefore, in June 2001, the Millennium and Expo Lines served 289,460 passengers per day. According to 2007 statistics, the non-interlined portion of the Millennium Line served an average of 70,000 passengers per day (TransLink, 2007).

Canada Line

As the third line in SkyTrain metro network, Canada Line comprises 19.2 kilometers of track and has 16 stations (Wikipedia, n.d.). It begins at Waterfront Station and splits: the Richmond branch terminates at Richmond–Brighouse Station and the airport branch terminates at YVR–Airport Station (InTransitBC, 2006).

Unlike the other two lines, the Canada Line was constructed with a DBFO style of PPP model. The Canada Line project appealed to both local government and private investors because of the desire for improved collaboration between public and private sectors to plan and finance public delivery, as well as the new infrastructure needed to serve the influx of visitors who would attend the 2010 Vancouver Winter Olympic Games.

The four public funding shareholders for the funding for Canada Line— Translink (as the representative of the regional government), the provincial government, the federal government, and the Vancouver International Airport Authority—authorized Canada Line Rapid Transit Inc. (CLCO) to consult the public and develop different ideas for the project. The Canada Line was ultimately built by SNC-Lavalin and InTransitBC will manage the line for 35 years under a contract with TransLink. Although

SNC-Lavalin contributed to the financing process of the project, the Canada Line was mainly financed by the public sector. This feature makes the Canada Line initiative different from a typical DBFO project (Figure 5).

Variable / Type	Design	Construction	Financing	Ownership	Operation
Design-Build-Finance-Operate	PR	PR	PR	PU	PR
The Canada Line Project	PR	PR	PU	PU	PR

Figure 5: The Difference between the typical DBFO model and the Canada Line project

The construction of the Canada Line began in October 2005 and finished in August 2009. Although it was originally scheduled to open on November 30, 2009, the Line was ready fifteen weeks ahead of schedule, well in advance of the Olympics (Sinoski, 2009). Moreover, the overall cost of the project was $2.1 billion, $92 million under budget. The projected ridership for the Canada Line is 100,000 boardings per day in 2013, rising to 142,000 boardings per day by 2021. So far, the Canada Line has successfully exceeded its targets. Specifically, during the 17 days of the 2010 Winter Olympics, the line carried an average of 228,190 passengers per day (Vancouver Sun, 2010).

Overview

To conclude, the Greater Vancouver Region's three rapid rail transit lines—the Expo, Millennium, and Canada Lines—were each built according to different funding and procurement methods. The Expo Line and Millennium Line are operated by the

British Columbia Rapid Transit Company under a contract with TransLink, a public transportation agency. As a DBFO project, private concessionaire ProTrans BC operates the Canada Line under a contract with TransLink. Notably, the construction and operation of the Expo Line (phase I) occurred before the establishment of TransLink.

Chapter Three: Analysis of the Vancouver Case

The fundamental purpose of this paper is to assess the potential gains of using a DBFO model for building urban rail transit infrastructure as opposed to a "traditional" public sector procurement model. In this chapter, I will use a DBFO case and two non-DBFO cases to compare and also analyze the impact of the political context on the effectiveness of P3s.

Comparison of the Three Lines

Using basic information about the three rapid transit lines in the Region of Vancouver, this section measures the effectiveness of the DBFO model according to the following three variables: efficiency, fulfillment of original purpose, and procedural transparency and public engagement.

Efficiency

Efficiency is the most important merit of the DBFO model. Normally, academics use cost saving as the chief indicator of the efficiency. A DBFO model to deliver urban

transportation infrastructure is generally less costly than if a public agency delivered the same project. However, each PPP project is different and the Canada Line is no exception.

In building the Canada Line, SNC-Lavalin contributed only a small percentage of construction funding. The total cost to build the Canada Line was $2.1 billion; the federal government, the provincial government, the Vancouver airport, and Translink contributed $400 million, $400 million, $300 million, and $375 million, respectively (Bula, 2010). Since the cost savings in this case were small, I will investigate other efficiencies such scheduled completion time and budget.

According to the public information I discussed in the previous chapter, all three lines were delivered on budget and on time; the Millennium Line and the Canada Line were even delivered under budget. For this analysis, "on budget" represents the overall cost of construction that is under the final budget and does not include any cost overruns that occurred during the planning process.

At this point, it is important to examine the efficiency of P3s by comparing the construction cost of the three transit lines per kilometer and matching the final product with the original plan.

(a) Construction Cost Per Kilometer (results retain one digit after the decimal point)

Information / Lines	Length (km)	Overall Cost (million/billion)	Construction cost per kilometer (million /km)

The Expo Line	21.4	$854 million (1986 dollars) = $1.684 billion ≈ $1.7 billion*	$79.4 million/km
The Millennium Line	20.3	$1.2 billion	$59.1 million/km
The Canada Line	19.2	$1.9 billion	$98.9 million/km

Figure 6: Construction cost per kilometer

Note: 1. To calculate the present value of 1986 dollars, I used the Inflation Calculator on the Back of Canada website. The Inflation Calculator uses monthly consumer price index (CPI) data from 1914 to the present to show changes in the cost of a fixed "basket" of consumer purchases[1].

