

**The Implementation of Financing Strategies  
in Urban Rapid Transit Infrastructure:  
*How Could Chinese Cities Do Better?***

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by  
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# Acknowledgements

This thesis attempts study the stories of many Chinese mainland cities, which have been developing transit infrastructure at an incredible speed. Each city has its own history and blueprint. Hopefully, this thesis could portray the decision-making process of how the cities made their own adaptations in learning advanced experience, especially in the contract design and the role of government, and the implementation process.

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# Abstract

Urban rapid transit infrastructure have been expanding at an exploding speed in Mainland China. Government subsidy used to be the sole fiscal support to the transit development for a long time. Now the government is facing enormous burden to support the expansion on its own. The major problems are the shortage of construction and revenue-expenditure gap in funding. Therefore, the municipalities are seeking to introduce foreign financing strategies to the transit funding to build a a more profitable financing platform.

Hong Kong MTR has been a popular model among mainland cities for its “Rail + Property” model and efficient internal management. However, under current context, it is really difficult to completely copy the success of Hong Kong. Therefore, the implementation has shown several variations. Beijing Metro adds a parallel system to the existing one, which are under the operation of Public-Private Partnership with Hong Kong MTR Company. Wuhan, while paving the avenue for “Rail + Property”, employed Finance Lease to utilize the existing facilities to collect construction funding, which made time for property auction and development adjunct to and atop of the transit line.

In analyzing the implementation process of the two cases, the thesis found out the strategies of implementing financing strategies in Chinese mainland cities, and illustrated the context and the incentives for the variations. By reviewing the case of Wuhan and Beijing, the thesis analyzed how the two cities made localized adaptations, their contracts in the two implementations, and the key part that contributed to reaching the expected effects. In finding a working principal from these two cases, the thesis also analyzed the problems in implementation caused by the government role, the financing platform of metro company, and the mechanism of implementation.

Key Words: Financing strategies, Implementation, Adaptions, Public-Private Partnership, Finance Lease

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# 1. Introduction

In the urbanization process, traffic congestion and transportation pollution are among the major problems for Chinese cities. Urban rapid transit infrastructure has become an important solution to these problems for its capacity as mass transport, high speed, less energy cost, low pollution, and less occupation of land. Urban Rapid transit is a type of high-capacity public transport generally found in urban areas, which operates on an exclusive right-of-way, which often grade separated tunnels or on elevated railways. The rapid transit system discussed in this thesis includes underground and overground railway systems, tram services, express lines, airlines and so on.

At the same time, mega city clusters are emerging in China. As a convenient transport in urban and suburban areas, the demands on the scale and the coverage of the urban rapid transit have been larger than anytime before. In the recent years, the transit infrastructures are sprawling at a faster speed than ever. From 2008 to 2015, the overall length of the transit lines has increased from 780 km to 1700km. 37 cities are constructing new transit lines in 2015.

This requires not only the local authorities, but also governments in higher levels to build a system to support the long-term transit development. Urban rapid transit is under the direct management of municipal government and usually an essential part of provincial and national plan. The transit services has a low possibility to be privatized and marketized. The current rapid construction projects challenges both the funding and the management capability of the city.

There are two major fiscal problems for the transit infrastructure: the shortage of construction funding and the absence of a stable revenue stream to support the maintenance and operation of the system. For a long time, the transit infrastructure has been wholly relied on the government subsidy, which would add huge fiscal monetary pressure to the government under current development. To relieve this, the government has been trying to

introduce the foreign financing strategies and advanced experience to the cities.

This thesis focuses on the implementation of the financing strategies in China and the process of localized adaptations. Specifically, Hong Kong MTR “Rail + Property” has been a popular example among Chinese cities. However, copying the success from Hong Kong has some fundamental system problems. System-wide comprehensive planning is difficult to accomplish after systemwide restructure of state-owned enterprises, in which the transit companies were dissected into separate companies to shoulder specific responsibilities, such as construction, operation, and development investment. Another prerequisite of “Rail + Property” is the use and development rights of the land properties in the transit line areas. However, currently, the transit companies do not have this control. It takes time to acquire the land rights and prepare for land auction, listings and other development activities.

Seeing these constraints, it is important for the cities to coordinate their existing resources and locate the priority demand. This thesis analyzed two cases utilizing different strategies in adapting Hong Kong strategies. To improve the efficiency inside of the operation system, Beijing introduced Hong Kong MTR directly to the transit system through a Public-Private Partnership and adds a parallel operation system to the existing one. In order to support future implementation of “Rail + Property”, Wuhan introduced Finance Lease to adjust capital structure and make time for land development adjunct to the transit lines.

Both Beijing and Wuhan are developing the transit system at an astonishing speed. It is said Beijing took 50 years to reach the scale of transit coverage that took London 150 years. As shown in the pictures below, by the year of 2020, the government of Beijing is planning to build 981 km transit line, almost 4 times as the length in 2008. Even though holding the Olympic Games offered Beijing sufficient incentives and resources to develop at such an astonishing velocity, how to find a efficient financing platform to support future development is still one of biggest challenge for Beijing.



Pic 1 Transit Map 2008



Pic 2 Transit Map 2015



Pic 3 Transit Planning Map 2020

Wuhan, as the leading second-tier city in China, is also an example of exploding growth in transit. Different from Beijing, in Wuhan, Line 1 started to function at the year of 2004 and served the city as the only transit line for 8 years. After that Line 2 opened in 2012, Line 4 in 2013, and line 3 in 2015. 6 new lines and 4 extensions are planned to be built in the next 6 years. According to the released official plan of city government, over 14 transit projects are going to be constructed in 2016, for which the expenditure on construction is estimated at 126 billion Yuan. The transit line is expected to reach 400kms in 2021. By the year of 2049, Wuhan will have 32 metro lines, around 1200 kms in the city.



Pic 4 Transit Map 2012



Pic 5 Transit Map 2015



Pic 6 Transit Map 2020

The two cases shows two variations in implementing identical strategy. A public-private partnership is a contractual arrangement between a public agency (federal, state, or local) and a private entity. Through this contract, the public and private sectors build the agreement to share their skills and assets in delivering a service or facility for the use of the general public. This mechanism introduced the advanced experience from Hong Kong to lower the operation and maintenance cost of the transit lines.

Finance lease is a way of providing finance – effectively a leasing company (the lessor or owner) buys the asset for the user (usually called the hirer or lessee) and rents it to them for an agreed period. Wuhan utilizes this strategy to collect sufficient funding for upcoming construction project.

For the transit project of this scale, it is really difficult to define it as “success” or “failure”. However, the study will still illustrate the workable principal in the implementation and finds out the strategies of implementing financing strategies.

This thesis will utilize these two cities as case studies and thoroughly study the implementation process in these two cities. Through the comparison and review of previous experience, this thesis hopes to identify the role of government in implementing foreign financing strategies and provides suggestions on future directions.

First, the thesis will summarize the common financing patterns in Mainland China. This part also includes a briefly study of Hong Kong MTR, that provides ideas on the financing mechanism in general.

Second, the thesis will study the case in Beijing and Wuhan respectively. For Beijing case, an extensive review will be conducted on the Public-Private Partnership mechanism in Line 4 and the design of contract to coordinate both private interests and public benefits. In Wuhan case, the thesis will review the decision-making process of the financing process for construction funding, and the scalability across China.

Third, the thesis will identify the role of government on the basis of the comparison between two case studies. This part will also summarize the limitations of this study and come up with future directions for the development.



## 2. Literature Review

This part reviews literature that support the decision-making process for municipal government to identify their financing strategies in need and make coordinated adaptations to work under the city context. The theoretical studies on transportation mega-projects fall into three general categories: the theory of urban transportation investment, the financing strategies in transit infrastructure, and the theory of decision making in financing urban development.

### 2.1. Theory of Urban Transportation Investment

#### 2.1.1. Attributes of Urban Rapid Transit

##### *Natural Monopoly*

Natural Monopoly usually describes the industry that has high fixed costs and relatively low variable costs. Clarkson and Miller proved that from the perspective of economies of scale, natural monopoly could improve the efficiency of the resources. The natural monopoly of urban rapid transit comes from the effects of economies of scale and high technical requirement for the transit system.

