

FUNDING CHINA'S URBAN INFRASTRUCTURE: REVENUE STRUCTURE AND FINANCING APPROACHES

Zhirong Jerry Zhao
Hubert H. Humphrey School of Public Affairs
University of Minnesota
zrzha@umn.edu

Chengxin Cao
Hubert H. Humphrey School of Public Affairs
University of Minnesota
caoxx161@umn.edu

ABSTRACT

Urban infrastructure has become increasingly important in China with its rapid urbanization and economic development. However, many questions remain unanswered about how different levels of governments in China gather financial resources to fund its urban infrastructure development, and whether the system is sufficient or sustainable. This article examines financial resources for China's urban infrastructure investment in recent decades. First, the article traces the history of China's urban infrastructure investment since 1949. Second, using data mainly from the China Urban Construction Yearbook (2000–2008), it examines revenue structure and financial approaches for China's urban infrastructure finance, its recent trends and patterns, and disparities across provinces. Finally, the article evaluates unique characteristics of the China-style urban infrastructure investment, and discusses some issues regarding the use of quasi-governmental authorities and land transfer fees.

1. INTRODUCTION

With rapid urbanization and economic development, high quality urban infrastructure has become increasingly important in China. Not only does it affect the welfare of the citizens but it also influences the progress of the society as a whole. Much literature has proved the positive relationship between urban infrastructure and economic growth (Wu, 2008; Chen et al., 2007). In recent decades, anecdotal observations and media studies have both shown rapid development of urban infrastructure, especially in the coastal regions. Some scholars, however, find that the provision of urban infrastructure investment in China is insufficient compared to the high growth rate of the economy and population (Lin, 2001). In addition, Wu (2008) posits that significant regional disparity occurs in urban infrastructure investment, which obstructs the economic development in infrastructure-insufficient regions. Many questions remain unanswered about how China gathers financial re-

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sources to fund its urban infrastructure development, how the Chinese government allocates the resources among different areas or different units of governments, and whether the system is sufficient or sustainable. This article examines revenue sources and financial approaches of China's urban infrastructure investment in recent decades. First, it traces the history of China's urban infrastructure investment since 1949. Second, using data mainly from the *China Urban Construction Yearbook* (Department of Finance, Ministry of Housing and Urban-Rural Development of China, 2000–2008), it examines financial sources for China's urban infrastructure finance and related trends and patterns. Finally, it evaluates specific characteristics of the China-style urban infrastructure investment, and discusses some issues regarding the use of quasi-governmental authority and public land finance.

In a broad concept, infrastructure is defined to provide “basic services to industry and household” (Lee & Martini, 1996). Generally, infrastructure investment includes: “energy (power generation and supply); transport (toll roads, light rail systems, bridges, and tunnels); water (sewerage, waste water treatment, and water supply); telecommunications (telephones); social infrastructure (hospitals, prisons, courts, museums, schools, and government accommodation)” (Grimsey & Lewis, 2002, p.108). A narrower definition of urban infrastructure, used by the Ministry of Housing and Urban-Rural Development of China, includes public utilities (water supply and drainage, residential gas and heating supply, and public transportation), municipal works (roads, bridges, tunnels, docks, and sewerage), parks, sanitation and waste management, and flood control in urbanized areas (Wu, 1999). This is also the working definition of urban infrastructure used in the *China Urban Construction Yearbook* (Department of Finance, Ministry of Housing and Urban-Rural Development of China, 2000–2008), which serves as the major data source for analysis in this article. In this article, urban infrastructure investment refers to financial inputs for these urban infrastructure facilities. The data do not include infrastructure investments for rural developments (such as irrigation systems), national or regional projects (such as the Three Gorges Dam or high-speed railways), or infrastructure projects that may have military purposes and, thus, were funded by other sources.