The initial Expo Line was 21.4 km and its construction cost was $854 million in 1986 dollars, which is equal to a present-day value of $1.7 billion. Therefore, the construction cost of the Expo Line is $79.4 million/km. Using the same calculation method, the construction cost of the Canada Line is $109.3 million/km.

Although the total length of the Millennium Line is 42.1 km, it shares 16 stations with the Expo Line. Independent of the Expo Line, its length is 20.3 km and includes 13 stations that are not shared with the Expo Line. Notably, these stations were designed dramatically different from those on the Expo Line (Skelhorne, 2007; Wales, 2008). Furthermore, since the $1.2 billion construction cost focused mainly on these 20.3 km, the construction cost of the Millennium Line is $59.1 million/km. A comparison of the three lines (Figure 6) demonstrates that the Canada Line project has the highest construction cost per kilometer.

[1] Inflation Calculator: Retrieved from: http://www.bankofcanada.ca/rates/related/inflation-calculator/.
Data Source: Statistics Canada, Consumer Price Indexes For Canada, Monthly (V41690973 series).

(b) Matching the Final Product with the Original Plan.

Although all three lines were built on budget (final budget) and on time, it is important to match the final product with the original plan to see whether the project team made changes during the planning and construction process.

First, we need to consider the reason why all three lines could be built on schedule. With completion of the rail line intended for the start of Expo 1986, the Expo Line project proceeded on an accelerated schedule. To maximize the efficiency of the project, BC Transit (the public agency in charge of the line) and Metro Canada Limited decided to integrate their staff in a Joint Project Office (Siemiatycki, 2006). Having learned from their experience developing the first Skytrain line, local planning establishments and project management teams were considerably more proficient in meeting their schedule to deliver the Millennium Line on time. For the Canada Line, the situation was similar to the circumstances surrounding the Expo Line's construction: the 2010 Vancouver Winter Olympics created an imperative to construct and open the new line on time.

Second, by matching the finished product with the original plan, we can determine whether the project team changed the scope of the project or if there were cost overruns during the planning and construction process. The construction cost of the first phase of the Expo Line cost $1.16 billion, including $854.4 million in capital costs and another $161 million in interest payments (all in 1986 dollars) (BC Transit 1989). This number was much higher than the $718.4 million (in 1986 dollars)

predicted by the UTA in their final 1983 cost estimates. In 1999, the cost for the first phase of the Millennium Lines was expected to well-exceed the capped $600 million budget. As a result, Translink requested an additional $25 million in provincial funding to achieve the necessary infrastructure to integrate the Millennium Line with the Expo Line. The provincial government's response was to ask the municipalities to reduce their list of infrastructure integration features. To build within budget, the construction of the Millennium Line cut five kilometers from the original proposed Phase II terminus at Granville Street and 10th Avenue (Wales, 2008). In December 2004, with considerable scope changes to remove stations and public amenity features and with additional funding provided by both public and private sectors, the Canada Line project proposed by SNC-Lavalin was given final approval for development at a total cost of $1.72 billion. However, the final construction cost of the project came in at $1.9 billion, a 22 percent increase over early cost estimates (Boei 2005). Thus, although three lines were built on budget (final budget), all three lines had cost overruns during the planning and construction phase..

Fulfillment of Original Objectives

To compare initial projections of the project's impact with the project's actual impacts, we need to determine the main purpose of each case. Vancouver has had a consistent congestion problem and long history of urban transportation development. In the early 1980s, the elected Social Credit Government won a narrow victory due to the economic recession. Then-Premier Bennett announced his "British Columbia Place"

stadium project. The construction of British Columbia Place stadium would be complemented by the hosting of Expo 86, a world fair for the latest in transportation innovations. Furthermore, British Columbia's provincial government could get extra funding from the federal government and urban development agency for using an innovative technology provided by the Ontario Urban Transit Development Corporation (UTA, 1983). Then the construction of the Expo Line was politically driven in the sense that the provincial government used the development of this mega-project to earn political support. Consequently, Expo 86 made Vancouver an international transportation showcase and the Social Credit government won nearly half the popular vote and a far larger proportion of the seats in the legislature in the subsequent election (Elections BC, 2005). Similarly, in 1995, the provincial NDP government's decision to build the Millennium Line was also motivated by the potential political benefits of undertaking a transit mega-project. Both the Expo and the Millennium Line successfully achieved their respective political purposes even though they each failed to relieve congestion completely or improve air quality (Poudenx, 2004). Despite the many thousands of people that use these lines every day, increasing population has not eased the traffic congestion problems in Metro Vancouver.

Unlike other two lines, the local government used the DBFO type of PPP as a mechanism to alleviate problems that had existed in earlier transit mega-project planning in Vancouver, including political interference, a lack of procedural transparency, and escalating costs. Unfortunately, these expected results have not met

expectations. Although this transportation delivery method has increased the overall accountability of the project, the involvement of the private sector neither minimized the cost escalation nor promoted technology innovation (Siemiatycki, 2006). Furthermore, while each public shareholder of the Canada Line had their own unique interest for investing in this mega project, the 2010 Winter Olympics was the true motivation for the Canada Line.. As previously discussed, the Canada Line opened 15 weeks ahead of schedule, well in advance of the Olympics. Moreover, the daily ridership totals have consistently exceeded its early targets (Wales, 2008). Therefore, the construction of the Canada Line has successfully achieved part of its original goal.