##### *Quasi-public Goods*

According to Samuelson's definition, public goods have non-rivalry and non-excludability. The service transit systems provide fits public goods, but it also exists competition and excludability. The passengers have to afford the tickets to take the train, which falls into the characteristics of private goods. Therefore, rapid transit system are quasi-public goods.

##### *Positive Externality*

On the basis of Marshall's theory, Pigou defined negative externality and positive externality. Positive externality lies in the benefits that enjoyed by a third party that are not directly involved. Urban rapid transit systems shows the positive externality by public benefits, such as improving the quality of travel, relieving the congestions and pollution.

### *Regionality of Business*

Alonso introduced concentric land-use structure in urban model: Central Business District – High-density residential – Low-density residential. Rapid transit systems are limited in urban areas. Only dense population and economic development could dilute the huge construction and operation cost.

## 2.1.2. Theory Base for Urban Transportation Finance

### *Keynesian Investment Theory*

Keynesian investment theory shows that usually no strong automatic mechanism could produce economical output towards full employment. The primary access is to stabilize the economy is by efficient fiscal policies. Transit infrastructure investment has a negative marginal investment return ratio and lacks the incentive for private capital. Therefore, the fiscal policies are crucial to the supported the infrastructure projects.

### *Investment Theory in Public Goods*

Samuelson defined the “Free Rider” issues in public goods. Because of the non-excludability public goods, people tend to be a free rider. This leads to the low investment return ratio and lacks the impetus for private investment. Therefore, it is difficult to meet the Pareto Optimal Output in the society.

The common public payment methods include: 1) users pay; 2) everybody pays; 3) beneficiaries pay. Currently most of the transit systems are going on the users pay way, but the ticket revenue could not cover the actual expenditure of the transit system. Government will subsidize the discrepancy to compensate the transit companies for its loss.

### *Theory on Urban Transportation Modes*

Urban economics analyzes the transportation modes from government’s side. It is an ex ante cost and benefit analysis to maximize the social benefits. The demand and supply relationship shows that for urban dense cities, rapid transit system is the optimal transport. The government should maximize the social benefits and minimize the social cost for transit projects.

## 2.2 Financing Strategies in Transit infrastructure

Cai categorized the transit investment mode generally into three categories: 1). government fund; 2). project finance; 3). Marketization. Based on this, Zhu and Zhang detailed the finance sources under Chinese context into five categories: 1). government funding, under direct administration of government agencies; 2). government funding, under the administration of special state-owned enterprises; 3). government funding, under the administration of private companies through leasing or concession contract; 4). project financing, management and operation under government concession; 5. marketization, private companies under government concession.

Wang Y. and Wang J. studied the evolution and logistics in the development, and summarize the process by the level of marketization. In the monopoly of public sectors, through financing schemes and institutional reorganization, the government gradually open up the market to private sectors. The avenues to bringing up the level of marketization are the restructure of organization and business. The private capital are gradually introduced to the financing system via business restructure and de regulation. Together with institution restructure, a relatively complete market could be built. The chart is shown below.

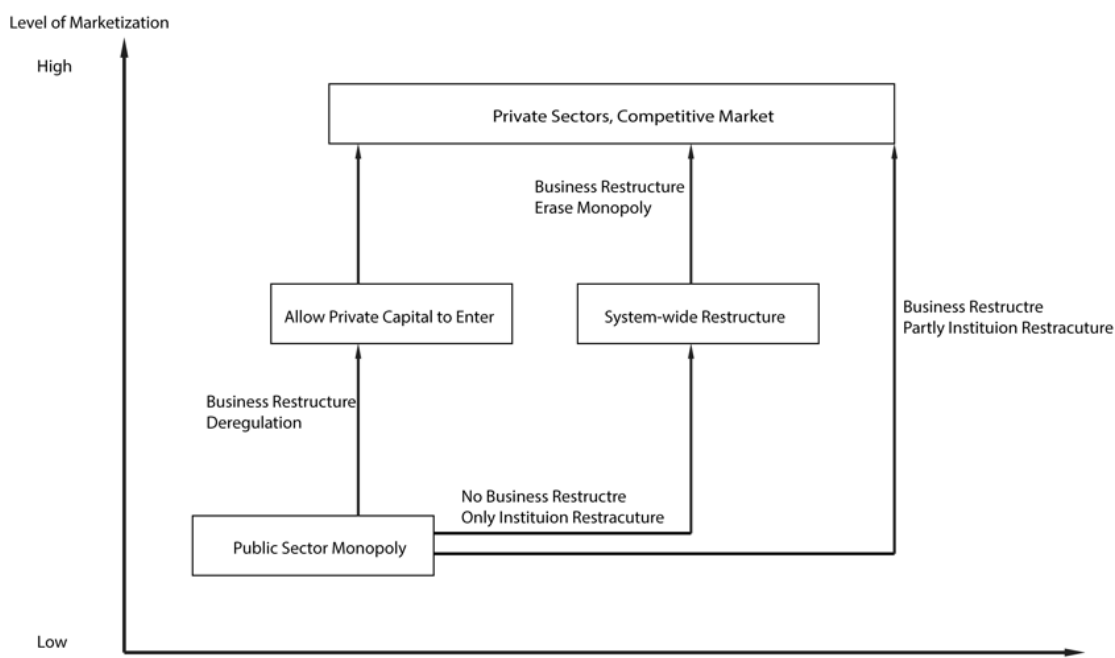


Chart 1 Evolution of Financing Strategies

## 2.3 Financing Strategy Decision Making

After studying the political and economic origins in the great transformation era, Polany argued that “free market” is a myth. The market has to be sustained as an entity under the context of the state and society. Though the study focused on the private goods, it is still reasonable to apply the theory to the quasi-public good, like transit system. To embrace the private and foreign capital into the transit system, the fiscal decision makers have to comprehensively consider the implementation environment and overarching goals of the financing and investment. Especially in China, the political and economic environment are both crucial to the participants in the financing and investment process.

Goulet theorizes about three rationalities governing planning and development decisions: political, technical, and ethical. Unitary rationality on the development plan could often lead to the failure. From the perspective of the government, the three rationalities do not work independently from each other. The inter-related relationship allows some degree of substitution. Therefore, the rationale for any implementation should be out of the comprehensive evaluation of the context and the development process. The transit system builds up a skeleton of the city development spatially and the enormous investment also calls for the coordinated fiscal policies. Apart from the fiscal problems, the development of transit system should actually benefit the planning process and generate public welfare.

Luo evaluated the environment for infrastructure financing and investment in China. Basically, the financing of transit system is to attract foreign and private capital into the infrastructure sectors. The successful application process are decided by three key factors: 1) a sustainable revenue stream; 2) no institutional barriers hinder the entrance of private sectors; 3) the capability to institutionally minimize the barriers caused by the economic and technical attributes of the transit system.

Diao analyzed the infrastructure investment experience from western countries and made suggestions to the Chinese cities. The development mode and the marketization largely depend on three indicators: 1) the efforts of the government; 2) the efficiency of the

involved private company; 3) the external environment, such as the development of domestic capital market. Based on Diao's studies, the evolution and development of the financing model hereinbefore could also be modified in various scenarios. This flexibility creates the opportunity for negotiation and the problems at the same time. Clarification of the responsibilities and revenues are very important in this process.

# 3. Research Methods

## 3.1 Case studies

This thesis aims at studying the various avenues for Chinese municipal governments to implement financing strategies. The case studies show how the municipal governments make their own variations in applying identical financing mechanism and how the implementation process goes on. Two mainland Chinese cities are selected as case studies. Both Beijing and Wuhan are trying to copy “Rail + Property”, Beijing built Public-Private Partnership with Hong Kong MTR and added P3’s operation system to the existing system, while Wuhan built finance lease contract to make time for implementing “Rail + Property” when current funding was not able to support the development.

1) Beijing – Beijing Infrastructure Investment Corporation, Beijing Capital Group, together with Hong Kong MTR Corporation founded the Public-Private Partnership Company -- Beijing MTR Corporation. It is the nationwide first implementation of Public-Private-Partnership in public transportation. Beijing MTR Corporation runs three transit lines in a parallel system with Beijing Metro Company.