The focus of this article is the financial sources of urban infrastructure investment, normally called “Urban Maintenance and Construction Revenues,” which include both pay-as-you-go fiscal revenues and market financing approaches. Pay-as-you-go fiscal revenues include central and local budgetary allocations,¹ Urban Maintenance and Construction Tax, public utility sur-

1 Central budgetary allocation refers to the earmarked grants from the central government for urban maintenance and construction, which take the form of fiscal transfer and special funds, namely irrigation works funds, road funds, and rural construction funds; local budgetary allocation always targets big projects and major programs, which take the form of special grants (Wang & Zhang, 2009).

charges,² water resource fees,³ infrastructure connection fees,⁴ user charges, land transfer fees, and assets exchange revenues. Market financing approaches include domestic loans, foreign capital, bonds, stock financing, and self-raised funds, etc.⁵

The rest of the article is composed of six sections. The second section describes the history of the development of urban infrastructure finance. The third section reviews previous research concerning China's urban infrastructure. The fourth section examines trends and patterns of urban infrastructure finance in the whole country as well as its allocation across regions and provinces. The fifth section evaluates China's urban infrastructure finance based on a W5s infrastructure finance framework. The sixth section concludes.

2. HISTORY OF URBAN INFRASTRUCTURE INVESTMENT IN CHINA

The history of urban infrastructure finance in China is marked by a series of turns. The first period, between 1949 and 1978, featured deficiency in both political and financial support of urban infrastructure development. The second period, between 1978 and 1994, was characterized by the central government's effort in promoting urban infrastructure development through laws and regulations. The third period, after the 1994 Tax-Assignment Reform, shows an increasingly important role played by local governments in providing urban infrastructure finance through a wide variety of innovative (yet problematic) ways.

2 UMCT is collected by local governments as a surcharge on the combined value of Value-Added Tax, product tax, and business tax—7% in cities, 5% in towns, and 1% elsewhere. A Public Utility Surcharge is a surcharge fee collected by local governments for goods and services including industry and domestic uses such as electricity, water, natural gas supplies, public transportation, and local telephone service (Ministry of Housing and Urban-Rural Development of PRC, 2001).

3 Water resource fees are charged to enterprises and public institutions for exploiting underground water resources in a programming zone of the city (Ministry of Housing and Urban-Rural Development of PRC, 2001).

4 Infrastructure connection fees are charged to enterprises, institutions, or individuals who engage in construction projects (including construction and expansion of land use) in the programming zone of the city. The charges are levied according to the building area or amount of the investment used for urban infrastructure including roads, water, sewerage, gases, heating, public transportation, sanitation and parks (Ministry of Housing and Urban-Rural Development of PRC, 2001).

5 Self-raised funds come from the accumulated capital of enterprises and public institutions for the purposes of expanded reproduction (Ministry of Housing and Urban-Rural Development of PRC, 2001).

2.1 Before 1978: The Shortage Period

Before the economic reform in 1979, China's infrastructure funding was typically characterized as centrally planned, meaning that all fiscal revenue was allocated and distributed by central government. More specifically, after municipality authorities collected the revenue and remitted it to the central government, the central government reallocated the financial resources according to expenditure needs of local jurisdiction (Wu, 1999).

Besides controlling the funding sources for urban infrastructure, the central government was also in charge of the whole process of infrastructure development, from planning and implementation. Ministry of Construction was delegated to "set investment goals, devise development strategies, review long-term plans, approve projects with foreign investment, and limit the scope of operation of certain infrastructure facilities" (Wu, 1999, p.2268).

Under this central-local fiscal relationship, urban infrastructure construction was not sufficiently supported and developed. From the 1950s to 1970s, investment in urban infrastructure was 12 billion Yuan in total, which is 1.43% of total fixed investment and 0.23% of GDP nationally; the proportion was much lower than other countries (Chan, 1998; Hua, 1993). This was due to the fact that consumption and infrastructure investment were deemed as "non-productive" compared to industrial investments (Chan, 1998). Also, local governments' financial resources for urban infrastructure were very limited. Before 1978, the rates of return for municipal governments were set very low by the central government. Plus, only the capital expenditure of production sectors was funded by the central government; service sectors did not have adequate funding for further development (Wu, 1999). Urban Maintenance and Construction Funds as the major of funding and other fees were also restricted to the reallocation of central government (Chan, 1998).