Public Involvement and Procedural Transparency

The power of "public control" is most evident during public consultations and meetings held during the decision-making process. During the planning process of the Expo and Millennium lines, local governments did not hold public consultations to gather public concerns. Public meetings during this phase of the planning process were held only to receive citizen support of the project and consequently failed to provide enough information for the public. For example, the public was generally unaware of how much higher the construction costs were for advanced rail transit such as the Expo Line and the Millennium Line compared to conventional rail transit or the extension of basic surface-level traffic services (Siemiatycki, 2006).

For the Canada Line, the DBFO model has increased some degree of public accountability for the project. Agencies made a consistent effort to undertake public

consultation for the Canada line during its planning and development phase, especially for the competition and selection of the private sector project partner. However, the urgency of the Olympics and the need to maintain the integrity of the competition nevertheless resulted in a partial lack of transparency in this case. The responsible public agency did not properly inform citizens of alternative construction methods during the consultation process; when the public heard from news reports that the line was going to be built using the cut-and-cover method, they were surprised because they believed that the line would be constructed using the deep-bore tunneling method. In fact, cut-and-cover methods have several advantages over deep-bore tunneling methods, including reduced cost, less risk of delay, and closer proximity to the surface-level, improving user access. However, the lack of transparency about these methods resulted in reduced transparency (Greenwood, 2005).

Conclusion

Variable / Line	Efficiency	Fulfillment of Main Purpose	Transparency/ Public involvement
The Expo Line	On Budget On Time Cost overrun during the planning process	Yes/No	Less Transparency
The Millennium Line	On Budget On Time Cost overrun during the planning process; Changed of scope	Yes/No	Less Transparency

The Canada Line	On Budget On Time Highest construction cost per kilometer; Changed of scope Cost overrun during the planning process	Yes/No	Some degree of public involvement but transparency still reduced

Figure 7: Comparison of the Three Lines

Figure 7 summarizes the comparison of the Expo, Millennium, and the Canada Lines. Although all three lines were successfully achieved their political purpose, they failed to meet other important goals. Consequently, this analysis demonstrates that the use of a DBFO approach to the development of the Canada Line did not improve cost efficiency, failed to achieve its original purpose, and had less procedural transparency than expected. As a result of this comparison, I would conclude that P3s do not seem to be effective for urban rail transit. However, there is a crucial aspect not yet discussed: the impact of political interests on each case. Political interference existed in the planning and construction process of three lines, which I will analyze in the next section.

The Political Context in Vancouver

Unlike any other municipality in North America, Vancouver has a unique political context for urban transportation development., From the streetcar system in the late nineteenth-century to the contemporary SkyTrain System, the city has not stopped constructing various transportation services since the city was established in 1886. Persistent congestion problems in Metro Vancouver and the political advantages associated with solving this problem have spurred local governments to continually

develop urban transit solutions. Urban transit proposals are popular with the general public because of the potential to relieve traffic congestion and create new business opportunities and investments. As one example, the NDP earned support from right-of-center Social Credit voters in the 1975 provincial election precisely because they were concerned about transportation investment. From this period forward, no governing provincial government in British Columbia would underestimate the importance of public perception in transportation planning (Siemiatycki, 2006).

The Expo Line

As previously discussed, the broader political context for transportation planning in Greater Vancouver was transformed during the 1979 election. The Social Credit government won a narrow election victory and lost political support because of the growing economic recession. To gain political capital, then-Premier Bennett announced the British Columbia Place stadium project at the Transpo 86 (Expo 86), a world fair showcasing the latest transportation innovations in celebration of Vancouver's centenary. Bennett's government was explicitly motivated to build the Canada transit line to stimulate economic development and retrench political support for the Social Credit party (Olds, 2001).

As a politically driven project, the Social Credit provincial government believed that the development of the Canada Line would create new business opportunities and stimulate the economy. This is generally why the government did not care about the dramatic capital cot escalation during the planning process (Hilferink, 2004). As

previously discussed, although the project eventually met its final budget, costs had already escalated during the planning process. Furthermore, although the Expo Line is a regional project, the provincial government lead the delivery of this public infrastructure and acted in the role of local officials. In order to make Vancouver a world-class city like Toronto and Montreal, Expo 86 and the World's Fair became a symbol of the Social Credit provincial government's leadership. Although the Line was eventually delivered on time and on budget, political motivation spurred the project management team to change its original scope to meet the purpose of the World's Fair. Since the congestion problem was not the main motivation for the government's investment in this transit mega-project, the design and operation of the Expo line failed to meet public concerns about traffic jams (Siemiatycki, 2006). Project managers also failed to effectively engage the public because decision makers wanted to ensure the project would be conducted as they originally planned with minimal public interference.