2) Wuhan – The municipal government of Wuhan designed long-term development plan for “Rail + Property”. However, at that time, Wuhan was exhausting its credit in bank mortgage for transit funding, while the scale and location of existing transit network could not support “R+P” mode. Therefore, Wuhan Metro introduced Finance Lease. Wuhan Metro Company signed finance lease contract with Industrial and Commercial Bank of China Finance Lease Company for 2 billion. Wuhan is the first city to implement finance lease in the transit infrastructure. Yuan construction fund. The finance lease readjusted the capital structure has been widely used thereafter.

## 3.2 Transportation data and performance evaluation data

The thesis will go through the development of transit system in Beijing and Wuhan. The transportation data were acquired from online open data. These data help illustrate the scale of development and the fiscal burden of the two cities.

The analysis of two foreign financing strategies will be based on the evaluation data of their performance. The data were also from the online open data, released official report, and news articles. Through reviewing the materials, the thesis hopes to picture the whole process of the implementation, how the local government revised the implementation to coordinate with their actual demands, and the key issues contribute to the success of the implementation. Due to the limited access to the fiscal data, some data in the analysis part are based on the estimation from acquired data.

## 4. Financing Patterns in Hong Kong and Mainland China

This part reviews the financing mechanism in Hong Kong MTR and the common financing patterns for infrastructure in Mainland China.

### 4.1 Financing Pattern in Hong Kong

Hong Kong MTR Corporation, a listed company, runs the only profitable transit system in the world. The sustainable strategic planning, marketized management, comprehensive land development, and integrated policy system ensures the success of Hong Kong subway.

#### 4.1.1 “Rail + Property”

Hong Kong introduced the TOD (Transit-Oriented Development) at the early stage of development. Typically, Hong Kong MTR Company is famous for its “Rail + Property” mode. The commerce and land property development around transit stations are the most successful components of Hong Kong “Rail + Property”. The revenue mainly comes from three aspects:

1) *Commerce and property value capture*

The development of transit lines brings up the real estate price along the transit lines and attracts population to the new development district. The growing population then lifts the value of the real estate again. The cyclical increase leads the continuously increase of the commerce and property value.

2) *The commercial revenue inside of the transit station*

To fully utilize the space of transit platform and underground passages, based on the massive ridership, MTR sets up advertising columns, LED screen, and retail stores for advertising fees and shop rents.

3) *Value Capture atop the station*

Development atop the stations is the major revenue source for MTR “Rail + Property”.



Shopping plaza, office buildings, commercial centers and communities are the typical forms of the development. And the MTR make profits from rents and management fees.

#### 4.1.2 Other sources

The funding sources for Hong Kong lies in five fields.

##### 1) *Fiscal Subsidy*

Hong Kong opened its first transit line in 1979 and did not reach the balance of investment and expenditure until 1991. In the early stage of the development, government funding is the major source for the transit funding. In 1996, Hong Kong government took out regulation that the government will compensate for 15% of the discrepancy in the revenues for that year.

##### 2) *Ticket revenues*

One unique condition is that ticket revenue is the second largest financing resource for MTR. Hong Kong MTR has the autonomy over ticket price, and adjusts the price based on inflation rate annually. The annual ridership reached over 1.6 billion person time and the tickets covers 175% of the system operation costs in 2015.

##### 3) *Investment*

Because of the reputation for profitable mass transit, Hong Kong MTR has been investing in rapid transit and exporting their functioning mechanics. The Beijing cases studied hereinafter is an example of Hong Kong investment, which Hong Kong invested and shared the operation and management techniques with Beijing MTR Corporation.

##### 4) *Other Sources*

Telecommunication in transit station contributes increasingly to MTR's funding. And Hong Kong MTR has been selling their expert capacity and expertise in providing consulting services for other areas and countries, including planning, financing, marketization, profession training, and so on.

## 4.2 Financing Pattern in Mainland China

The financing pattern of rapid transit system could in Chinese mainland cities could be divided into four categories: 1) government funds and government operates; 2) the marketized operation under the government administration; 3) Project financing; 4) Listed financing platforms.

### 4.2.1 Government funds and operates

The government funds the projects mainly from two ways: direct investment and debt financing. Typically, direct investment and government operates could be seen in the earlier stage in Beijing and Tianjin transit systems. The development depends on the government subsidy to build new lines and operates the system. Government seldom provide development rights of land properties along the transit lines or policy supports. The sole funding source doesn't generate financing cost but causes the inefficiency in the system. The government could not afford the mega transit system and needs to come up with incentive mechanism to improve operation efficiency.

Debt financing and government operates is the pattern that the government pay part of the investment and provide guarantee for the bank loans and debt to collect the rest of funding. This method is widely used for the reason that it's easy to arrange by government credit and provide sufficient capital. At the same time, it brings huge debts and lows down the operation efficiency.

### 4.2.2 Private sector operates under government administration

The pattern "private operation under government administration" is that the government pays for the construction and attract the private sectors to the operation and management through leasing contracts and concession contracts. It introduced marketization impetus and improves the efficiency in the operation. However, due to the low revenues from the transit investment, the application usually goes with additional beneficiary policies to the private

sectors. For example, Shanghai Metro signed 10-year free contract with Shentong Metro on the operation of certain transit lines and facilities. Shentong Metro has to maintain the original ticket price for five years and adjust the price with the government after five years.

#### 4.2.3 Project financing

Project financing is a way that uses the anticipated benefits and duties in risk mitigation as guarantee, the project funding as collateral and actual revenues to pay back the loan. Public-Private Partnership discussed in this thesis is a typical example of project financing. The common project financing methods include BOT (Build-Operate-Transfer), BTO (Build-Transfer-Own), and so on. Both the government and private companies invested in the project, and the share of government investment is decided by the expected Investment-Return-Ratio from the private companies. The government reviews the performance of the project companies and offers incentive and concession procedures.

According to the quasi-public goods of urban rapid transit, urban rapid transit infrastructure lacks the ability to generate sufficient stable revenues. Governments subsidize the project and fill the funding gap by the co-founded company. Due to the differences in the capacities to shoulder the fiscal burden, the subsidies goes either "Subsidize in Building Operate and Transfer" or "Build Subsidize in Operation and Transfer".

This method distributes the risk and benefits to various participants. It creates the incentive mechanism for the government and pushes the private companies to lower their operation cost and uplift the management level. The Beijing case hereinafter is a typical example for this pattern.

#### 4.2.4 Financing platforms with diverse investment bodies

This usually could be seen through the restructure and reorganization of the existing state-owned enterprises. By increasing the share stock of the listed state-owned enterprises, to attract social capital to invest in the transit system. When introducing the market

competition to the company operation, it could reach the marketization under governmental regulation and control.

This mechanism introduces the diverse investment bodies and market competition to the financing system, reaching the marketization under the supervision of the government. However, the fundamental controversy here is the different ultimate goal between government and private sectors. Therefore the government has to set up certain restriction and incentive policy packages to ensure the success of the implementation.

Hong Kong has been the vanguard for this pattern. Hong Kong MTR Metro Corporation has been selling billions of equity to the public. And mainland Chinese cities have been applying this strategies in various transport elements since the 1990s.

# 5. Public-Private-Partnership in Beijing

## 5.1 Background

### 5.1.1. Development Timeline

At the year of 1953, the Chinese government issued the first official documentation on the development of transit system. The proposal of constructing a transit system in Beijing is to transport soldiers for the consideration of national defense. The utility of social benefits was not the deciding factor in the planning process.

Line 1 started transport services in 1969. Not until 1981 did the subway open to the public. Then within 12 years, the daily passenger flow reached 1million. Winning the bid of the Olympics Games was the starting point of speed up transit infrastructure development. Daily passenger flow of Beijing subway reached 10 million at the year of 2013 and has been continuing to grow, greatly exceed the capacity of the existing system.

### 5.1.2.Pricing system

According to 2013 Fiscal Report of Beijing, public transportation ranked No.4 in the annual governmental expenditure, higher than the social services and medical services. It accounted for 5.48% of the total expenditure. And the numbers in Shanghai, Guangzhou and Shenzhen were 2.08%, 1.28%, and 1.2% respectively.

