

Urban rail transit PPPs: Risk Assessment of Recent Strategies

Sock-Yong Phang
Associate Professor of Economics
Singapore Management University

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Abstract

While there has been greater success with regard to the privatization of commuter rail, intercity rail services as well as the deregulation of urban bus transit, the privatization of urban rail operations remains more of a rarity in the developed world. In the past 15 years, however, there has been a proliferation of rail transit PPPs in Latin America and Southeast Asia. The first part of this paper reviews the recent experiences of Bangkok, Kuala Lumpur, Manila, Buenos Aires, Rio de Janeiro, Singapore, Hong Kong, and London and classifies the approaches adopted into four broad strategies:

- (i) the development of new systems through super turnkey procurements,
- (ii) the concessioning of rail and subway services,
- (iii) the sale of state-owned operators through share issue privatization, and
- (iv) PPPs for infrastructure maintenance and upgrading.

The second part provides a framework to assess the risk of alternative strategies for urban rail transit procurement and operations.

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1. Introduction

The wave of privatization that has swept the infrastructure, utilities and transportation sectors in the past three decades appears to have found fewer converts in the urban rail transit sectors of North America. While there has been greater success with regard to the privatization of commuter rail, intercity rail services as well as the deregulation of urban bus transit, private sector involvement in urban rail transit remains more of a rarity in North America (Redlin, 2003).

That urban rail transit has historically been a sector that cannot be run profitably, whether publicly or privately-owned, is often cited as one of the obstacles to successful private sector involvement (Due, 2003; Gomez-Ibanez, 1993). The difficulties arise from a number of sources: (i) expensive construction, operating and maintenance costs; (ii) the inadequacy of fare revenue resulting in the need for direct and/or indirect public subsidies such as land development rights; and (iii) the complexities of forming and sustaining coalitions and partnerships necessary in rail transit privatization. The average farebox recovery ratio was 27% for US metros and 25% for US Light Rail Transit systems (1997 data from Babalik-Sutcliffe, 2002).

According to Due (2003), 'government-owned urban transit systems remain largely intact in the US, even more so in continental Europe, and less so in the developing world.' A recent study to identify the factors behind the success of new urban rail

systems was based on eight government-owned and operated systems: four in the US, three in the UK and one in Canada (Babalik-Sutcliffe, 2002). The issue of private sector involvement was not considered at all. Often cited as a reason for urban rail's failure to attract private capital to what is often perceived as a risky setting is the diffusion of benefits and hence difficulties involved in recapture of value.

Outside of North America, however, there has been a wave of urban rail projects involving the private sector in the last fifteen years. Cities that have competitively contract out services for its urban rail lines include the Latin American cities of Buenos Aires and Rio de Janeiro. London Underground in 2002 begun a process of transferring rail infrastructure (track, signaling, bridges, tunnels, lifts, escalators, stations and trains) to three private infrastructure companies, in order to secure long term sustained funding for the tube through public private partnership. Train and station services however remain in the public sector.

The record for East Asia has also been encouraging. Japanese railway conglomerates have led the way for rail and land use development for most of the last century. While this was also true for the US a century ago, the co-investment in railways and new town development is still commonly practiced in Japan today. Many other East Asian cities, with incomes and land use density levels that are more favorable to higher levels of transit ridership, have looked to Tokyo as a model for rail and land development. Large cities in Europe, North America and Japan built their rail transit systems before World War II when cars were not as common as today. Most Asian cities however could not afford to build urban railways in prewar days and with the growth in motorization after the war, it was not easy for them to build urban rail systems.

However, rising incomes and car ownership rates, with the attendant urban congestion and pollution problems, have resulted in the need to seriously consider urban rail as a solution. The governments of four Southeast Asian cities (Bangkok, Jakarta, Kuala Lumpur and Manila) have utilized urban rail concessions to build new rail transit systems, while previously state owned operators in Hong Kong and Singapore have become public listed companies.

Grimsey and Lewis (2004) make the following distinction between privatization and Public Private Partnerships (PPP):

‘within a PPP the public sector acquires and pays for services from the private sector on behalf of the community and retains ultimate responsibility for the delivery of the services, albeit that they are being provided by the private sector over an extended period of time (i.e. 25 years or longer). By contrast, when a government entity is privatized the private firm that takes over the business also assumes the responsibility for service delivery...A PPP is a formal business arrangement between the public and private sectors.... regulation through contract and the lack of government disengagement define much that is distinctive about a PPP. ‘

Based on the above distinction, most recent efforts at involving the private sector in the provision of public transport services come under the category of PPP. As recent international experience has demonstrated, different strategies have been used to involve the private sector in the urban rail transit business. In the first part of this paper (Sections 2 to 5) we provide a review of four alternative PPP strategies adopted by various governments in the past fifteen years. The four strategies reviewed are:

- (v) the development of new systems through super turnkey procurements,
- (vi) the concessioning of rail and subway services,
- (vii) the sale of state-owned operators through share issue privatization, and
- (viii) PPP for infrastructure maintenance and upgrading.

In Section 6, we draw on the recent economic literature on PPPs to provide a comparative analysis of the division of risks between the public and private sector for each of the four strategies. This analysis adds to the literature on PPPs by assessing the costs and benefits of privatizing risk that underlies these complex relationships. Section 7 concludes.

2. Development of new transit lines through super turnkey procurements

The involvement of the private sector in the implementation of new urban rail projects can take many forms. In what has become known as the 'traditional design-bid-build' strategy, the transit authority's engineering team is responsible for the detailed designs and solicits bids and awards contracts to the private sector to build the system. Under a design-build procurement strategy, the authority solicits bids at typically 30 percent of design with detailed designs prepared by the successful contractor (Zweighaft, 2001). Variations of the design-build strategy include turnkey, design-build-operate-maintain (DBOM), and super turnkey. In a turnkey procurement, a single contractor takes entire responsibility for the project allowing for the owner to simply 'turn the key' to begin operations. In DBOM, the contractor has operational maintenance responsibilities upon project completion.

In design-build-finance-operate (DBFO)¹ or super turnkey² projects, the contractor also brings its own financing for the construction program. These contracts are usually long term (25 to 30 years being common), has detailed provisions on payment, service standards and performance measures, provide an objective means to vary payment depending on performance, and with the concessionaire usually having to assume substantial risk.

While design build allows transportation agencies to gain access to technologies beyond their current organizational capabilities thus saving time and money, DBOM can help assure the development of a system that could be economically maintained and operated. Super turnkey can turn initially financially nonviable projects into viable ones by bringing private investors into the transit industry as partners. Many of the risks and much of the project management responsibility is also transferred from the authority to the private contractor.

In a survey of the organization models for 15 recent major transit projects in the US, Zweighaft (2001) cites two instance of DBOM (the JFK Airport Access Project rail system Puerto Rico's Tren Urbano), and one instance of super turnkey, the Hudson-Bergen LRT project (see Middleton, 1997 for details). Most of the remaining projects fell under the traditional design-bid-build categories. Private financing for new rail transit projects is thus rarely used in the US. Gomez-Ibanez (1993) cites two examples: monorails in Walt Disney's amusement parks, and a short rail line for internal circulation in a major office and retail center at Las Colinas near Dallas, Texas. However, super

¹ DBFO is a term coined by the UK Highways Agency to describe their concession-based road schemes under the Private Finance Initiative (Grimsey and Lewis, 2004).

² The US Federal Transit Authority refers to DBFO projects as super turnkey projects.

turnkey has been extensively used in infrastructure projects in other countries, particularly UK, France, Thailand, Malaysia, Hong Kong, Indonesia and the Philippines (Gomez-Ibanez, 1993; Halcrow, 2004). In a departure from traditional practice, the Union Pearson Air Rail Link in Toronto was awarded as a DBFO PPP contract in 2003, while the Richmond Airport Vancouver Project (the Canada Line) was awarded as a DBFO PPP contract to InTransitBC in 2005, both through competitive bidding processes.