The Millennium Line

The Expo Line proved that the mega-transportation projects could help the sitting government gain political support, leading to the repeated selection of mega-project initiatives to help solve the growing congestion problem in Metro Vancouver. Although the provincial NDP (1996-1999) and their leader, Glen Clark, were against the Expo Line project that had been delivered by the previous Social Credit

Government, they nevertheless still wanted the potential benefits of undertaking a transit mega-project once they came to power.

For the NDP provincial government, the decision to invest in the Millennium Line was less about moving people, and was instead presented as an important milestone to gain political capital. Although other alternatives such as increasing the size of the bus fleet and implementing bus-only lanes are less expensive solutions than advanced rail transit, the provincial governments nevertheless have political incentives to continue to investing in transportation mega-projects (Siemiatycki, 2006).

In this political context, governments failed to deliver the transit line efficiently. Although they gained experience from the delivery of the Expo Line and despite the fact that the Millennium line had the fewest construction cost per kilometer, project managers still changed the scope during the construction period to meet budgetary constraints (Wales, 2008). This resulted in less effective public engagement and less procedural transparency. Similar to the planning process of the Expo Line, governments provided minimal opportunities for residents to learn details about the project and express their concerns in order to make sure the transit line was delivered as planned. Nevertheless, transportation mega-projects are so popular that the provincial government gained political capital despite again failing to address congestion problems in Metro Vancouver.

The Canada Line

Although previous mega-projects faced criticism, a neo-liberal approach to transportation planning made it politically tenable for Gordon Campbell and his right-of-centre Liberal Party to promote another mega-project in the Greater Vancouver area (Siemiatycki, 2006). The application of DBFO model was the central reason for the rise of the Canada Line project.

Although the most urgent reason to build the line was the need to meet the 2010 Winter Olympics deadline, all the public shareholders of the Canada Line had unique political interests spurring their investment in the mega-project. The governing Liberal federal government thought investing in the Canada Line could increase electoral support for the provincial Liberal government in British Columbia. The provincial government believed that the Canada Line was a chance for the newly elected Liberal Party to align urban development with party interests. Developing the Canada Line as the cornerstone of regional transportation plans could also create benefits for the entire region (Fry, 2005). These political interests explain why the Canada Line was mainly financed by the public sector, a significant difference from the typical DBFO project.

Furthermore, the project proceeded on an accelerated schedule: "There was immense pressure from the national and provincial government on each level of local government to provide approvals that furthered the RAV development plan, since any level of government that refused funding would be seen as the one that scuttled a

popular and necessary infrastructure project" (Siemiatycki, 2006). Although all government stakeholders agreed that private-sector financing would be critical to the realization of the project, the provincial government went as far as to make its financial contribution contingent on the project's delivery (Doyle, 2002). Nevertheless, the planning process of the Canada Line did not effectively involve the public. Moreover, public stakeholders could not transfer risks to SNC-Lavalin which would have better prevented cost escalations and time delays. As the result, the construction of the Canada line had a 22 percent cost overrun above early cost estimates during the planning process (Boei 2005).

According to this comparative analysis of the Expo, Millennium, and Canada Line and their respective political context, there was little apparent advantage overall to the DFBO model in the Vancouver setting based on efficiency, fulfillment of original purpose, and procedural transparency.

Conclusion: The Impacts of the Political Context

In this chapter, I introduced and discussed three rail transit lines in Metro Vancouver: the Expo Line, the Millennium Line and the Canada Line (a DBFO project). However, I cannot prove the effectiveness of using P3s for urban rail transit based on the comparison of three variables: efficiency, fulfillment of original purpose, and procedural transparency.

The broader political environment significantly influenced these three measurements. First, governments will change the scope of projects to deliver transit lines on budget

and on time. When a world event occurs, such as the World's Fair or the Olympics, this event becomes the main motivation for government investment in public transportation and projects will proceed according to a rushed schedule. Second, these projects are all politically driven, aimed at improving political capital and garnering votes rather than meeting public concerns. In general, governments were unconcerned about cost escalations during the planning process because this did not impact the political motivation for their initial investment in the mega-project. This is the chief reason why these transportation mega-projects have failed to solve congestion problems. Specifically, the Canada Line project did not demonstrate the benefits of P3s as expected. Third, to make sure that the project is delivered as planned, the provincial government tended to interfere the planning process of all three transit lines. Even in the DBFO project, the project team did not engage the public effectively and also failed to provide enough opportunities for residents to express their concerns.

Since transportation planning in Vancouver shares much in common with a top-down system, the political context has a huge impact on public infrastructure delivery. The promotion of mega-projects in Metro Vancouver highlights how closely connected transit planning and infrastructure investment decisions are with local and national development policies and political election strategies. In the Vancouver context, the provincial government's political incentives ultimately decided the final outcomes of these mega-transportation projects. If investment in urban transit is simply a tool for governments to gain a political advantage, it ultimately does not matter whether

responsible agencies use the conventional public procurement method or a PPP model.