2.2 Between 1978 and 1994: The Central-Government-Promotion Period

The central-local government relationship began to change after 1978, when fiscal decentralization was introduced and local government began to retain a higher rate of revenue and gets more freedom for discretionary spending. Meanwhile, local governments were also obligated for more expenditure items (Wu, 1999). Additionally during this period, the central government began to recognize the importance of urban infrastructure construction and tried to support faster urban development by utilizing an improved funding system. Starting from the 1980s, China began to establish the legal foundation for urban infrastructure investment. Law of Urban Planning approved in 1989 served as "a major milestone in formalizing city planning legislation" (Chan, 1998, p.507). Later, in 1991, "the first national urban land-use classification and planning standards were issued" (Chan, 1998, p.507).

Consequently, the resources of funding urban infrastructure were broadened. In 1979, a new urban construction tax—which imposed a rate of 5% on industrial and commercial profits from domestic enterprises—was experimented in 57 cities and then gradually expanded to 150 cities (Chan, 1998). This tax was replaced by Urban Maintenance and Construction Tax (UMCT) in 1985 (Chan, 1998). The UMCT was the only earmarked tax in the fiscal system and became an important tool for infrastructure funding.

Land transfer fee—an important source of funding nowadays, was started in 1981 in Shenzhen foreign enterprises-funded projects and then expanded to other cities (Chan, 1998). Two laws were launched in 1988 and 1990 that provided the legal foundation for land leasing as an infrastructure funding tool by Chinese municipalities (China State Council 1988, 1990). By 1994, Xizang was the only province that land-use right had not been sold at (Chan, 1998). In addition, the central government set its share of land-leasing revenues at 60% at the beginning and then gradually reduced to 40%, 32%, and 5% (Peterson, 2006). And, by 1994, all land-leasing revenues were assigned to municipal governments (Peterson, 2006).

Fees and user charges were also introduced to generate more revenue for urban infrastructure, including wastewater treatment charges, user charges of toll bridges in Guangzhou and Foshan (Chan, 1998). “Infrastructure connection” fees were introduced by the State Council in 1984. It started in several cities and become popular in early 1990s (Chan, 1998). Infrastructure connection fee was charged on new construction and immigrants. It was also always connected with selling urban residency rights (“Hukou”) (Chan, 1998).

2.3 After 1994: The Increasing-Local-Initiative Period

Although UMCT and PUS were significant in the urban infrastructure finance from 1978 to 1994, such approaches declined in importance after. After the fiscal reform of 1994, fiscal decentralization was further improved. The Tax Sharing System converted the old system of “general revenue sharing” to a new one of “tax assignment and tax sharing” (Bird & Wong, 2005, p.7). This means that rather than sharing total tax revenues, the new fiscal system assigns specific tax items to either local or central government (Bird & Wong, 2005). As a result, municipal governments became more capable to collect revenue for infrastructure development. An urban land use tax, a real estate tax, and an urban maintenance and construction tax became financial resources of local governments (Wu, 2008).

3. PREVIOUS RESEARCH ON CHINA'S URBAN INFRASTRUCTURE FINANCE

There has been limited research that systematically examines urban infrastructure finance in China. In this section, we briefly review two streams of relevant literature. The first stream of literature concentrates on is the historical development of China's urban infrastructure finance system. The system used to be characterized with central government planning and allocation. In recent decades, however, local government has gained more autonomy in urban infrastructure finance and resources of funds have been diversified (Wu 1999; Wu 2008; Chan 1998). Furthermore, the importance of government as a provider of urban infrastructure funds has decreased, while marketization, including funds from land leasing and borrowing, plays a more and more essential role (Wang and Zhang 2009). As of today, the sources of urban infrastructure finance include central and local government budgetary allocation, local earmarked taxes, fees and user charges, borrowing, and self-raised funds, etc. (Wu, 1999, 2008). Some research reports focus on specific revenue or financing sources, or case studies in specific areas. A report by the World Bank and International Finance Corporation (Bellier and Zhou 2003) analyzes the increasing used of private participation in China's infrastructure development. A Lincoln Institute report (Mikesell et al. 2008) studies infrastructure development in Guangdong Province, China, and examines the decision-making processes as well as financing mechanisms there.