London remains an important test bed for a range of private sector involvement in urban rail development. The extension of the Docklands Light Railway into the City's financial centre was part funded by the major private developer in Docklands. In the 1990s, a decision was taken to extend it across the river Thames to Lewisham, and to turn the operation of the entire system to a private concession. This involved awarding the design and build concession for the 4 km (£200m)³ cross river concession and a 7 year operating concession in 1997 to the SERCO group (which was subsequently extended to run until 2006). London's Croydon Tramlink, a new suburban light rail system which opened in 2000, was procured through a design-bid-built-operate-maintain strategy where the bids were assessed on the lowest capital subsidy required to construct the system, on the basis of no on-going revenue support and operation within the London Transport integrated fares and service regime (Halcrow, 2004). London Transport funded £125 million of the £200 million capital costs. However, as revenues were lower than expected by the concessionaire, financing arrangements have had to be restructured.

In the section, we review the experiences of three Southeast Asian cities: Kuala Lumpur, Bangkok and Manila which have acquired new rail systems in the past decade. In all three cases, private investors proposed significant funding for new rail transit

³ £1 is approximately US\$1.80 (August 29, 2005 rate).

systems. These cases offer a variety of insights into the possibilities and problems of super turnkey procurement in urban rail transit.

Kuala Lumpur

Kuala Lumpur (KL), the capital of Malaysia, has an area of 243 sq km with a population of 1.4 million and employment of 838,000. Up until the late 1980s, public transport was mainly performed by buses. Sometime in the early 1990s, proposals for urban rail transit took root and developed rapidly, with the government first approving the BOT proposal from the foreign Taylor/Woodrow/AEG consortium to build the STAR LRT. After KL was awarded the 1998 Commonwealth Games in 1994, the government extended the route length of STAR and approved the PUTRA LRT (Halcrow, 2004).

The STAR system started as the first urban rail BOT project in Malaysia with 60 year lease in November 1991. The 1998 Commonwealth Games precipitated the government to request a southern extension of the line to serve the Games stadium. As a compensation for the low density extension, STAR was given a 3 km northern extension into a high density residential area. Operations began in Dec 1996 for phase 1 (12 km) with completion of the line in 1998 with a total route length of 27 km.

PUTRA was incorporated in 1994 with a 60 year concession to design, construct and operate a 29 km LRT. PUTRA was wholly owned by Renong Bhd – a major Malaysian conglomerate that was asked to start work before signing a concession to meet the Commonwealth Games deadline. The fully automated driverless system began operations in September 1998.

After a few years of operation at less than one third of forecast demand, and under difficult conditions brought on by the Asian economic crisis, both STAR and PUTRA faced serious financial difficulties in servicing their debts and were subsequently 'bailed out' in 2002 by the government. Phase I of the takeover involved the government converting overdue loans into bonds in the nation's biggest ever corporate restructuring through a government owned company Syarikat Prasarana Negara Berhad (SPNB) established to manage 'critical public infrastructure' in the Klang Valley. In 2001, the SPNB purchased all the rights to the outstanding debts of STAR and PUTRA via the issue of RM 5.5 billion⁴ of fixed rate guaranteed bonds to the two companies' creditors. In 2002, the government effectively took over the assets and operations of the two LRT systems following their inability to meet their debt obligations after being served winding-up petitions.

The takeover of the LRT systems was considered by many to be a failure of the privatization program (Wong et al, 2005) and was justified by the government as necessary and unavoidable as public interest was involved, and affordable public transport services were considered ultimately to be the responsibility of the government. As PUTRA was also a subsidiary of Renong, the biggest conglomerate with the largest debt in the country (over RM25 billion), a government takeover also helped reduce its debt as well as the amount of non performing loans in the banking system. Critics however viewed sums involved to save STAR and PUTRA as excessive, with actual construction costs believed to be much less. Moreover, SPNB subsequently leased back the LRT operations to the management of PUTRA and STAR at discounts after

⁴ RM 1 is approximately US\$0.265 (August 29, 2005 rate).

nationalization and Wong et.al. (2005) has described to saga as 'tantamount to socializing losses and liabilities while allowing profits and profitable assets to be privatized.'

Other than the two LRT systems, the KL is also served by the state owned KTM commuter rail, an express rail link to the KL International Airport (constructed under a 30 year concession with services starting in 2002), and a 8.6 km Monorail, a BOT project which serves the central area and helps to connect the various rail lines serving KL. The monorail concession contract was signed in 2000 and the project company KL Investment Group Bhd was listed on the KL Stock Exchange in 2003 when operations began.

Bangkok

As the capital city of Thailand, the population of Bangkok is in excess of 10 million with notorious peak hour traffic speeds at 10 km per hour throughout much of the metropolitan area. There were a number of failed attempts at attracting investors to build a much needed transit system in the 1980s (Perez, 2004). Half a dozen mega transport infrastructure projects, all involving the private sector, were finally initiated in the late 1980s and 1990s, and comprised expressways and three transit lines: Blue, Red and Green. A new agency, the Metropolitan Rapid Transit Authority (MRTA) was established to coordinate the rail projects.

In 1990, the Hong Kong based Hopewell Holdings signed a concession agreement with the State Railway of Thailand for the 60 km US\$3.2 billion Red Line cum expressway system. In 1993, the Blue Line concession was awarded to a group led by Bangkok Land, a large Thai real estate company. Both the Red and Blue Lines were

designed as above ground elevated transit systems. In 1994 however, the government made a decision to require the MRT lines to be built underground within a 25 square km zone in central Bangkok. The decision was to cause Bangkok Land to withdraw from the Blue Line project, which subsequently became an MRTA project. Construction began in 1997 on the fully underground system. A concession to equip and operate the Blue Line was put out to bid in 1999 and the line opened for service in 2004.

The Red Line was exempted from the requirement to go underground as it was already under construction. However, Hopewell stopped construction in August 1997 in the midst of the Asian economic crisis. The concession was then unilaterally terminated by the government in December 1997, with further development delayed by Hopewell's claims for reimbursement for the US\$600 million it had spent on the project (Gomez-Ibanez, 2000).

The 15 km Green Line or Skytrain was conceived to serve downtown Bangkok and its alignment included two routes that cross in downtown Siam Square. The line was to be financed from fare revenues with the Bangkok Metropolitan Authority providing all the right-of-way for free by allowing the line to be built over important arterial streets. When the 30 year concession was put out to bid in 1991, Tanayong Corporation, a Thai real estate company, was selected from three short-listed bidders partly because it had offered the lowest fare – 12 baht.⁵ With a price tag of over US\$1.5 billion, all of which was to be purely privately financed, the project attracted much international attention.⁶ Tanayong subsequently created a separate company, the Bangkok Transit System

⁵ This was increased to 15 baht in 1992 after negotiations began. One Thai baht is approximately US\$0.024 (August 29, 2005 rate).

⁶ Perez (2004) contains a 73 page case study of the BTS project.

Company (BTS), to build and own the concession. The concession contract provided for fare increases every 18 months thereafter with the increase in consumer price index, with provisions for increases also in the event of exceptional circumstances including major changes in foreign exchange rates.

Project implementation was far from smooth: there were lengthy disputes over the site of the train depot, going underground or remaining elevated, as well as location of support pillars. Financiers for the projects other than Tanayong and a large Thai construction company (Italian-Thai) also grew to include Siemens, the German government's international development bank, a syndicate of Thai banks, as well as the International Finance Corporation, the World Bank's private sector lending arm. The Asian financial crisis and the devaluation of the Thai baht hit the BTS hard as many foreign loans, construction and equipment costs were in foreign currency, while Tanayong's revenues were primarily in baht. A controversy over fares that BTS could charge had to be brought before the seven-person arbitration panel. And all these were before Skytrain opened for service in December 1999 (at fares ranging from 10 to 40 baht), some three years later than as stipulated in the 1992 concession contract (Gomez-Ibanez, 2000).