Chapter Four: The Chinese Context

In this chapter, I will connect the Vancouver case to the Chinese context. P3s have been implemented in China for more than two decades. They have become the primary method for local governments to deliver public services and infrastructure. Although the political system in China differs significantly from the Canadian system, the following chapter will overview the impact of the political context on the effectiveness of using P3s for public transportation delivery in the Chinese context.

PPP Practices in China

The development of P3s in China has experienced three periods. First is the period of exploration (1850-1930). The market liberalization reforms of public services stimulated the rise of PPPs in China, giving private investors increased access to market space originally controlled by the government (Wang, 2013). During this period, there were minimal bidding processes and governments did not promulgate related regulations and legislations for P3s. The second period occurred between 1994-2002, often called the “pilot time”. National and local governments implemented many pilot projects to test the feasibility of the PPP model, including transportation, wastewater treatment, and so forth. Chinese academics also started their research on P3s during this time period. From 2002 to 2008, the development of

P3s in China entered into the third phase: the promotion stage. The National Ministry of Construction has successfully implemented a number of documents to regulate the structure of PPP projects (n.d., 2014). Overall, P3s have been increasingly applied as the primary mechanism of public service delivery. At the same time, governments tended to improve the design of P3s through learning experiences gained from failed projects.

According to official data from PPP Center of National Ministry of Finance, P3s have been vigorously implemented. As of Feb 29, 2016, there are a total of 7710 PPP projects across the country with over ￥8.3 trillion investments covering energy, transportation, water conservancy construction, ecological construction and environmental protection, municipal engineering, and 19 other industries (China Economic Weekly, 2016). Specifically, due to growing traffic demands, enormous investment requirements, and high fiscal pressures, PPPs have been increasingly recognized as the most effective method for governments to deliver large-scale transport infrastructure projects (Mu, Jong, Koppenjan, 2011). Consequently, the construction and financing of public transpiration has been steadily moving from public sector government to private sector firms.

Rapid transit has become the preferred transportation technology for Chinese governments in attempting to solve the problem of population density and inadequate space. According to the 2010 China Metro Annual Report, the operational length of metro systems increased from 143 to 960 km during a ten-year time period (China

Metro Annual Report Team, 2010). Facing the increasing need to improve metro transit amidst fiscal management challenges, local governments noticed that the PPP model could be a good mechanism for transportation infrastructure delivery. Cities such as Shenzhen and Beijing applied a PPP model in their metro development in 2004 and 2006, respectively (Chang, 2013). Chongqing, the most populous city in China, has recently signed over ￥130 billion worth of PPP projects, including eight highway projects and several rapid transit projects (Chinanews, 2016).

Political Constraints

In theory, there are several benefits for governments to apply a PPP arrangement, as discussed in the literature review chapter. Private entities have incentives to reduce cost, engage the public, and improve management and operational efficiency of public projects. Some literature suggests that some governments experiencing severe financial constraints, such as Chinese local governments, tend to use the PPP model more commonly than others (Hammami, Ruhashyankiko, and Yehoue, 2006).

These benefits are not always consistent. Since late 2009, there has been a tendency to decrease private participation in public infrastructure and services in China. Some public agencies in China experienced various forms of opportunistic behavior when they interacted with private entities (Chang, 2013). For example, a local government in Tianjin broke their contract with a private company during the operation phase of a PPP power plant project (n.d., 2016). According to the provisions of the contract, the municipality was supposed to provide financial subsidies to the private sector if the

project failed to collect sufficient profits. In 2002, government subsidies accounted for less than ￥58 million, only 1.25 percent of the company's main business income, resulting in the project's failure.

The political context is ultimately an important factor affecting the effectiveness of P3s in China. Notably, the political environment in China differs considerably from Canada. China is a top-down system and the national government tends to frequently interfere in local affairs. As the result, private entities often have little space to demonstrate their advantages, such as reduced cost or improved efficiencies, when municipalities try to structure a PPP project. A classic example of this is the National Stadium (nicknamed the "Bird's Nest"), which began as a PPP project before it became a typical governmental infrastructure (Tian, 2015). The cooperation between the Beijing municipal government and Zhongxin Group Consortium (which consists of four private companies) ended just one year after the operation of the "Bird's Nest". The political context was the chief reason for the failure of the National Stadium PPP project.

Following China's successful bid for the 2008 Beijing Olympic games, national and municipal governments sought to make Beijing a global city and improve China's international reputation. As the epicenter of the Olympics, the National Stadium attracted more political attention than other projects. Similar to the Canada Line project in Vancouver, the public sector was the main investor of the "Bird's Nest" (Tian, 2015). However, because the Beijing government was overly involved in the

design process, the private sector has limited ability to structure the project more efficiently and scientifically (Tian, 2015).

According to my study of the Canada Line project, the political context shapes the effectiveness of the PPP model. If a PPP project is politically driven, it may fail to deliver its desired outcomes, such as improved project efficiency, fulfillment to its original purpose, or effective engagement with the public. Since China is a top-down political system and local governments in China have recently promoted the development of P3s and signed up a number of rapid transit PPP projects, it is important for these governments to notice the potential loss of benefits of P3s because of this political element. When a public project is driven by popularity, re-election concerns, or elite interests rather than sound public policy judgments or public interests, governments are motivated to interfere with the planning process of PPP projects to ensure that the project proceeds as planned. Consequently, the construction of projects may exceed its original estimated cost and fail to meet public expectations.