Uniform Pricing System had been one major feature of Beijing Transit System. From 1969 to 2014, Beijing had always been utilizing the uniformed price for both rapid transit and bus services. On December 28, 2014, government of Beijing broke the old rule and implemented the laddering pricing system in the public transportation system that based on the travel distance of each rider. The government expected the price reform in 2014 would be the leverage to relieve congestion, transform travel behaviors and relieve the fiscal burden on the subsidy.

There haven't been sufficient data shows the change of ridership or ticket revenues in response to the price change. However, Beijing experienced twice price increases at the same scale in 1996 and 2000. Both of the two changes significantly reduced the ridership in that year. However, in both of the two cases, the ridership went back to the original growth after 1-2 years.

### 5.1.3. Implementation of Public-Private Partnership

In the year of 2004, to better serve 2008 Beijing Olympic Games, the government of Beijing held an investment promotion conference on transit infrastructure for the very first time. Line 4 was chosen to be the pilot project in the countrywide to apply Public-Private-Partnership model in transportation infrastructure. Proposals of founding a P3 corporation--Beijing MTR Corporation by Beijing Infrastructure Investment Corporation, Beijing Capital Group and Beijing and Hong Kong Mass Transit Railway Corporation won the bid for a 30-year contract to Line 4.

Beijing MTR Corporation were anticipated to save Beijing 100 million RMB in transportation funding in 30-year contract. The excellent operation performance and effective management mechanism of Line 4 later helped Beijing MTR Corporation in winning the bid of Line 14 and 16.

## 5.2 Public-Private Partnership Application in Line 4

### 5.2.1 Institutional Context of Beijing Transit system

Beijing Metro Corporation was originally in charge of all the transit projects in Beijing. In the year of 2001, it was dissected into Beijing Metro Construction Administration Corporation, Beijing Metro Operation Co., Ltd and Beijing Infrastructure Investment Corporation to separate the services of construction, operation and investment represent the government in the three functions respectively.

As mentioned hereinbefore, Beijing Capital Group and Hong Kong MTR (Mass Transit Railway) Corporation were introduced to the system through the PPP contract. Together with Beijing Infrastructure Investment Corporation, they founded Beijing MTR Corporation.

Therefore, there are two independent institutional fabrics currently working in Beijing transit. Beijing MTR Corporation manages the Line 4, 14, 16, while Beijing Metro Operation Co., Ltd was in charge of operation and maintenance of the rest lines. The institutional structure of Beijing is shown in the picture below. According to the contract, Beijing MTR shares the revenues with Beijing Metro Operation on the basis of the passengers' traveling distance in their own lines.

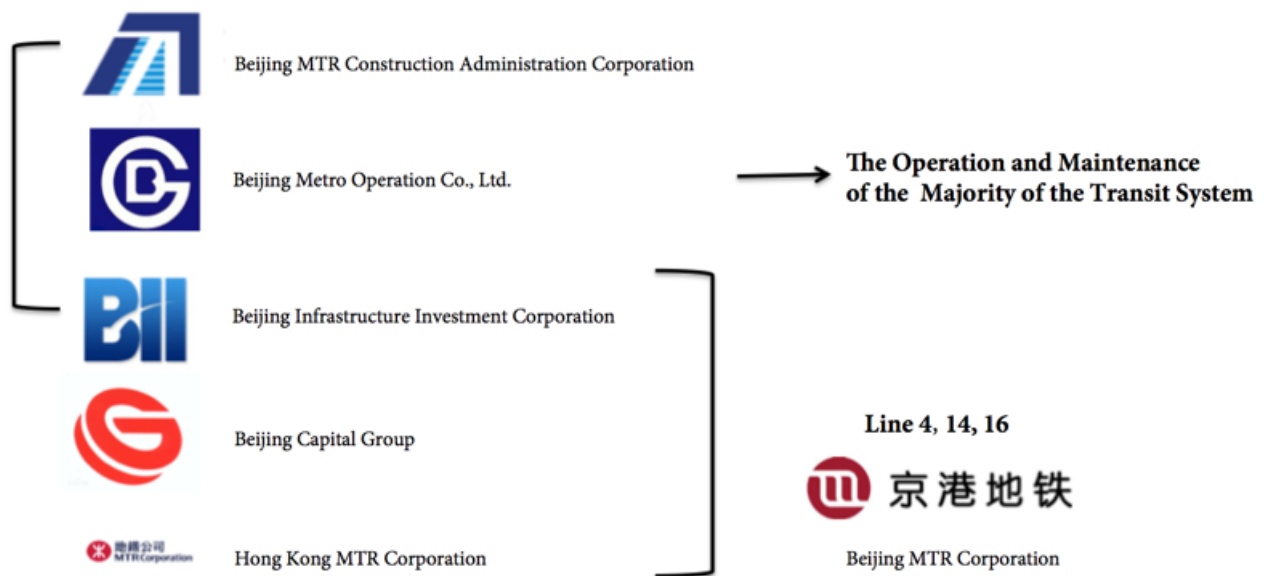


Chart 2 Institutional Context of Beijing Transit

## 5.2.2 Public-Private Partnership Contract

Line 4 is a countrywide pilot project for PPP application in transportation infrastructure. And it was the first time for Beijing to introduce private investment in mega-infrastructure. The design of the contract has two overarching goals:

- 1) Ensure the stability of the contracted company and the quality of services;
- 2) Prevent the possibility of exorbitant profit from growing ridership and price

increase.

In the contract, PPP company-- Beijing MTR Corporation has the concessionary development rights of Line 4. When the contract expires, The P3 Company will transfer the whole property it owns back to Beijing Infrastructure Investment Corporation unrequitedly after the contract expires.

### 5.2.3 Institutional Settings

The contract divided the project into two phases and two properties. Phase 1 is 4-year construction period of the rail with the cost of 10.7 billion yuan, which was invested by BIIC branch company Line 4 Investment Company and constructed by Beijing MTR Construction Administration Corporation. PPP Company took the responsibility of Phase 2 – the investment of electromechanical facilities and subway vehicles for 4.6 billion yuan, and a 30-year integrated management of the whole line.

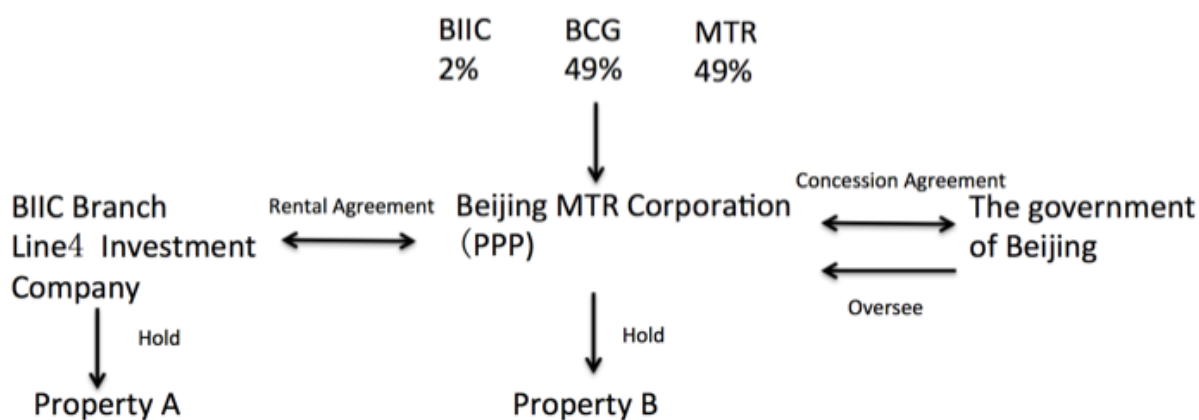


Chart 3 Institutional Organization of Line 4

BIIC, BCG and MTR hold 2%, 49% and 49% respectively of the stock of Beijing MTR Corporation. The check and balance of the institutional settings shows in two aspects:

#### 1) *Participants*

BIIC, a state-owned-enterprise, is the intermediary and platform of transit investment and funding that receives the subsidies from the government and distributes them in the



transit system. BCG is a state-owned-enterprise that has abundant experience in real estate investment and investment banking. Hong Kong MTR Corporation is the most successful transit corporation in the world, which functions the only profitable transit system all over the world— Hong Kong Subway system. Hong Kong MTR is famous for its “Retail + Property” and has successfully applied their models in several countries.