Since its opening, ridership has been below the forecasted 570,000 level: year 1 ridership was just one-quarter forecast; the system at present carries an average of 350,000 passengers/day (Halcrow, 2004). While fare box revenue has been sufficient to cover operating costs, the ability of BTS to service its substantial debt remains a source of great concern. BTS today continues to face the challenges of increasing ridership, restructuring its debt, and the threat of nationalization.

Manila

Manila, another mega Southeast Asia city with a population of about 11 million, built a MRT line through a Build-Lease-Transfer concession in the 1990s. Under the concession contract signed in 1993, the concessionaire (MRTC) finances, constructs and maintains the project for 25 years and implements commercial developments for 50 years. In return, it receives a fixed revenue stream and annual rental payments for property. The government takes foreign exchange and revenue risks and provides sovereign guarantee for all debt. MRTC takes construction and maintenance risk in return for a guaranteed 15% return on equity on the basis of lease payments for the railway, with property upside. Operations are by the government who take the commercial risk and share in the property upside. The MRTC opened for service in phases beginning in 1999 and carries an average 375,000 passengers per day (Halcrow, 2004).

3. Concessioneering rail and subway services

Since the 1980s, competitive tendering for bus services has been implemented in numerous cities where services were formerly operated by the state. Competitive tendering slowly spread to urban rail in the 1990s, starting with Argentina and Brazil (to be discussed in greater detail in this section). Concessioneering of rail lines often depend on the fact that public sector investments in rail lines have been largely written off by the government with no need to be recovered by new private owners/operators. Stockholm Transport has awarded five-to-ten year contracts for operating its three metro rail lines, its light rail system, the suburban railway service, as well as commuter rail services. It

normally leases vehicles to contractors and owns the tracks and facilities. In some instances, station staffing is also contracted out. In 1999, Singapore's Land Transport Authority awarded a concession to run the brand new 20 km Northeast Line and two adjoining LRT systems in a close tender exercise involving the two major local bus operators, conspicuously keeping the incumbent rail operator out. The line commenced operations in 2003 and is operated by publicly listed SBS Transit.

Buenos Aires

In the mid-1990s, as part of an overall privatization program, Argentina launched an ambitious plan to privatize its entire transport sector. Gomez-Ibanez, in 1997, described Argentina as 'the only country outside Japan that had private urban commuter railways and the only country in the world that had granted a private concession to operate its subway'. This certainly reflects how privatization of urban rail has spread in the past decade.

The Argentine concession model, used in the concession of the Buenos Aires urban rail systems, required interested private sector parties to submit bids to execute an investment plan defined and funded by the state and to be implemented by the concessionaire. The urban commuter railroad services centered around Buenos Aires and included a network of 899 km, 267 stations and 1,800 trains carrying over one million passengers daily. These services, which were previously operated by the state-owned railway company, were divided into seven separate lines and offered as twenty year concessions to the private sector. The municipally-owned subway system (36.5 km and one LRT of 7.4 km) was included in one of the commuter concessions.

The bids required the submission of a schedule of declining operating subsidies to be paid by the state and of fees to be paid by the concessionaire to the state for the concession rights (Robelo, 1999b), given stipulated level of service provisions and tariff set by the government. The schedule of subsidies must decline to zero by a certain date, after which the concessionaire starts paying the government an annual concession fee. The winner of the concession would be the bidder with the lowest net present value for the cost of the investment plan plus the subsidy to be paid by the government minus the concession fee to be paid by the concessionaire.

The concessions attracted a large number of bids and winners were selected in January 1993; by May 1995, all seven lines had been transferred to the concession winners. The operation of Subte, Buenos Aires' subway system was taken over by Metro Vias on January 1, 1994 with a commitment to US\$394.8 million in improvements to the antiquated system by 2012. Metro Vias' performance according to Perez (2004), has 'won plaudits from observers around the world, encouraging the Argentines to pursue additional rail transit projects in the capital and British transport officials to consider the privatization of London Underground.' Overall, Gomez-Ibanez (1997) cited three concerns over the concession program: delays between award and transfer leading to service deterioration; ambiguities in the concession contracts that required renegotiation of bids; and concessionaires' worries over unexpectedly high ridership since the awards were based on smallest subsidy to complete the required investment program.

Rio de Janeiro

The Rio de Janeiro metropolitan area comprises 546,865 hectares and has a population of 10 million. The mostly private bus system is the backbone of the public transport system, with only 4% of the 8.7 million public transport trips daily made by suburban train (Flumitrens, 264 km network) and 3 percent by subway (Metro, 23 km long). While bus services were provided by private operators without direct subsidies, in 1995-1996, Flumitrens received US\$180 million in subsidies and the Metro US\$109 million (Robelo, 1999a). To help address a budget crisis in the mid 1990s, the government implemented reforms to sell or concession loss making state-owned enterprises to the private sector. As part of the reform program, the Metro was concession in December 1997 and Flumitrens in July 1998.

The Rio concessions differed from the Buenos Aires concessions as the concessionaires were not required to fund the investment plans given that the state had already secured loans from Brazil's National Development Bank for the Metro and was in the process of negotiating with the World Bank in the case of Flumitrens. Although initial financial projections suggested that the Metro would require an operating subsidy for one or two years and the Fluemitrens over the first four years, the state decided against a negative concession (subsidy) for a number of reasons. The concessionaires would have no major investment funding obligations; ongoing extensions continue to be state financed and rolling stock already ordered would be taken over by the concessionaire; tariffs were increased to account for inflation and the concessionaire was expected to move more boldly to rationalized staff than the projections has assumed. Moreover, federal law apparently did not allow 'negative concessions'; the government was also facing criticism from the opposition party that it was giving away state property

as well (Robelo, 1999b). In the case of the Flumitrens concession, the government got round the problem by specifying that the concession fees paid by the Metro concessionaire would be used to subsidize the Flumitrens concession.

The state government commissioned two major studies each for the Metro and Flumitrens to help with the design of the concession and the bidding process (see Robelo, 1999a for details). Table 1 summarizes the main features of the Rio de Janeiro urban rail concession contracts. The Metro concession attracted a large number of bidders, with sizeable number of foreign bidders participating. The prequalification and bidding processes were handled in a transparent manner by a special commission of the Rio de Janeiro stock exchange. The winning bid was submitted by a consortium led by an Argentine company and a local investment bank, with the bid about ten times the minimum price set in the bidding documents.

In the case of Flumitrens, the prequalification process attracted only one consortium. The state, suspecting a cartel, delayed the bidding and revised the documents to make the concession more attractive and to provide time for other bidders to enter (Robelo, 1999b). The Metro operator was also prevented from bidding in the Flumitrens concession. Five bids were received with the winning bid submitted by a Spanish-Brazilian consortium at six times the minimum price set. The concessionaire however was required to make out-of-pocket payment equivalent to the minimum price and the materials in the inventory. The rest of the payment would be in terms of rehabilitating the train fleet and civil works to be completed, through discounted loans made available by the state. The concessionaire would benefit if it is able to deliver the specified outputs at less than the cost quoted.