Conclusion

In recent decades, PPPs have been recognized as an effective mechanism for public infrastructure delivery. The enormous investments that accompany mega-transit infrastructure projects have led to significant financing and operation policy changes in Canada. In theory, P3s could integrate the advantages of both public and private sector infrastructure delivery by transferring risk to the partner best able to manage it,

increasing the project's rationality, and improve the project's procedural transparency and financial responsibility.

However, the political context will affect the potential benefits of P3s. In the case of Vancouver, although the Canada Line is a DBFO project—unlike the public procurement method used to design and finance the Expo Line and the Millennium Line—all of three lines failed to deliver their desired outcomes. In each case, there were different goals: those actually related to transportation, and those related to other aims. As previously discussed, while these three lines successfully achieved their political purposes, they all failed to meet public interests, such as relieving traffic congestion or improving air quality.

Consequently, there is little apparent advantage of the DBFO model according to a comparison of these three projects in the Vancouver setting. The BC provincial government had a huge impact on the investment of large transportation projects in the Metro Vancouver area. As a politically driven project, the project management team of the Canada Line did not promote a competitive selection nor engage in a reasonable consultation process to effectively engage the private sector and the general public. Under this top-down system, local governments are driven by political interests and do not care about the feasibility of P3s. Despite the fact that Chinese local governments are very different from Canadian municipalities, PPP projects in China also face similar challenges because the political context similarly undermines the effectiveness and efficiency of the PPP model of infrastructure delivery.

Contributions

According to the case study, when government has a political motivation in financing a mega-project, it may fail to optimally structure a PPP; accordingly, P3s will lose some potential benefits of public infrastructure delivery. Although P3s have theoretical advantages in some circumstances, its overall effectiveness will be influenced by the political context. If a project is chiefly politically driven, then the method of financing and design is simply a tool for political purposes; in these circumstances, there is little advantage to the PPP model over a traditional procure method.

Further Research

The comparison of the three rapid rail transit lines in Vancouver was based on three variables—efficiency, fulfillment of original purposes and effective public engagement—each of which could be improved by considering transaction costs in the subsection of budget calculation. There has been increasing academic interest in Chinese PPP practices during the past decade. Current research on China's PPP agreements focuses mainly on risk allocation. Since there is no detailed analysis on the implications of the PPP model in China, deeper investigation on the influence of political context is required. To better understand the benefits, costs, and limits of the PPP model in China, detailed research on a Chinese rapid transit PPP case would be beneficial.

References

Altshuler Altshuler, A., Luberoff, D. (2003). *Mega-projects: The changing politics of urban public investments*. Washington, DC: Brookings Institution.

Asquith, A., Brunton, M., and obinson, D. (2015). Political influence on public-private partnerships in the public health sector in New Zealand. *International Journal of Public Administration,* 38(3): 179-188.

Asian Development Bank. (2008). *Public-private partnership handbook*. Page 20.

BC Transit. (1989). *Skytrain, A Catalystfor Development.* Retrieved September 26, 2005, from http://www.rapidtransit.bc.ca/media/pdf/catalyst-apr-00.pdf.

Bula, F. (2010). Light rail showdown: Vancouver versus Seattle. Retrieved August 13, 2010 from: http://www.theglobeandmail.com/news/british-columbia/light-rail-showdown-vancouver-versus-seattle/article1319451/?page=all.

Boei, W. (2005). Final RAV deal up by $180 million: Winning bidder, two new partners will cover the increase. *The Vancouver Sun*, August 3, B1.

British Columbia Ministry of Transportation. (2011). Information Bulletin: Evergreen Line RFP released.

Chang, Z. (2013). Public–private partnerships in China: A case of the Beijing No.4 Metro line. *Transport Policy*, 30: 153-160.

China Economic Weekly. (2016). Ministry of Finance first disclosed China PPP Big Data: The total investment is over ￥8.3 trillion yuan. *Xinhua*. Retrieved March 8, 2016 from http://news.xinhuanet.com/fortune/2016-03/08/c_128782164.htm.[Chinese]

China Metro Annual Report Team (2010). *Annual Report of China Urban Mass Transit (Zhongguo chengshi guidao jiaotong niandu baogao)*. China Railway Press. [Chinese]

Chinanews. (2016). Chongqing signed up 130 billion yuan PPP cooperation projects again; Huang Qifan reaffirmed the priciples approaches, and issues. *Chinanews.* Retrieved July 1, 2016 from http://www.chinanews.com/cj/2016/07-01/7924675.shtml. [Chinese]

City of Vancouver. (2007). Traffic entering Vancouver, 1986 to 2005. *WayBack Machine.* Retrieved May 30, 2007

from https://web.archive.org/web/20071011110739/http://www.vancouver.ca/commsvcs/cityplans/transportation/traffic.htm.