Involving the governmental investors and successful private practitioner introduces the advanced experience and ensures the supervisions from government.

## 2) *Stock share*

The distribution of 2%, 49% and 49% smartly meets the foreign investment standard and economically offers decision-making rights to BIIC.

The company has 5 directors in the board of directors, 2 from BCG, 2 from Hong Kong MTR and 1 from BIIC. This setting provides BIIC the deciding vote in decision-making process.

The government of Beijing entitled the rights in Phase B to Beijing MTR Corporation through a concessionary agreement (te xu xie yi) and only oversees the functioning of Beijing MTR Corporation, which leaves sufficient room for PPP company to apply their development strategies without government interventions.

## 5.2.4 Risk Governance and Mitigation

One of the well-recognized design of Line 4 PPP application is its comprehensive and coordinated contract in risk mitigation, for public services, public sectors and private sectors.

### 1) *Public Service Risk Mitigation*

PPP contract is an implementation of long-term profit gain from public sector asset. What worth mentioning is that Beijing MTR Corporation runs a separate charging system and monitoring system from other lines. Under this mechanism, the major challenges for the application are:

#### a) *Unqualified services.* (For example, the P3 contract has a specific clause on

the punctuality rate. If the performance of Line 4 doesn't meet the contracted rate, it will be regarded as "Unqualified services".)

b) Increased ticket price

If either of two scenarios appears, it would decrease the user experience in the transit infrastructure and exclude poorer user groups from equitable accesses to the public services.

Therefore, the government sets detailed standards of service level, quality, ticket price, and safety guarantee. Once any of the terms were not qualified, government will intervene the functioning of the transit line until it meets the standard.

2) *Public Sector Risk Mitigation*

The sprawl of transit lines and growing population in Beijing provide a huge potential user pool for Line 4. This captures the attention of the government in the mitigation of excessive profits from public services.

A scope of anticipated ridership/daily passenger flow by the estimation of professional consulting firm is set in the contract. When the ridership exceeds the ceiling, the majority of excessive revenues will be transferred to the government. No specific share of the excessive revenues is set; the figure will dynamically depend on the overall functioning of the transit system in that year.

3) *Private Sector Risk Mitigation*

The private sectors have the risk of the sustained losses from ticket revenues, cost management, and unanticipated external factors. Five strategies were set to mitigate the risk for private sectors—Hong Kong Metro Corporation.

a) Split the investment to improve mercantile rate of return

The investment of Line 4 is split into two parts (shown as Property A and Property B in Pic 7). The government investment company invests construction projects that require larger amount of investment. This part of investment is regarded as genuine profitless public expenditure.

PPP company shoulders only the responsibility of the facility investment that is able to generate stable revenue stream return through effective management. Minimized investment share incentives the private capital and relieve its investment burden.

b) Special Project Loans for PPP company

Special Project Loans from National Development Bank are issued to Beijing MTR Corporation, which infill adequate cash flow to the company and improve the mercantile rate of return for its shareholders.

c) Sufficient government subsidy to maintain low fare

Line 4 has the uniformed price as other lines in Beijing. To compensate private interests, the government identifies the scope of costs and estimates the actual ticket fare of each year based on the listed costs. The municipality will subsidize the gap between nominal fare and the actual fare every year.

d) Dynamic leasing fare to balance the revenue

As shown in Pic 7, Beijing MTR Corporation rents Property A from Beijing Line 4 Investment Company through a lease contract. The lease fee varies with the actual ridership of that year, which increases with the ridership growth and decrease with less ridership.

e) Advanced buy-back trigger Mechanism

This mechanism is designed to ensure the investment safety of the private sectors. According to the concessionary agreement, in the period of the public-private partnership contract, once the annual ridership touches the floor of the ridership scope mentioned herein-before successively at the first 3 years, government of Beijing will advance the timing to buy back the Property B at the market price and end the contract. The PPP company will only bear the loss in the three years and be able to escape from the contract without penalties. This clause targets at the extreme scenarios, and shows flexibility in protecting the safety of private capital.

## 5.2.5 Performance

### 5.2.5.1 Government Incentives

The major cause for enormous fiscal burden on the government is the revenue-expenditure gap. In 2013, the operation cost is 8.56 Yuan/person-time; the revenue is 1.87 Yuan/person-time. According on the average traveling distance of each ride —15 km, this means the government had to subsidize 0.446 Yuan for every kilometer a passenger had traveled.

Both BIIC and Beijing Metro Operation Co., Ltd are 'brother' state-owned enterprises. This makes BIIC lack of the capacity to intervene and reform the operation of Beijing Metro Operation Co., Ltd through fiscal leverage. Besides, there is no efficiency model that could be used as reference for Beijing Metro operation Co. Ltd. inside of the transit system or external incentives to improve its efficiency. The monopoly status and opaque fiscal structure also breeds corruption and resource waste, which even worsens fiscal condition.

The government expects to reach the following goals through the PPP applications:

- 1) Relieve the burden on fiscal subsidy and resource allocation,
- 2) Bring positive competition in the transit system,
- 3) Improve the level of management of transit line,
- 4) Transform the role of government from 'parent' to 'supervisor',
- 5) Introduce market mechanism and keep the government from enterprise

management

### 5.2.5.2 Beijing MTR Corporation Performance

Based on the estimations from Beijing MTR Corporations, under the MTR mechanism, the total government fiscal expenditure of Line 4 is around 50 billion Yuan, compared with 60 billion Yuan under traditional mechanism. The government claimed the implementation decreased fiscal expenditure by 10 billion RMB.

As mentioned hereinbefore, Hong Kong Mass Transit Rail generates largest component

of its revenues from its 'Property + Retail' model. In the case of Line 4, the government only offers very limited development rights of the transit corridors for Beijing MTR. If single out the farebox recovery, the ratio Line 4 in 2011 is 52%, under the condition of uniform two yuan ticket. Though the laddering price system is expected to improve this ratio, under the time of uniform pricing system, the advantages of MTR management is not significant.

However, Beijing Government official transportation report claims that apart from the land revenues, the average annual revenues from Line 4 are still much higher than other transit lines. After reviewing the mechanism of two transit operation companies, the sustainable revenues come from three aspects:

1) Effective cost control and management

As a listed company, Beijing MTR Corporation has a more transparent cost management mechanism under the inspection of stockholders. This mechanism pushes the corporation to keep detailed track of expenditure items and effectively prevent corruptions.

Beijing MTR Corporation also has a lively asset management system that integrates the depreciations in fixed facilities into every project. In this way is MTR Corporation able to better control the costs in the existing and future projects.

2) More revenues than anticipated from rapidly growing ridership

The estimated daily passenger flow is 0.71 million person-time by 2010, 0.82 million person-time by 2015, and 0.99 million person-time by 2034. In fact, the highest daily ridership has already reached 0.996 million person-time on 2010. In 2012, the ridership in Line 4 even exceeded that of Line 2. There is no evidence showing a direct relationship in the service quality and the ridership. However, the larger-than-anticipated ridership provided user pool that enlarges the revenue base of Line 4.

3) More revenues from advertisement and other development inside the transit station

According to the reports on transit incomes, Line 4 outstands in the property devel-

opment in the stations, such as the advertisements revenues.

## 5.3 Analysis

### 5.3.1 Takeaway from Beijing implementation

Although there is no standardized definition of success, Beijing PPP implementation has become a classic example because of its coordinated contract design and integrated institutional Structure.

#### 1) Coordinated contract design

The design of PPP contract shows both private sectors and the government have a clear understanding of the cost, benefits, and risks in transit system. Economic status, political structure and demographic characteristics are integrated in the design to make it a win-win contract.

The application should be profitable but not excessively profitable. Creative ways like identification of flow scope could be a good inspiration in other implementations.