Table 1 Rio de Janeiro Metropolitan Region Urban Rail Concessions

	Metro Concession (1997)	Flumitrens Concession (1998)
Package size	41 km right-of-way extension.	200 km right-of-way extension
Term	20 years, renewable once for 20 more years.	25 years, renewable once for 25 more years.
Ownership of equipment and tracks	Rio de Janeiro state government	As for the Metro.
Service quality specifications	Based on performance targets for frequency, reliability, safety, and comfort established in the concession contract.	As for the Metro.
Payments by the government	None.	None. But proceeds of the Metro concession fee will be made available to the concessionaire for investments.
Award criterion	Net present value of best offer above the minimum price (US\$25 million) plus materials in stock (US\$3.56 million).	Net present value of best offer above the minimum price (US\$28 million) plus materials in stock (US\$8.25 million), plus the discount on capital made available by the state, plus the cost of optional investments assumed by the bidder.
Tariff renegotiation conditions	The flat tariff for a one-way trip was set by the state in the bidding documents and can be updated only for inflation, according to a formula. For expansion and new investments under the present contract, the concession must submit a plan for approval by the state government.	As for the Metro. The concessionaire will be allowed to increase the tariff by 50 percent if it installs air conditioning in the trains.
Performance assurance	Concession contract monitoring by the Public Services Regulatory Agency of Rio de Janeiro State.	As for the Metro.
Network planning	The state will establish the conditions for operation of new lines.	As for the Metro.
Access to facilities		The concessionaire of the freight railway system has access to Flumitrens lines and pays a track access fee.

Source: Robelo (1999b), with minor modifications.

4. Sale of state-owned operators through share issue privatization

Share issue privatization (SIP) is a method of privatization in which some or all of a government's stake in a state owned enterprise (SOE) is sold to investors through a public share offering. Jones et. al. (1999) analyze a large sample of 630 SIPs from 59 countries over the period 1977 to 1997 - the large sample indicating that this was indeed a commonly used method of privatization in many sectors. However, when Singapore's Mass Rapid Transit operator (SMRT) went public in July 2000, it was the world's first urban rail operator to do so. This was followed a few months later (in October) by Hong Kong's MTR Corporation's SIP (Ho, 2001a), and these two cases have remained the only instances of urban rail SIP since.

In SIP, the government has to make three sets of interrelated decisions: how to transfer control, how to price the offer and how to allocate shares (Megginson and Netter, 2001). The control transfer decision includes how large a fraction of the company's share to issue in initial versus subsequent offers, as well as whether there would be any post-privatization restrictions on corporate control. The most common technique used is government retention of a 'golden share' which gives it power to veto certain actions, such as foreign takeovers. The pricing decision requires the government to decide whether the offer price should be set by tender, a book-building exercise, or at a fixed price. If the latter, the amount of underpricing, and whether the price should be set immediately prior to the offer or many weeks in advance must be decided. The share allocation decision requires the government to choose whether to favor one group of potential investors (such as individual or domestic investors or SOE employees over

another (for example foreign and institutional investors). The decisions in these areas that were taken for the Hong Kong and Singapore rail transit SIPs are reviewed here.

Hong Kong

Hong Kong has one of the highest population densities in the world with a population of 7 million living in a mountainous land area of 1099 square km, where only 17% of the land is built-up. More than 2.2 million passengers travel daily over the Mass Transit Railway (MTR) network which is a network of six lines totaling 88 km and 50 stations. The basic network of Hong Kong's MTR, comprising three lines, was designed in the early 1970s. The government established the Mass Transit Railway Corporation (MTRC) in 1975 as a statutory corporation wholly owned by the Hong Kong government and gave it full responsibility for financing, constructing and operating the subway system. The MTRC did not receive any government subsidies except in the form of land grants as it was not required to buy land in the open market (Tiry, 2003). The first lines began operations in 1979. The system was expanded during the 1990s when a new airport was built 30 km west on Lantau Island.

To remain financially viable, the MTRC adopted an aggressive business strategy involving pursuit of substantial income from real estate constructed over its stations. These projects were undertaken either by the MTRC itself or in joint ventures with other developers. The opening of MTR subway lines since 1979 has therefore been accompanied by numerous real estate projects promoted by the MTRC. These real estate projects both financed construction of transit infrastructure and also attracted more users to the nearby facilities and services. Ho (2001a) described the MTRC's property

development unit as the 'jewel in the MTRC's crown'. Tiry (2003) views the Hong Kong experience as showing that 'cities can redeveloped and renewed through mass transit if the transit system is given supports, such as combined functions, denser use at interconnecting nodes, intermodality, and appealing open spaces.'

In 1999, when the government decided to privatize the MTRC, the state owned enterprise recorded HK\$2.1 billion in profits for the year and was considered one of the world's most successful metro. The decision was to privatize the MTRC on an as-is basis (Ho, 2001a), with the setting up a limited company known as Mass Transit Railway Corporation Limited (MTRCL). All the assets (including tracks, tunnels, stations and properties) and liabilities of MTRC were vested in MTRCL following approval by legislators in February 2000 of the Hong Kong Mass Transit Railway Bill, which was passed by an easy majority of 34 votes to 22.

Under the plan, the government would enter into an Operating Agreement with the MTRCL that would specify detailed terms of franchise, including performance monitoring and fare setting mechanisms. The term of the exclusive franchise was for an initial term of 50 years. The government intended to remain the majority shareholder, and would sell off less than 50 percent of the MTRCL and retain the majority shares over the next 20 years. The offering in October 2000 was for 1 billion shares (200 million retail investors and 800 million institutional investors) or 20% of the issued share capital of the MTRCL. The offer price per share had been set at the top end of an HK\$8 to HK\$9.38 price range, with retail investors in Hong Kong enjoying a 5.25% discount at HK\$8.88.⁷ Eligible retail investors could get loyalty bonus shares of one for every 20

⁷ HK\$1 is approximately US\$0.129 (August 29, 2005 rate).

shares purchased in the offer and held continuously for one year, and one for every 15 shares purchased held continuously for 2 years (Ho, 2001a).

Over subscription of more than 20 times by retail investors and 15.25 times by institutional investors caused the government to change the ratio of retail to institutional allocation from 2:8 to 6:4 as one of the objectives of the exercise was to encourage participation by retail investors in Hong Kong. Sixty percent of the shares available were eventually allocated to the approximately 618,000 applicants received in the Hong Kong public offer. On 5 October 2000, MTRC shares soared to a high of HK\$13, closing at HK\$13.65 on 29 December 2000 (Ho, 2001b). Through the sale of 20% of the company, the government managed to raise more than HK\$10 billion while retaining majority control of MTRCL.

Singapore

Singapore is a densely populated high income city state with 4.2 million people and a land area of only 697 square kilometers. The idea to build a rail transit system, eventually called the MRT, was first discussed in the early 1970s. While the government wanted Singapore to have a healthy and vibrant public transport system, it did not wish public transport to be a continual drain on government funds. After ten years of studies and still faced with conflicting advice, the government finally made the decision to build a 67 km MRT system in 1982. It was felt that the MRT system would improve competitiveness in attracting the kind of higher value added investments desired by Singapore, especially in the financial and business sector (Phang, 2003).

Other than Cost Benefit Analysis, the financial viability of the proposed rail system was the other key element of the MRT studies. The government insisted that the revenue generated from MRT fares had to cover operating and maintenance costs, including the replacement of operating assets like rolling stock. Consistent with this philosophy, the government funded the construction cost of the long-term MRT infrastructure – tunnels, viaducts and stations. The government also funded the first set of operating assets, including trains and signalling systems, which would be expected to wear out and require replacement after about 30 years of operation. Commuter fares were set to cover the day-to-day operating cost of the MRT and, under the License and Operating Agreement (LOA), the operator was required to make annual deposits to an Assets Replacement Reserve that would accumulate funds to replace the original equipment with a second set in due course (Phang, 2003).

By 1983, the Mass Rapid Transit Corporation (MRTC) was established as a statutory board and construction began in October 1983. Part of the system began operations in November 1987 and the full first-stage project, comprising 42 stations and a route length of 67 kilometers, was completed in July 1990. In 1987, MRTC leased the running of the rail system to a new company, the Singapore MRT Limited, which is commercially run, although wholly government-owned. Temasek Holdings Private Limited, a government holding company, held all but one share of the SMRT. The MRTC and subsequently from 1995, the Land Transport Authority (LTA) held a single Special Share which provided it with veto rights to fundamental issues.