Davis, C. (2006). The History of Metropolitan Vancouver. Retrieved 23 November 2006 from: http://www.vancouverhistory.ca/chronology2.html.

Debande, O. (2002). Private financing of transport infrastructure: An assessment of the UK experience. *Journal of Transport Economics and Policy* 36 (3): 355–87.

Doyle, D. (2002). *Letter to Pat Jacobsen*. June 19. Freedom of Information Request.

Euromoney Publications PLC. (2002). Privatization & public private partnership review. *Privatization & public private partnership review,* Pp56-58.

Elections BC. (2005). *Electoral History of British Columbia 1871-1986.* Retrieved September 26, 2005, from http://www.elections.bc.ca/elections/electoral_history/toc.html

Erie, S., Kogan, V., and MacKenzie, S. A. (2010). Redevelopment, San Diego Style: The Limits of Public—Private Partnerships. *Urban Affairs Review,* 45(5): 644-678.

Ferlie, E., Lynn, L. E., Pollitt, C. (2005). *The Oxford handbook of public management.* New York : Oxford University Press. Pp356-357.

Ferreras, J. (2013) Vancouver Has Canada's Worst Traffic Congestion: Report. *The Huffington Post B.C.* Retrieved February 17, 2013 from: http://www.huffingtonpost.ca/2012/10/11/vancouver-worst-traffic-congestion-canada_n_1959412.html.

Flyvbjerg, B., Bruzelius, N., Rothengatter, W. (2003). *Megaprojects and risk: An anatomy of ambition*. New York: Cambridge University Press.

Fourie, F. C., Burger, P. (2001). Fiscal implications of public-private partnerships. *The South African Journal of Economics*, 69(1): 147 – 168.

Fry, H . (2005). Keeping in Touch: Major New Investments in Public Transportation. *Member of Parliament Brochure.* Vancouver, Canada.

Gatti, S. (2007). *Project Finance in theory and practice*. Cambridge, Massachusetts: Academic Press. p. 414.

Garcea, J. (2015). Infrastructure P3s in the Multi-Level Governance Context Within the Canadian Federal System: An Overview of the Organizational, Financial and Policy Frameworks. The International Conference on Public Policy, 7.

Greenwood, J. (2005). Court to decide if RAV is being done right: B.C.'s $1.7B rapid transit plan faces legal challenge. *National Post*, June 18, FP7.

Grimsey D., Lewis M. K. (2002). Evaluating the risks of PPPs for infrastructure projects. *International Journal of Project Management*, 20, Pp 107 -108.

Hammami, M., Ruhashyankiko J. F., Yehoue E. B. (2006). Determinants of Public-Private Partnerships in Infrastructure. *IMF Working Paper*, No. 06/99.

Hilferink, S. (2004). *Societal Cost Benefit Analysis: a bridge to more efficient infrastructure decision-making?* Utrecht University: Master's Thesis.

Ho, S. P., Levitt, R., Tsui, C. W., Hsu, Y. W. (2015). Opportunism-Focused Transaction Cost Analysis of Public-Private Partnerships. *Journal of Management in Engineering*, 31(6).

InTransitBC. (2006). Overview and Route Map. Retrieved December 17, 2006 *from:* http://www.canadaline.ca/aboutOverview.asp.

Iseki, H., Houtman, R. (2012). Evaluation of progress in contractual terms: Two case studies of recent DBFO PPP projects in North America. *Research in Transportation Economics,* 36(1): 73-84.

Mason, B. (1989). SkyTrain and Cambie Bridge taking us down road to Expo Series: The Eighties. First Edition. *The Province*. p. 20

Mu, R., Jong, M de., and Koppenjan, J. (2011). The rise and fall of Public–Private Partnerships in China: a path-dependent approach. *Journal of Transport Geography*, 19(4): 794-806.

Murphy, T. J. (2008). The case for public-private partnerships in infrastructure. *Canadian Public Administration*, 51(1): 99-126.

n.d. (2014). Look to the future from the development path of P3s in China. *Caixin.* Retrieved August 1, 2014 from http://opinion.caixin.com/2014-08-01/100712038.html. [Chinese]

n.d. (2016). The discussion of five failed PPP projects in China. *Zgppp.* Retrieved Feburary 24, 2016 from http://www.zgppp.cn/hangyezixun/xinwenzhongxin/2016-02-24/2170.html. [Chinese]

Olds, K. (2001). *Globalization and Urban Change.* New York: Oxford University Press.

Pekka, P. (2002). *Innovative project delivery methods for infrastructure*. Finnish Road Enterprise. pp. 120.

Pomeroy, B. (1998). The limits to public-private partnership. *The RUSI Journal*, 143(4): 27-29.

Poudenx, P. (2004). *The Greater Vancouver Personal Transportation Sector Energy Demand - Implication for The Development of a Wind-Based Sustainable Energy Supply.* Vancouver: University of British Columbia.

Ross, T. W., Yan, J. (2015). Comparing Public-Private Partnerships and traditional public procurement: Efficiency vs. flexibility. *Journal of Comparative Policy Analysis: Research and Practice*, 17(5): 1-19.