#### Integrated institutional structure

State-owned-enterprise at a larger stock share is a deciding feature of the PPP case. The capacity of municipal government to embrace private investment in public services largely depends on the extent to which the concessionary company (PPP company) is able to fit in the local context. The cooperation of local infrastructure financing platform and experienced private company is an applicable direction for more future projects.

## 5.4 Future Development

#### 1) Deepen the system reform in Beijing transit

Seeing the comparisons between Beijing Metro Operation Co., Ltd and Beijing Metro Corporation, simply applying a new financing model will not fundamentally improve the situation. Due to the complexity of the project, one limitation of this paper is lack of a broader

view of the management problems in the transit system. To build a more profitable financing platform for transit development, the city has to comprehensively collaborate planning on construction, operation, and investment as a whole and work with land property development. Prior to this process, how to draw the boundary between government and private entities, how to build independent state-owned transit rails and how the government should deliver their supervision are the questions need to be solved before moving forward.

## 2) Mixed PPP Delivery

In the mixed PPP cases, the private investors are a shareholder of the transit companies that not only runs the management system, but also the financial investors, construction contractors, land developer, facility providers and so on. The Line 16 project by Beijing MTR Corporation introduce the equity financing into the existing PPP mechanism, upgrade the financing strategy to “equity financing + concessionary operation” model, which are also two applicable improvements for future implementation projects.

In a nutshell, Line 4 project in Beijing is more than a trial of PPP in public transit. It is a project that defines new transportation narrative and incentive to open up the mind for innovative financing strategies. The experience and implementation strategies are an example for PPP project delivery in in infrastructure and public services.

## 6. Finance Lease in Wuhan

### 6.1. Development Context

The metro ticket in Wuhan is laddered by distance, 2 Yuan for travel below 9kms, 3 Yuan for 9-14 kms, then 1 Yuan for 2 more km until the ceiling of 6 Yuan is reached. In 2014, the daily passenger flow within 9 km is 0.51 million, counting for 53.19%, between 9-14 km is 0.29 million, 22%. Therefore, over 70% of the passengers are traveling and commuting at a relatively short distance (ticket price below 3 Yuan). The real average cost of each trip is 2.45 Yuan. However, the actual average ticket price is 2.25 Yuan. The city government claims to pay the 0.25 Yuan difference for every trip.

As mentioned in hereinbefore, Line 1 was the one and only working transit lines in Wuhan for over eight years. Before the finance lease contract, the government of Wuhan had signed 21.9 billion Yuan loans in 3 contracts with National Development Bank and state-owned commercial banks. However, these loans were still not able to cover the 27.3 billion Yuan budget for the three transit construction projects in 2009. The reasons for Wuhan to utilize to finance lease strategy as the “solution” includes:

- 1) the city had already reached the ceiling of the loan;
- 2) to “use time to get space”, make time for land property auction and lease.

What worth mentioning is that in Wuhan case, the implementation of finance lease targeted at relieving the current fiscal burden for the proposed projects and expanding the capital base for future investment. Different from Beijing, this strategy does not generate revenues in the operation phase of the transit system.



## 6.2 Funding resources

The overarching goal of the financing system in Wuhan Metro is to accommodate sufficient funding for development while ensuring the quality of the service. There are seven major funding sources for Wuhan Metro funding, including:

1) Special transit construction fund from municipal budget, mainly from land leasing fees from city-owned land, city maintenance and construction tax, and urban infrastructure facility support expense

2) Land leasing revenues from land properties atop and adjunct to the transit lines;

3) Special fund for key enterprise development;

4) Subsidy for transit operation;

5) Special appropriation from federal and provincial subsidy;

6) Municipal transit bonds

7) Funding from other sources, such as telecommunication system lease, metro card, advertisement, and real estates.

As mentioned hereinbefore, Wuhan has been employing the laddering pricing system. To validate the feasibility of uplifting the farebox recovery ratio, Wuhan held several public hearings on higher ticket price. It turned out that the transit expenses accounts 4.44% of the annual incomes, which has already been reached the intermediate level in China. Uplifting the current ticket price is not a good solution for the city.

Fiscal budget on transportation development of Wuhan is lower than that of Beijing. The appropriation from federal and provincial subsidy is limited at approximately 40% of the total costs. Local government is pushed to bake the rest 60% cake on their own. However, on the one hand, all the municipal sources involve complex and time-consuming application and evaluation procedures. On the other hand, government credits become the major collateral in all the resource mobilization activities. To facilitate the timely allocation of the resources and better utilize the limited governmental credits, the city government of Wuhan introduced Finance Lease strategy in 2008. It is also the countrywide first implementation of the strategy

in financing the urban rapid transit infrastructure.

## 6.3 Finance Lease

### 6.3.1. Mechanism and Contract

Finance lease is a way of providing finance – effectively a leasing company (the lessor or owner) buys the asset for the user (usually called the hirer or lessee) and rents it to them for an agreed period.

In November 2008, Wuhan Metro Company signed the 15-year finance lease contract with Industrial and Commercial Bank of China Finance Lease Company. According to the contract, Wuhan Metro Company sold Line 1 key facilities and vehicles to ICBC Finance Lease Company, in return for the eligibility to rent these properties from ICBC Finance Lease Company and to withdraw 2 billion Yuan from Industrial and Commercial Bank of China in 3 years regarding of actual demands on funding for new facility purchase and construction.

During the contract period, ICBC Finance Lease Company only holds the nominal ownership of the leased properties, and could not intervene the operation of the metro lines. When the contract expires, after Wuhan Metro Company pays up the rents and the residual values of the properties, Wuhan Metro Company would be able to reacquire the ownership.

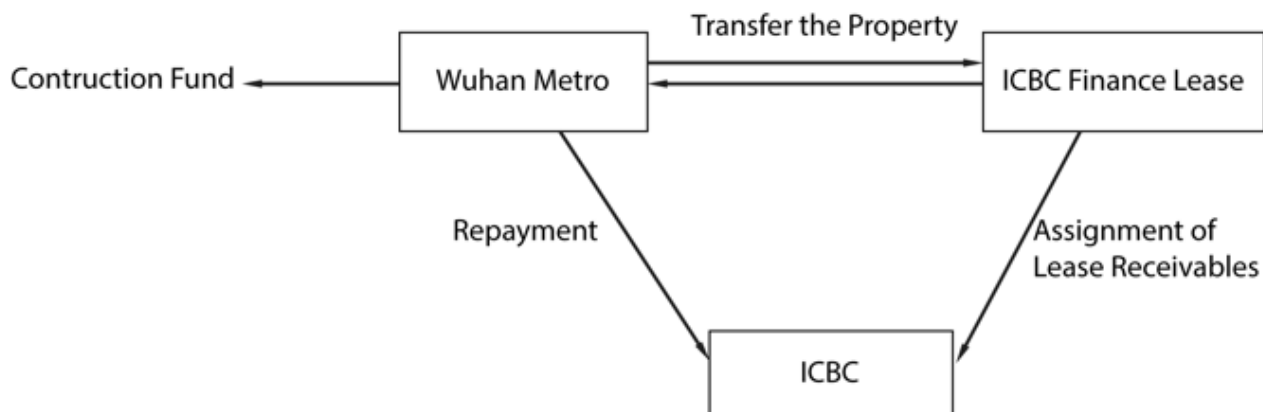


Chart 4 Finance Lease Contract Structure

What makes finance lease case very unique is that it is not building up a Special Purpose Vehicle (SPV) as other financing strategies did, but a solution to adjust financing structure. It has been utilized several times by the government of Wuhan thereafter. The original plan of the government of Wuhan is to implement “Rail + Property” in Hong Kong, which were suspended by the absence of land ownership and suitable environment. In implementing process of Finance Lease, “Rail + Property” is still the ultimate goal of transit financing platforms for Wuhan and the city has been putting much effort in realizing this strategy since then.

Finance lease usually is realized in three forms: sale and leaseback, direct lease, and sublease. The 2008 Wuhan metro contract is contains two parts: the sale and leaseback for the equipment and direct lease for the new facility purchase and construction. ICBC Finance Lease Company pays up the 2 billion yuan at one time for construction and pay the purchase of facilities in the future.