The conditions of the first 10-year lease stated that SMRT must pay an annual rental for the lease of the train fleet and upon expiration of the lease term may be required

to purchase the rolling stock at its book value. As a pioneer company, SMRT enjoyed tax exempt status. The SMRT had also to set aside funds for the replacement or overhaul of major capital assets required to operate the MRT system. Fares were set to cover operating costs (including provisions for rolling stock replacement) but not the capital costs of the infrastructure. In 1999, the year before it was listed on Singapore's stock exchange, SMRT reported an annual ridership of 346 million passengers, turnover of S\$353 million and a profit before tax of S\$121 million.⁸

Prior to the SIP of SMRT, the government had in a 1996 White Paper, changed its financing policy in favour of rail transit as follows: 'The Government to continue funding infrastructure and the first set of operating assets, and commuters to continue paying fares which cover operating costs including depreciation. However, the second set of operating assets will be financed by fare revenue covering only the historical cost of the first set of operating assets, while Government co-finances the balance.' This change paved the way for Cabinet approval of rail transit proposals that have almost doubled the size of the rail system in the past decade (Phang, 2003).

With the push toward more rail lines, the government decided on a multi-modal duopoly model for the public transport industry. The concession for the new Northeast Line was awarded to the largest bus operator Singapore Bus Services (now SBS Transit) in 1999. The SMRT's 10-year licence and operating contract with the LTA to operate the MRT system expired on 26 August 1997 and was extended by the LTA to 31 March 1998. LTA signed a new 30-year licence and operating agreement with SMRT which commenced on 1 April 1998. Under the new LOA, which would be reviewed as and when necessary, SMRT bought over all operating assets (including rolling stock) from

⁸ S\$1 is approximately US\$0.595 (August 29, 2005 rate).

the LTA at net book value of \$1.2 billion, payable in five equal instalments from 1998 to 2002. It leases the tracks and stations from the LTA for a nominal fee and pays the LTA a licence fee for the right to run the train services. At the same time, the LTA provided the SMRT with a grant amounting to \$480 million to help SMRT purchase the assets (1999 Annual Reports of LTA and SMRT). This second LOA transformed SMRT's financial structure with the objective of paving the way for its eventual listing on the stock exchange (Phang and Walder, 2000).

When the SMRT was listed on the Singapore Exchange on 26 July, 2000, it was the world's first urban rail transit operator to go public. The government investment holding company, Temasek Holdings, sold 33 percent of SMRT Corporation or 492 million shares for S\$300 million (S\$0.61 per share), thus retaining majority ownership and control. The Share Issue Privatization attracted international attention as the SMRT had shown steady growth in passenger volume, and had a steady and above-par dividend policy promised by the management. The government grant had also effectively padded the SMRT's bottom-line, and had enabled the company to derive strong recurrent income in the future (Ho, 2001). On 11 December 2001, SMRT became a multi-modal transport operator through its acquisition of TIBS, Singapore's second licensed public bus operator, thus completing the public transport industry restructuring process initiated by the government in 1998. In August 2005, Temasek Holdings announced a reduction of its stake in SMRT Corp to 55 percent through a further placement of 110 million shares at S\$1.11 per share.

5. PPP for infrastructure maintenance and upgrading

London

The London Underground dates back to the late nineteenth century when two technological breakthroughs – electrification and advent of underground tube railways – changed the face of London’s transport system. The system was built by privately owned companies which had obtained charters from Parliament to build seven electric tube underground lines. Much of the funding for constructing the London tubes came from Americans who had electrified urban transit earlier than the British and had made great profits (Armstrong and Gourvish, 2000). By the early twentieth century, the lines faced competition from two sources – buses and electric trams, neither of which had been anticipated in business forecasts. The underground rail companies were effectively nationalized, with compensation, in July 1933. Today the extensive system is a major business, with 408 km metro network, over 3 million passenger journeys a day, some 500 peak trains, 275 stations, over 12,000 staff and vast engineering assets (<http://tube.tfl.gov.uk>, accessed in August 2005).

Public provision and financing was dominant for most of the twentieth century, however, in the last two decades, private financing has returned to the top of the agenda (Grimsey and Lewis, 2004). The UK government cited the Underground’s inability to cover operation and maintenance costs as the reason for an investment backlog of £1.2 billion. This substantial backlog provided justification for its decision in 1998 to embark on a ‘radical change to secure long term sustained funding, through Public Private Partnership (PPP).’ Under the PPP scheme, the core of the Underground - the track, signaling, bridges, tunnels, lifts, escalators, stations and trains would be transferred in

three parts to private infrastructure companies (Infracos). The contracts would last 30 years, but with prices agreed for only the first 7½ years, and enable £8 billion to be invested in the Underground's infrastructure over 15 years. The train services continue to be run by London Underground Limited. The preferred bidders for the publicly run and privately built investment program for the Tube were announced in 2001 (National Audit Office, 2004).

These PPP contracts with the Tube Lines (Infraco JNP) and Metronet consortia (Infraco BCV and Infraco SSL) to modernize the London Underground, signed in 2002 and 2003, represent the largest Private Finance Initiative contracts by capital value (Grimsey and Lewis, 2004). The net present value of the scheme was estimated to be about £16 billion and the cost of setting it up £455 million. Given the scale and change provisions in the PPP contracts, a Greater London Authority Act 1999 provided for the appointment of a PPP Arbiter who can be asked to determine the key financial terms periodically, and to give guidance on any aspect of the agreements at any time (<http://www.ppparbiter.org.uk> accessed in August 2005).

Administratively, the appointment of the Infracos was followed by the transfer of control of the London Underground Ltd from the control of the Government and Secretary of State for Transport to the Mayor of London and Transport for London (TfL) on July 15, 2003. The PPP scheme has attracted a great deal of controversy⁹ and was imposed on TfL against its will by the government when control was transferred to the Mayor of London. TfL in fact opposed the PPPs and made a number of interventions,

⁹ "TSSA cross examines Derek Smith's 10 Tube PPP myths" provides an overview of the areas of disagreements (<http://www.tssa.org.uk> accessed in August 2005).

including two applications for judicial review, in its efforts to change the deals (National Audit Office, 2004).

Other areas where the private sector is involved in financing the development of the London Underground include rolling stock leasing as well as renewal of power supplies and communication systems. These Private Finance Initiatives (PFI) typically involves the private sector making specified investments to avoid a large hump in LUL's investment program (or debt) and then leasing the rolling stock or facilities to the LUL. For example, half a billion pound's worth of new cars required for the Northern Line was procured from GEC Alsthom through a 20 year PFI concession. CEC Alsthom took over two depots, funding constructing, commissioning and maintaining the new trains and providing these for LUL to operate (Halcrow, 2004).

The efforts that have been taken by London Underground to involve the private sector in financing its investment backlog involve complex institutional arrangements and sophisticated financial institutions, leading Halcrow (2004) to warn that care must be taken when attempting to apply London's experience to other cities.

6. Risk assessment of alternative PPP rail transit strategies

The above review of recent international experience with involving the private sector in the delivery of urban rail transit infrastructure and services has been encouraging, despite ongoing controversy on the merits of PPPs (Glaister et.al., 1999; Redlin, 2003; Bettignies and Ross, 2004). While significant political and popular opposition to outright privatization remain, governments worldwide have found public private partnerships to be viable solutions in the infrastructure sector, with the urban rail

sector no longer the exception in recent years. The often cited challenges inherent in urban rail privatization (high costs, long payback period, and complex partnerships) have been overcome in many instances through innovative strategies. There is no simple paradigm and choice of solution appropriate for local requirements requires great care. Halcrow (2004) does warn that the consequences of the wrong choice can be costly and long lasting.