Savas, E. S., Osborne, D., Gaebler, T. (1992). *Reinventing Government*. Reading: Addison- Wesley.

Savas, E. S. (1999). *Privatization and public-private partnerships*. London: Chatham House.

Siemiatycki, M. (2006). Implications of Private-Public Partnerships on the development of urban public transit infrastructure: The case of Vancouver, Canada. *Journal of Planning Education and Research,* 26(2), 137-151.

Siemiatycki, M. (2006). *Mega-projects in the making: A century of transportation infrastructure investment in Vancouver Canada.* The University of British Columbia.

Siemiatycki, M. (2010). Delivering transportation infrastructure through public-private partnerships. *Journal of the American Planning Association*, 76(1): 43-56.

Siemiatycki, M. (2012). The Global Experience with Infrastructure Public-Private Partnerships. *Planning & Environmental Law*, 64(9): 6-11.

Sinoski, K. (2009). Canada Line linking Vancouver and Richmond to open Aug. 17.*Vancouver Sun*. Retrieved August 4, 2009 from: https://web.archive.org/web/20090807065913/http://www.vancouversun.com:80/Canada%20Line%20open/1859013/story.html

Skelhorne, P. (2007). Skytrain: The Smart Choice for Greater Vancouver. *American Public Transportation Association.* Retrieved January 14, 2007 from: http://web.archive.org/web/20070927220917/http://www.apta.com/services/intnatl/intfocus/skytrain2.cfm.

Snider, D. (2007). Light Rail vs. Trolley Bus. *Mass Transit*. Retrieved 30 May 2012 from: http://www.masstransitmag.com/article/10221148/light-rail-vs-trolley-bus.

Taggart, J. (2001). Vancouver's Millennium Line: The extension of Vancouver's SkyTrain establishes a new direction for the design of the city's transit stations. Retrieved July 1, 2001 from: https://www.canadianarchitect.com/features/vancouver-s-millennium-line/.

Tian, X. X. (2015). The Olympic venue "Bird's Nest" PPP projects disbanded at the halfway, deeply into the paradox of dividend. *Business Sohu.* Retrieved January 19, 2015 from http://business.sohu.com/20150129/n408174060.shtml. [Chinese]

TransLink. (2001). Bus service comes to the new Braid Millennium Station. Retrieved February 23, 2016 from: http://www.translink.ca/en/About-Us/Media/2001/December/Bus-service-comes-to-the-new-Braid-Millennium-Station-January-7-2002.aspx.

TransLink. (2007). Millennium Line celebrates five-year anniversary with growing ridership. Retrieved August 3, 2007 from: http://www.translink.ca/en/About-Us/Media/2007/August/Millennium-Line-celebrates-five-year-anniversary-with-growing-ridership.aspx.

TransLink. (2011). TransLink reports transit ridership heading for a new record. Retrieved August 22, 2011 from: http://www.translink.ca/en/About-Us/Media/2011/August/TransLink-reports-transit-ridership-heading-for-a-new-record.aspx.

UTA. (1983). *Advanced Light Rapid Transit: The Systemfor Greater Vancouver.* Vancouver: UTA.

Vancouver Sun. (2010). TransLink carried 26 million passengers during Games. Retrieved March 23, 2010 from: http://www.canada.com/story.html?id=dbd27c44-5fb4-4f10-a58d-56c3b3de8445.

Vining, A. R., Boardman A. E., Poschmann, F. (2006). Public-Private Partnerships in the U.S. and Canada: There are no 'free lunches'. *Journal of Comparative Policy Analysis,* 7(3): 1-22.

Vining, A. R., Boardman A. E. (2008). Public-Private Partnerships in Canada: Theory and Evidence. Canadian Public Administration, 51(1): 9-44.

Wales, T. (2008). The Road Less Travelled: TransLink's improbable journey from 1999 to 2008. TransLink. Retrieved from: http://www.translink.ca/-/media/Documents/about_translink/corporate_overview/corporate_reports/history/translink_history_nov_2008.pdf.

Wang, M. (2013). Public–private partnerships in China. *Public Administration Review*, 73(2): 311 -312.

Wikipedia. (n.d). Expo Line (TransLink), Retrieved from: https://en.wikipedia.org/wiki/Expo_Line_(TransLink)#cite_note-1.

Wikipedia. (n.d). Millennium Line, Retrieved from: https://en.wikipedia.org/wiki/Millennium_Line.

Wikipedia. (n.d). Canada Line, Retrieved from: https://en.wikipedia.org/wiki/Canada_Line.

World bank. (2015). Concessions, Build-Operate-Transfer (BOT) and Design-Build-Operate (DBO) projects. BOT - PPP in Infrastructure Resource Center. Retrieved July 06, from http://pppirc.worldbank.org/public-private-partnership/agreements/concessions-bots-dbos

Zheng, J., Roehrich, J. K., and Lewis, M. A. (2008). The dynamics of contractual and relational governance: Evidence from long-term public–private procurement arrangements. *Journal of Purchasing and Supply Management*, 14(1): 43-54.