The second stream of literature is about the quantity and quality of urban infrastructure provision in China. Lin (2001) argues that conventional infrastructure, such as roads, railways, petroleum and gas pipelines, and electricity, grew slower after the economic reform of 1978, while high-tech infrastructure such as aviation and telecommunications developed more rapidly during 1980s and 1990s. The results were problems of unmet demand, deficiencies in cost recovery and inadequate infrastructure maintenance during the period. For example, in late 1990s, wastewater treatment and sewage facilities were not sufficient, because low water price led to excessive water demand while insufficient revenue for maintenance and management (World Bank 1995; Wu 1999). Another problem of urban infrastructure provision is increasing provincial disparity (Lin 2001, Wu 2008). Cities in the eastern region uniformly enjoy higher levels of services in all infrastructure types, while in inland provinces, public transportation, roads, streets, water supply, waste treatment are in much poorer conditions. The insufficient infrastructure provision has shown to become an obstruction of economic growth in those areas (Wang 2008).

This article aims to add to the literature on China's urban infrastructure finance in several ways. First, it will provide a more comprehensive and clear categorization of financial sources for urban infrastructure finance. Second, it

will examine the trends and patterns with up-to-date data and also compare them to observations about the 1990s. Third, it will discuss the disparity in urban infrastructure finance across regions and provinces. Finally, it will evaluate China's urban infrastructure finance based on a theoretical framework, allowing for a better understanding of its specific characteristics.

4. TRENDS, PATTERNS, AND DISPARITIES OF CHINA'S URBAN INFRASTRUCTURE FINANCE

The primary data for this analysis are from the *China Urban Construction Yearbook*, (Department of Finance, Ministry of Housing and Urban-Rural Development of China, 2000–2008), as well as some data before 1999 compiled by Wu (2008).⁶ In order to remove the influence of inflation, the paper adjusts the urban maintenance and construction revenue each year⁷ using a price index of fixed assets (constant 2000 RMB). As Table 1 shows, the total amount of urban maintenance and construction revenues has increased dramatically in the past two decades. It increased 13 fold from 1990 to 2005 (constant 2000 RMB). Per capita funding increased from 33 Yuan in 1990 to 372 Yuan in year 2005. (The exchange rate between RMB and US dollars is about 8 to 1 during 1990–2005 and, thus, the per capita increase is equivalent to about \$4 in 1990 to about \$45 in 2005). Urban maintenance and construction revenues as a percentage of GDP increased from 1.8% in 1999 to 2.9% in 2005. More specifically, the average annual growth rate of fiscal revenue from 1990 to 2005 is 12.8%, and 17.1% for market financing. Therefore, the proportion of market financing has been increasing in the past two decades from 18% in 1990 to 51% in 2005. In the subsections below, we discuss national trends and patterns of urban infrastructure finance by each item in fiscal revenue and market financing, and thus examine related regional disparities regarding different funding levels in Municipalities, eastern provinces, central provinces, and western provinces.

4.1 Pay-as-you-go Fiscal Revenues

Central and local budgetary allocation. The amount of central budgetary allocation towards local infrastructure is very limited compared to other resources. In 2007, it was 3 billion RMB (constant 2000 RMB), while the local budgetary allocation was 128.6 billion. Central budgetary allocation increased from 1990 to 2000, while the per capita level increased 5 fold. However, it

⁶ The data include all Chinese provinces except for Beijing and Tibet, for which many data points are missing.

⁷ Because the price index of fixed assets for 1990 is not accessible, we use the price index of 1991 instead for calculating the adjusted urban maintenance and construction revenue of 1990, and assume the price index of 1999 equals 100.

started to decrease beginning in 2000. The per capita central budgetary allocation in 2007 was only 32% of the allocation in 2001. In comparison, local budgetary allocation dramatically increased between 1990 and 2007, with an average annual growth rate of 17.3%, higher than fiscal revenue rate of 15.3%. Therefore, local budgetary allocation is one source of the growth in fiscal revenue.