Given that the debates on the issue are more often driven by ideology, how are governments to assess if a particular PPP approach can be an efficient mechanism for the provision of urban rail transit services? In this section, we review the recent academic literature and provide a careful analysis of the issues involved to help shed light on the issue.

Hart (2003) and Bettignies and Ross (2004) provide a general framework for thinking about the economics of public-private partnerships while discussion for PPPs in infrastructure is found in Gomez-Ibanez and Meyer (1993), Daniels and Trebilcock (1996), Perrot and Chatelus (2000), Gomez-Ibanez (2003) and Hammami et.al. (2006). Irwin et.al. (1997) contains a collection of World Bank papers on dealing with public risk in private infrastructure. Here we provide a framework for analyzing PPPs in the urban rail transit sector.

Similar to other PPP projects (Bettignies and Ross, 2004), an urban rail transit project may be roughly broken down into four principle 'tasks': (i) defining and designing the project, (ii) financing the capital costs of the project, (iii) building or procuring the physical assets, and (iv) operating and maintaining the assets in order to deliver the product and service.

The following sequential questions arise with regard to the PPP decision which we will examine here:

- (1) Should the system be provided by the public sector or through a PPP?
- (2) If the decision is for PPP, what are the considerations in choice of PPP strategy?

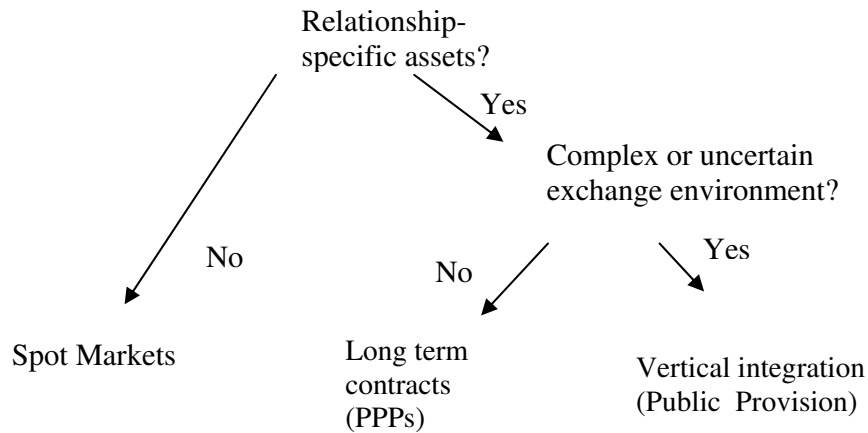
The answers to the above depend in the final analysis on a detailed understanding of the numerous risks involved in these complex projects, an objective assessment of whether the private or public sector is better able to manage the risks (which differs according to local circumstances), and finally a policy decision as to how the tasks and risks should be allocated.

6.1 Public provision or PPP?

Gomez-Ibanez and Meyer (1993) suggest five conditions favorable to successful privatization: effective competition, large efficiency gains, few transfers, limited environmental problems or other externalities, and reasonable but not excessive profitability. As urban rail transit in its entirety possibly meet only one of the above conditions (large efficiency gains), this accounts for its slow progress in privatization relative to other infrastructure sector as well as the need for innovative and complex PPP arrangements as opposed to outright privatization.

In deciding which tasks or combination of tasks to allocate to the private sector via a long term contract, Bettignies and Ross (2004) have adapted Crocker and Masten (1996)'s the firm's choice between long term contracts versus vertical integration diagram to fit the PPP versus public provision context (see Figure 1).

Figure 1 Public provision or PPP decision



Source: Bettignies and Ross (2004)

Outsourcing of relationship specific assets in a complex and uncertain environment gives rise to the risk of incomplete contracts and its associated problems. Gomez-Ibanez (2003, chapter 5) contains a review of the literature on incomplete contracts and a useful analysis of the dilemmas created by incompleteness in the context of Argentina's railroads. Designing complete long term PPP contracts for urban rail transit systems in an uncertain macro environment is clearly a daunting task for both the public and private sector partners.

Public sector specific risks. Entering into a partnership with a private monopoly to provide services perceived to be responsibility of government requires the public sector to bear a diverse set of risks including:¹⁰

- risks of interruption to works program and service interruptions;
- risks of cost overruns;

¹⁰ Aoust et.al. (2000, p.59).

- political risks with respect to residents and users;
- risks of project buyout;
- risks of nonperformance;
- risks of absence of potential concessionaire replacement;
- risks of relinquishing future site planning and development options.

While policy makers and the private concessionaire may try to anticipate every risk and ensure that each risk is properly allocated or shared in the partnership, there are limitations to foresight and it is impossible to plan for every potential contingency. There is therefore a need to establish a regulatory framework or to build flexibility into such contracts to allow for renegotiations and contract extensions.

Renegotiation and bargaining outcomes however become dependent on *ex post* bargaining power, which itself is dependent on the alternatives in the event of negotiation breakdown. These uncertain 'payoffs' in term are affected by the nature of pre-contractual power relations, relative commercial resources, relative 'politicization' of decision making within the two parties to the transaction, relative salience of the transaction to the two parties, and the relative switching costs faced by the two parties (Lonsdale, 2005).

Lonsdale (2005) warns of post-contractual lock-in in the context of the UK, where the public body becomes asymmetrically locked-in to the private sector provider. Risk that is transferred to the private sector under the PPP contract and specified in the original agreement is transferred back to the public sector by opportunistic self-interested suppliers. While opportunistic behavior may be tempered by the desire to obtain future business, this is dependent on the probability of significant future business within a

reasonable time period. Moreover, it cannot be assumed that mobile managers will act rationally in the long term interests of the firm.

Private sector specific risks. For the private sector, Wells and Gleason (1995) and Irwin et.al. (1997) warn of the continuing relevance of Vernon's perils of the obsolescing bargain for foreign investors venturing into infrastructure in developing countries. Infrastructure investments, once made, are not portable and run the risks of expropriation at the worst, or the gradual erosion of investors' rights and privileges. The private partner in a PPP bears 'political risks' which include expropriation risks (nationalization, confiscation, embargo); and appropriation risks. Appropriation of the investor's profits without causing it to leave can arise from changes in government priorities or policies, inability to transfer or convert project-generated revenues, as well as public sector partner's failure to comply with specific commitments made under the PPP. Wells and Gleason (1995) suggest that paradoxically, while high risk for private investors may justify high returns, for infrastructure projects, high returns may result in higher risk of expropriation or appropriation.

Given the relationship-specific investments required and the highly complex and uncertain environments for urban rail transit, it is not surprising that governments that do not wish to risk loss of control through having to negotiate with potentially opportunistic private sector partners decide on public sector provision as the preferred alternative.

In order to better understand the recent wave of PPP contracts in the sector, we extend Figure 1 to incorporate Hart's relative incompleteness argument as well as the possibility of lower private sector financing cost (see Figure 2). It has been the norm for large scale public sector construction in most market economies to be contracted out

through competitive tendering to the private sector. It is common for public urban rail transit systems to adhere to this model while financing and subsequently operating and maintaining the system within the public sector. Bettignies and Ross (2004) attribute this to the bidding process common for construction contracts which allows competition for the market, optimal allocation of risks as well as scale and/or learning economies of the construction process.