Based on the previous studies, the implementation of finance lease is a reasonable choice for the municipal government of Wuhan for the following reasons:

1) Utilize the existing fixed assets and protect the safety of state-owned properties. In the finance lease of transit construction, though the lessor (ICBC Finance Lease Company) holds the ownership of the infrastructure facilities, all the relative risks and revenues have been transferred to the lessee (Wuhan Metro Company). The lessee holds the property and has the priority to buy back the leased facilities. On the one hand, it maximized the value of existing facilities. On the other hand, this mechanism prevents loss in state-owned assets from the lease contract. And the special characteristics of transit property and public welfare ensure the safety of the leased property to the end of the contract.

2) Increase the capital base for the metro investment and avoid added-value tax and business tax. The interest rate for lease is at the average level of bank loan in China. However, the finance lease still holds several advantages in investment capital base and tax

avoidance.

a) The funding from Finance Lease is listed among the source for the capital base of infrastructure projects. According to National Development and Reform Committee, the capital base for infrastructure project has to exceed a certain percentage of the total funding, in which the bank mortgage is not counted in the capital base. Therefore, finance lease actually brings flexibility in other funding sources by finishing the quota.

b) The funding from Finance lease has more freedom in the allocation. As the national government are strengthening the intervention and supervision of credit delivery, construction loans are limited to use only in the payment of specific construction projects. Seeing at the amount of loans in Wuhan, the municipal government has to go through bank entrusted payment and complex procedures. Without these kinds of constraints, finance lease offers the opportunity to the lessee to acquire the payment in full and distribute the funding on actual demands.

c) The funding from finance lease is not counted in the calculation for added-value tax and business tax. While the taxation of bank loan covers the full values of the loan, in the taxation of finance lease, the principal is excluded from the value of sales in both added-value tax and business tax.

d) Finance lease creates time value of the funding from speed-up depreciation. The property from finance lease is able to conduct speed-up depreciation, which distribute the general taxation into a longer term. This creates time value for the part of funding that is supposed to pay for the general taxation.

e) Finance lease also has flexibility in the payment method. Even though not shown in Wuhan case, finance lease has several payment structure that could be tailored to the metro company, including step-up, step-down, rent holidays and so on.

3) Shorter period in the application. Finance lease contract has simpler application and approval procedures, which scores higher efficiency. Finance lease company designs its own evaluation system that have fewer procedures. In case of the situation where the overall

financing environment get worse or an urgent call for additional fund, finance lease would better satisfy the demands of Wuhan Metro Company than bank loans.

### 6.3.2 Government Incentives

Apart from the advantages hereinbefore, finance lease mechanism also incentives municipal government in the following aspects:

- 1) Protect the government from exhausting its credit.

The happening of finance lease in Wuhan is supported by the government guarantee. The municipality of Wuhan issued a Letter of Guarantee to ICBC Finance Lease Company for the contract. This Letter of Guarantee did not influence the credit history of the government. Prior to the contract, the government has utilized its credit for over 20 billion yuan in syndicated loan and land development loans. If turning the same amount of finance lease to bank loan, it would exhaust the credit and financial capability of the government for future capital programs.

- 2) Adjust the existing capital structure.

Finance lease enlarges the capital base of the transit investment and generates the liquidity of the funding. In Wuhan's case, this liquidity relieves the fiscal burden of the government and reorganizes the capital structure, especially in revising the long-term debt rate to a more bearable one.

## 6.4 Risk Governance and Mitigation

There are very few details of the leased contract released, which makes measuring the risks inside the contract really difficult. This part will approach the measurement from a more general perspective and discuss the deciding factors in minimizing the risks for three parties in this contract.

Finance lease was introduced to China in the late 1980s. Though the strategy

widely spread in various fields, the legislation and regulations on finance lease have not been updated with the development. For mega infrastructure and immovable properties, the government and finance lease companies haven't come up with a system that adapts the foreign strategies in Chinese mainland cities and protects all the participants. By reviewing the basics in the contract process of Wuhan, this thesis hopes to identify some principal indicators for major risks.

1) The project supported by the contract.

The lease contract is suitable for the projects that could generate stable cash flow in a long period, such as highways, waste management facilities. And it is not suitable for the ones that only relies on the government subsidies, such as government office buildings, affordable housings.

Transit system generates stable cash flow but is yet not profitable. By the time of the implementation in 2008, the city of Wuhan hasn't built up a working local financing platform for Wuhan Metro. According to the officers in ICBC Finance Lease Company, what supports their will to facilitate this cooperation is the decisive role of transportation in urban development and the long-time relationship with the city government of Wuhan.

2) Policy risk.

Since 2009, the Ministry of Finance, Central Bank, and National Development and Reform Commission have released several Notice (tongzhi) in supervising the illegal contract in finance lease and Suggestions (yijian) on the risk measurement of local financing platforms. Currently, it requires advanced evaluation and communications with the government before involving in municipal infrastructure projects. So far there hasn't been cases in the default or policy changes that could be utilized as a reference in transit sector. In the previous cases for wastewater management infrastructure, the companies confronts the problems to suffer from defaults and have to seek legal help to get the contracted payment.

3) The credit history of the municipal government and the operation of the local

finance platform.

Before the implementation of finance lease credit, it is important to check the credit history of the government and whether the local financing platform is aligned with the national and regional development plan. Surprisingly, ICBC Finance Lease Company did not request any credit rating before the finance lease project. The essence of transportation could not be the universal key for exception. The policy modifications and economic fluctuation still cultivates the possibility for the government to breach the contract, whose example could be found in the previous cases in water management facilities.

## 6.5 Development of financing platform after Finance Lease

As mentioned hereinbefore, to make time for land property auction is one of the major considerations in finance lease. As a result, the 15-year contract bought Wuhan time to accommodate the proposed development and several strategies have been applied in the financing platform.

The obstacles for “Rail + Property” in 2008 was that Line 1 mainly pass through the old residential areas. The redevelopment of commercial areas did not catch the pace of the transit development then. Since 2009, Metro Line 1 has bred several major commercial development districts. By the time of 2015, five working transit lines has built a small-scale transit network and creates the location-based values for the land properties.

In 2014, Wuhan Metro Company and Wuhan Real Estate Group set up co-found company for land property development alongside the transit lines. In 2015, the first transit-oriented residential community opened to the public. The first retail center atop the subway station is planning to open in 2016.

The implementation of “Retail + Property” in Wuhan is not the focus of this thesis. With the implementation of Finance Lease as a buffer, it turned out that the land properties were developed in a more sustainable manner than easily implemented in 2008. Besides, “Build - Transfer” were introduced to Wuhan Metro in Line 8 for the first time.

## 6.6 Scalability

Government subsidy plus bank loan usually suffice to meet the financial requirements at the initial stage of transit construction and to build a small scale of transit network. However, as with the expansion of transit lines, finance lease have several advantages over traditional structures. These advantages could solve some universal problems among Chinese mainland cities.

- 1) Relieve the fiscal burden of the government.

One of the critical functions for finance lease is that it relieves the pressure of the government to collect a huge amount of funding in a short time. And the mechanism distributes the payment into a longer period, usually longer than that of bank loans. The time value and other fiscal benefits have elaborated hereinbefore.

- 2) Avoid the time-consuming procedures.

Due to the starting stage of finance lease in China, it has a relatively loose administration environment. The short period of application is one significant advantage of finance lease. Neither fiscal subsidy from government nor bank loan could effect in the urgent case. For the cities do not have a completed financing platform, the difficulties in getting sufficient loans also slows the investment in transit development.

- 3) Make the maximized profit from fixed assets.

The accomplished in transit construction normally do not generate any further cash flow. Finance lease trades the fixed assets from previous investment to function as the leased property to infill new capital to the funding pool and creates time value from the speed-up depreciation of the facilities.

In 2010, the government of Wuhan signed a 3 billion Yuan sale and leaseback contract with the union body of ICBC Finance Lease Company, Bohai Lease, and China Merchants Bank Finance Lease Company, which leased the facilities of Line 1 and Line 2.



The success in Wuhan encourages other cities to implement this strategy. For example, Beijing Metro leased the vehicles for 3 billion Yuan; Tianjin leased the railway facilities for 4.6 billion Yuan; Shenyang signed the lease contract for 4 billion Yuan for railway properties; Zhengzhou contracted for 2 billion Yuan on railway properties.