Hart (2003) makes a further distinction between incomplete contracts in building and operations and argues that the choice between PPPs (build and operate) and conventional provision (private sector builds only) turns on relative contracting costs. Here, the builder can make two types of unseen investments which affect operation costs: investment in building quality which is productive and investment in 'corner cutting' which is negative. Conventional procurement is preferred if the quality of construction can be well specified and corner cutting investments are relatively easy to monitor, whereas the quality of service cannot be (e.g prisons and schools). PPP is good if the quality of the service can be well specified in the initial contract (there are good performance measures which can be used to reward or penalize the service provider) whereas the quality of building cannot be (e.g. hospitals). How easy is it to specify the quality of mass transit system requirements relative to quality of service? The answer could well depend on the capabilities and capacities of the public sector to undertake the tasks. Transit authorities in developed countries may have substantial capabilities and capacities or be able to tap on the necessary expertise in specifying the quality of construction desired. This would cause them to lean toward public provision. In developing country cities, the government that does not have the expertise may be better

off relying on private consortiums that have worked on similar projects in other cities thus tapping on their economies of scale.

Related to Hart's relative contracting costs is the often-cited benefit of BOTs that arises from the complementarities or economies of scope between design, building and operations. These are particularly relevant for urban mass transit systems which are relatively complex infrastructure projects. The consortium that has to build the project has strong incentives to ensure that it is well designed. If it has to operate and maintain the system, it has strong incentives to ensure that it is designed and built such that operation and maintenance costs are minimize over the length of the contract.

The recent wave of PPP arrangements differ from conventional procurement or DB contracts in the involvement of private finance, and its *combination* with construction and/or operation/maintenance tasks. Hart (2003) suggests that it is 'strange' for policy makers to frequently argue that PPPs are good because the private sector is a cheaper source of financing or insurance than the public sector, as 'it is hard to imagine an agent that is more able to borrow or to provide insurance than the government (with its enormous powers of taxation).'

Bettignies and Ross (2004) however argue that it is not at all clear that the government (especially subnational ones) will be able to borrow at a lower cost than the private sector. One of the most frequent reasons governments employ PPP is that they are cash-strapped and too debt-laden already; it is not surprising that Hammami et.al. (2006) find that PPPs tend to be more common in countries where governments suffer from heavy debt burdens. While that is true for many underdeveloped and developing economies, the argument is increasingly made by developed country governments as

well. Factors to consider in the evaluation of relative costs of financing would include (i) the credit-worthiness of the private borrower and the protections offered in its contract with the public sector partner; (ii) the extent to which tax savings or subsidies may come from other levels of government if privately financed; and (iii) the marginal versus average cost of borrowing for governments.

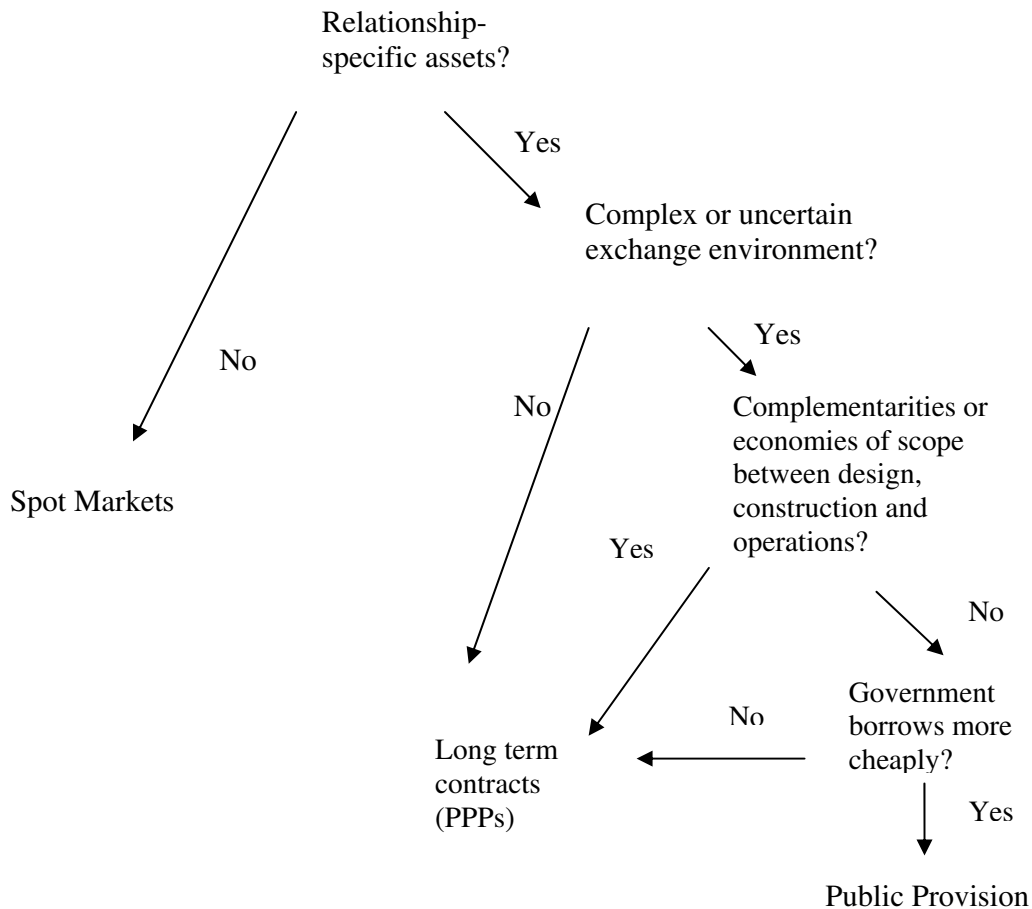
Packaging the financing function with other tasks also recognizes the complementarities that can exist between private financing and building, in particular that of reducing the risks of construction delays and project costs overruns (Bittignies and Ross, 2004). Under public procurement, public sector managers are so far removed from their principals (taxpayers) that project costs overruns may be more likely. Moreover, if delays are caused by the government (design changes, environment and zoning issues), under a PPP, the private partner may recover damages thus reducing the risks of such delays. The existence of complementarities between financing and infrastructure maintenance has been a source of controversy for the London Underground infracos, given the high transaction costs involved.¹¹ Glaister et.al. (1999) suggest that the New York City Metropolitan Transit Authority's strategy of privatizing finance through bond securitization while retaining public control of the transit system would have been a superior alternative.

The benefits of a PPP (that include lower costs of financing, private sector expertise, efficiencies and complementarities across tasks) will thus need to be weighed against the risks of loss of government control to a private monopoly, the need to

¹¹ See for example 'The Way Out' Glaister, Scanlon and Travers (1999), 'Our very own Enron' (Monbiot, 2002), 'Very British corruption' (Monbiot, 2005) and 'Comparing cost' (Maltby, 2003).

renegotiate incomplete contracts and dealing with potentially opportunistic private sector partners.

Figure 2 Public provision or PPP decision for urban rail transit



6.2 Considerations for choice of PPP strategy

Having considered the benefits and costs of entering into a PPP, the government that decides in favor of a PPP will next have to consider the appropriate strategy to adopt. The matrix in Table 2 shows the combination of tasks allocated to the private sector through the various urban rail transit PPP strategies reviewed earlier.

Table 2 Tasks allocated to private sector under different strategies

	Task 1 Define & Design	Task 2 Finance	Task 3 Construct & Procure	Task 4a Operate	Task 4b Maintain
Public Provision			X		
DB	X		X		
DBFO	X	X	X	X	X
Operating concessions (for existing systems)		X		X	X
Hong Kong Share Issue	X	X	X	X	X
Singapore Share Issue		X		X	X
London Infracos (for existing systems)		X			X

As compared to DBFOs, operating concession contracts are less complex and hence less risky for both partners. The Hong Kong SIP strategy can be seen to be a variant of the DBFO strategy in the similarity of the tasks undertaken by the private sector. Similarly the Singapore SIP strategy is a variant of the operating concessions strategy as only operations is privatized. The key difference is the absence of pro-efficiency competitive tendering for the award of operations contracts in Hong Kong and Singapore. Here, the benefits from open competitive tendering have been weighed and found to be not worth the costs of loss of domestic control in the context of small

economies where the government desires operations to remain with domestic domiciled firms. This would reduce the risk of having to enter into partnership with a potentially opportunistic private partner. Singapore and Hong Kong therefore chose the share issue privatization model, under which capital market discipline is introduced with government control, with the Singapore concession strategy representing a more risk adverse approach. The public share offerings in Singapore and Hong Kong however demonstrate that profitability of the firm remains the prerequisite for successful privatization via share offering.