## 6.7 Recommendations

Finance lease provides a different perspective for transit financing. Instead of creating a new special purpose vehicle, this strategy prepares the existing capital structure for future capital projects. To comprehensively take advantage of the finance lease in urban rapid transit development, three recommendations are listed below.

Develop the legislation system for finance lease services.

Based on the research so far, it turns out that there hasn't been a legal system for financing lease in infrastructure as a whole. From experience in other financing strategies, various problems will appear as the development process goes on. The legislations are still lacking of specific clauses on the fundamental issues, such as the ownership transfer, risk and responsibility sharing. Developing and completing the legislation system would better regulate the services and the investment.

Public education on finance lease.

Compared with finance lease services in the other transportation industry, the applications in urban rapid transit are at a very small amount. More education and popularization of finance lease among the consultant, officers in transit investment could provide an access to a more comprehensive and precise understanding of finance lease.

Open up the financing resources.

The finance lease is usually the affiliation of state-owned bank. To expand financing access, the company could bring private sectors in the contracts. The foreign investment is also a potential source for the government to reach out to.

# 7. Summary

## 7.1 Findings

Wuhan and Beijing directs two different paths in the transit investment. As mentioned hereinbefore, P3 is a parallel operation system, while finance lease is a temporary solution on the way for a more sustainable financing platform. The innovative applications in two cities illustrate the following important issues for the followers.

### 7.1.1. The role of government

Urban rapid transit, as quasi-public goods, is under the direct administration of local and national government and will not be fully privatized or marketized. In the P3 case, the government becomes a supervisor that oversees and regulates the P3 Company. In finance lease case, the government utilized its absolute credit to facilitate the contract. While embracing the new strategies, the government hopes to take the opportunity to revise its functions in the transit system, in which yet have some stubborn problems caused by its role.

#### 1) Leading investment body

Government remains the leading investment body in the construction and maintenance part. In the case studies, both the two cities rely on the fiscal subsidy to balance their expenditure and revenue. Even though the government has been working as the sole investment body in transit funding for a long time, to support the contemporary development, the governments at various levels are trying to infill more diverse capital in the system. However, the government still remains the immovable predominant status in financial decision-making process. The implementation of project finance hasn't utilized the marketization to fully incentive the local finance platform, thus the government still has to shoulder the responsibility for most of the development process.

## 2) Participant and Regulator

Government is not only a crucial actor in the financing process, but also the regulator in the whole transportation system. In the two case studies, the metro companies are either government-funded state-owned enterprise or co-founded enterprise with foreign company. This ambiguity in participating role generates conflicts in the decision-making process. The government, who has the absolute power over the system, is a participant that shares the responsibilities and revenues in the system. The standing point of the policy lies in a gray zone. Which will be more important, the order of the system, or the economic benefits from the implementation?

Apart from the one mentioned before, another problem is that the government are also expecting the transit to be a symbol of upgraded city image and international city status. The government are willing to push the projects that could build up a stunning appearance without facilitating the evolution to a more sustainable and profitable financing system at all.

As a result, the responsibilities and rights in investment and maintenance were difficult to clarify. The transit companies have a heavy dependence on the local environment and suffer from the loss from low operation efficiency. Though lacking of material on the governmental administration, reports and news show that local government has undertaken relatively frequent administrative interventions in the metro company. This kind of interventions does not have a clear boundary. In this way will the project finance company not be able to fully adapt its advanced experience or upgrade the financial structure.

### 7.1.2. The development of Metro Company

As the key state-owned enterprises, the metro companies are under the overprotection of governmental subsidy. As a result, they usually have loose management and operation system. Seeing the performance of MTR Corporation, transit companies have the potential to decrease their fiscal discrepancy by improving internal efficiency. One major task for the municipal government is to find an incentive for the worry-free transit company to change from the very inside.

The ultimate goal for transit infrastructure financing is to turn the development in financing strategy to better service and more accessibility to the public. System-wide improvement in efficiency and resource usage could mobilize the capital to the new construction projects and in building a more friendly experience in the transit system.

Another key fact is that nearly all the metro companies are anticipating the land properties to be the main revenue sources. However, the traditional metro companies haven't planned to adjust its existing financial structure in response to the transit-oriented development. The Wuhan case shows that the government could be trapped in its financial structure. Thus, how to transform the existing structure with the overall transit development should be an urgent next step for the government.

### 7.1.3. The mechanism of financing strategy and implementation

The case studies in this thesis show a broad variation of financing strategy implementation. The application lies in not only copying the whole project, but also the variations that take advantages of certain parts of the financing strategy to build the paths to its long-term financing goal. It is important that the implementation fits in the development stage of transit system. The government and metro company should identify their most urgent demand and find the solutions for the specific problem.

The research in this thesis also shows that the contract design is a deciding issue in making a successful implementation. The main issues from Beijing and Wuhan are listed as below.

#### 1) Revenue and responsibility sharing

The contracted agreement renders the revenues and responsibilities distributed reasonably among all the participants. The standing points of each sector in the contract may vary case by case, but the design in sharing the cost and loss have to be attractive to infill new capital, or compensated by subsidiary fiscal policies or concessionary benefits to incentive the private sectors.

## 2) Risk mitigation

The contract needs to thoroughly estimate the risk of not only the public and private sectors as the stakeholders, but also public service packages as the ultimate deliverables of financing strategies. The core mitigation work in the contract is to maintain and upgrade the quality of the service and ensure the fruits from innovative financing strategies could benefit the public. At the time, it is essential to protect the safety of the infrastructure. In lease or collateral contract, the safety of the assets is crucial.

## 3) Integrated financing system

The current local finance platform for transit infrastructure focuses on the functionality as an intermediary and investor in land properties. The pilot implementations are also indicating a more diverse and integrated financing system that consists of the profiles of the strategies and the long-term financing plan. Especially in the case of Wuhan, it would be more organized and systematic in preparing for “Rail + Property” if the implementation of finance lease were better connected the ultimate development concept.

## 7.2 Limitations

All the data and information used in this thesis were obtained from open data, from which a lot of details were not released or accessible by public avenues. Especially in Wuhan Metro case, the limited information on the finance lease contract restrains the depth of analysis. A comprehensive risk measurement based on actual clauses could better portray the whole implementation process more precisely.

In order to concentrate on the analysis of specific financing strategy, this thesis did not analyze the other major funding sources, which includes land property revenues and short-term municipal bonds on transit infrastructure. These two are major incomes for the transportation department and also fundamental components in the capital structure of financing platform. According to the research, fewer information or official reports were released regarding real

estate revenues and municipal bonds. One potential future direction is to dig into the housing price after the major transit-oriented development district were established.

Both Beijing and Wuhan cases are the trial implementation of foreign financing strategies in China. The two cities designed coordinated modifications to facilitate the financing process. The cities afterwards also revise the Beijing and Wuhan experience. It would be interesting to study the takeaways and improvements of these cities from second-hand implementations.

### 7.3 Conclusion

Recommendations for each implementation have been listed in the sections hereinbefore. The study shows the flexibility and variations in the way to applying identical financing strategy. On the basis of the local demand, the government needs to coordinate with its priority and adapt the implementation to the environment.

The government is still the leading investment body in this process and the multi-dimensional role renders it both participants and regulator in the decision-making. This gray zone also slows down the efficiency of state-owned metro companies. How could the city better develop the metro company, and the financing platform of massive transit are the challenges for the government to deepen the reform.

The overarching goal of implementing financing strategies is to turn the financing gains to a more profitable metro company and better service to serve the public. The agreement-based implementation must coordinate with the public and private sectors, and the specific demands on transit. The distribution of revenues and responsibilities, risks is the key to a successful implementation. The design of the contract should include stakeholders and public services together.

To better change the financing implementation into the public benefit, the government should align the development of financing platform with the comprehensive transit planning. Promoting the financial development has to be accomplished with the overall transit devel-

opment. For example, in Beijing case, the efficiency in operation budget is based on a better performance of the operation system. It is same to the future “Rail + Property” implementation, since land development is the ideal revenue source of the government, the implementation should create access to diverse land property development.

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