The potential to transfer risk to the private sector is often cited as one of the main reasons why PPPs are an effective procurement mechanism. The crux of PPP contract design and the eventual success of the partnership lie in a careful analysis of the inherent risks involved in each of the project tasks and how best to manage them. Risk management involves four successive stages:

- risk identification;
- quantitative and qualitative evaluation of potential project impacts due to risk occurrence;
- risk mitigation;
- allocation of each residual risk to the most relevant partner.¹²

Risk identification involves distinguishing risks intrinsic to the project from exogenous project environmental risk. The latter category of risk does not pertain to either of the two parties, yet may have serious repercussions on various aspects of the project. They include risks of force majeure (acts of God), macroeconomic risks as well as risks of changes to the legal environment that are not specific to the sector. In general,

¹² Aoust, Bennett and Fiszelson (2000), p.59.

it is impossible for any one party to bear the entire risk and the contract will need to be sufficiently flexible to allow for renegotiation and compensation.

Table 3 contains a typology of the main risks relevant to urban rail transit PPPs (in addition to the public and private sector specific risks discussed in the previous section), an assessment of whether the individual risk should be allocated to the private sector (based on existing literature¹³), and whether the risks is allocated to the private sector under a particular PPP strategy.

We have categorized the risks intrinsic to the project under the four main project tasks 1) design 2) finance 3) construction and 4) operations. Two critical factors determine whether a particular risk should be shifted to the private sector: the degree to which it is able to influence or control the outcome that is risky, and its ability to bear the risk (Irwin et.al, 1997, p.8). The government should transfer a particular task or risk to the private sector if such a transfer of responsibility or property rights lead to a net efficiency improvement.

Design. Risks arising during the design stage include change order risks, as well as environment and zoning permit risks. These should be borne by the public sector partner. Untested technological innovation with their potential positive externalities should be treated as a joint venture R&D effort with the risk shared between the public sector authority and private consortium.

Finance. Financial risks are parameters inherent in the project's financial set-up and include interest rate risk and exchange rate risk. Increases in interest rates and depreciation of the local currency inflate project costs and reduce profits. It also includes the risks of contractual parties in the partnership consortium not upholding their financial

¹³ Irwin et.al. (1997), Aoust et.al. (2000) and Gray and Irwin (2003).

commitments. Many developing country infrastructure contracts have been structured so that taxpayers or customers bear the interest and exchange rate risks resulting either in governments breaching contracts or customers bearing large price hikes. Gray and Irwin (2003) argue that the benefits of allocating exchange rate risk to a government are often illusory and that project investors are better placed to mitigate project finance risks through hedging and diversification in equity markets, although this may mean higher fares or expected rates of returns as premium for bearing this risk.

Construction. The risks at the construction state include property acquisition and right of way delays risk, health and safety risks, counterparty risks, construction delays risk, and unforeseen construction cost overruns risk arising from uncertain tunneling and geological conditions. Construction is most often delegated to the private sector even with public sector procurement as it has long been recognized that the private sector has greater incentives to minimize construction delays and costs overruns. In the context of urban rail however, when assessment of geological risks is overly uncertain, it is appropriate for the public sector to bear part of the risks of delays and overruns.

Operations. The two main sources of risks at the operations stage are demand (ridership projection, revenue) risks and the risks of operating and maintenance costs overruns. Having the private partner bear ridership risk in a DBFO will reduce the risk of white elephants being built. However, demand forecast is not an exact science and in many PPPs, the risk is divided between the private and public sector. Various means of dividing this risk have been utilized such as a variable concession term that is dependent on demand, and least present value of revenues auctions (Engel et.al., 1997). Operating costs increases that can be ascribed to the private sector should be allocated to the private

sector while the private sector should be compensated for cost increases that result from changes to sector specific regulations (e.g. safety, quality of service).

Under the PPP contract the government will have to provide guarantees against risks that are not allocated to the private sector. Inappropriate allocation of risks and poorly designed guarantees can result in adverse selection and moral hazard problems that undermine the benefits of private sector involvement. Guarantees also impose hidden costs on the public sector, consumers or taxpayers some of which may not be immediately apparent at the early stages of the project. These costs, if not properly understood, will increase the risk of societal and political rejection of the PPP. The existence and/or development of public sector technical expertise and regulatory capacity are thus crucial for the success of PPPs.

7. Conclusion

The high costs inherent in developing new transit systems provided strong motivation in many developing countries for governments to seek private sector co-financing. While it is recognized that financial self-sufficiency is an important aid to privatization, and that very few metros can be self-financing, recent experience suggest that even in systems experiencing high deficits, DBFOs and concessions can be designed in such a way as to attract the private sector. In this paper we have provided a framework for assessing the risks associated with the various forms of urban rail transit PPPs and how these should and have been managed. The Hong Kong and Singapore share issue privatization approach can be seen as strategies to minimize the costs and risks of

negotiations with private sector partners. The above analysis also serves to explain why the Transport for London PPPs has been a highly controversial arrangement.

As pointed out by Grimsey and Lewis (2004), “PPPs are not, and probably never will be, the dominant method of infrastructure acquisition. They are too complex, and costly, for many small projects, and constitute ‘using a sledgehammer to crack a nut’. In some cases, they may be beyond the capacity of the public sector agency to implement and manage. For other projects the tight specification of the outputs required may be difficult to detail for an extended period.” Procurement and operation of most urban rail transit systems certainly does not fit the allegory of ‘cracking a nut’. The varied international experience of the past decade serves to demonstrate that the ‘sledgehammer’ of PPPs have become an important instrument in urban rail transit policy. The transaction costs however are high with long term success dependent on an array of factors. A comprehensive cost-benefit analysis, with risks management as a key aspect of the analysis, is a prerequisite to designing appropriate and stable PPP contracts.

Table 3 Risks and assessment of party more able to bear the risks

Nature of risks	Risks better allocated to private sector?	Risks allocated to private sector?		
		Design-Build	DBFO, Hong Kong SIP	Operating Concessions, Singapore SIP
General/project environment <ul style="list-style-type: none"> Force majeure risks Macroeconomic risks Legal risks 	No. Shared. No.	Shared through negotiation.	Shared through negotiation.	Shared through negotiation.
Task 1 Design <ul style="list-style-type: none"> Change orders risk Environment and zoning permits risk Untested technology risk 	No. No. Shared.	No. No. Contract specific.	No. No. Contract specific.	NOT RELEVANT.
Task 2 Finance <ul style="list-style-type: none"> Interest rate risk Exchange rate risk Intra consortium counterparty risk 	YES.	Contract specific. Yes.	Contract specific. Yes.	Contract specific. Yes.
Task 3 Construction and Procurement <ul style="list-style-type: none"> Property acquisition and right of way delays risk Construction delays risk not attributable to public sector Intra consortium counterparty risk Health and safety risks Unforeseen construction cost overruns risk (tunneling and geological) 	No. Yes. Yes. Shared. Shared.	No. Yes. Yes. Shared. Contract specific.	No. Yes. Yes. Shared. Contract specific.	NOT RELEVANT.
Task 4 Operate and Maintain <ul style="list-style-type: none"> Ridership projection risk Risk of operating and maintenance costs overruns not attributable to public sector 	Shared. Yes.	NOT RELEVANT.	Contract specific. Yes.	Contract specific. Yes.

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