Table 1: Per Capita Urban Infrastructure Revenues (Yuan/Person), 1990-2007

	1990	1993	1996	1999	2002	2005	2007
Fiscal Revenues	19.2	23.3	26.4	45.5	101.1	164.6	293.0
Budgetary allocation	4.9	9.1	8.1	22.2	36.3	59.5	99.6
Central budgetary allocation	1.7	2.8	0.9	8.4	5.9	4.3	2.3
Local budgetary allocation	3.1	6.2	7.2	13.8	30.4	55.2	97.3
Local earmarked taxes	13.9	13.7	17.8	22.7	28.3	42.1	45.5
Maintenance and Construction Tax	10.3	10.3	13.2	17.6	24.5	38.2	40.2
Public Utility Surcharge	3.6	3.5	4.6	5.1	3.9	3.8	5.4
Fees and user charges	0.4	0.5	0.5	0.6	14.6	21.7	38.3
Water resource fee	0.4	0.5	0.5	0.6	1.0	1.7	1.8
Infrastructure connection fee	**	**	**	**	6.7	9.9	17.5
User charges ^a	**	**	**	**	6.9	10.1	19.0
Land transfer fee ^b	**	**	**	**	21.9	41.2	109.7
Market Financing	5.9	10.9	22.6	53.1	119.6	190.3	**
Domestic loans	1.4	4.7	8.0	30.1	67.6	115.8	**
Nationally issued bonds	**	**	**	**	5.1	10.6	**
Bank loans	**	**	**	**	62.5	105.2	**
Other bonds	**	**	**	**	0.2	2.4	**
Self-raised funds	4.1	4.8	10.0	19.1	46.5	65.6	**
Foreign capital	0.4	1.4	4.7	4.0	4.7	6.4	**
Stocks	**	**	**	**	0.5	0.1	**
Other sources	8.3	26.7	21.8	32.1	23.6	21.2	16.9
Total	33.4	60.9	70.8	130.7	244.2	376.1	310.0

Data sources: Wu (2008); China's Urban Construction Yearbook (2000-2008).

Note: ** for missing data.

a. User charges include primarily toll on roads and bridges, water treatment fee, and garbage treatment fee.

b. Only data of year 2006 and 2007 is available for assets exchange revenue; therefore, it is combined with land transfer fee.

Local earmarked taxes—two-item funds. Two-item funds refer to “Urban Maintenance and Construction Tax” and “Public Utility Surcharge” that are typically used for urban infrastructure development. Although these earmarked local taxes played an essential role before 1990 (they accounted for 42% of total urban maintenance and construction funds in 1990), their importance has been decreasing since then. Per capita local earmarked taxes increased from 13.8 RMB per capita in 1990 to 45.0 RMB per capita in 2007 with an average annual growth rate of 5.4%, which is much smaller than fiscal revenue (15.3%) and market financing (17.1%). Therefore, the proportion of local earmarked taxes in total funding has decreased. In addition, two-item funds also have some problems. Wu (2008) indicates the inadequacy of

two-item funds due to low rate set up by the central government and the instability due to the fact that two-item funds fluctuate with the output of the economy.

Fees and user charges. Fees and user charges include water resource fees, infrastructure connection fees, and user charges. Due to the limitation of data source, infrastructure connection fees and land transfer fees are included in other sources rather than fees and user charges before 2001, which explains the huge gap of the amount of fees and user charges collected between 1990-2000 and 2001-2007. Also, it gives the reason for the dramatic decrease of other sources after 2001. For the same reason, the percentage of each item in fees and user charges are not listed before 2001. The average annual growth rate of fees and user charges is 21.7%, which is higher than fiscal revenue and market financing. Furthermore, user charges are the ones that increased the fastest. However, compared to other items, the amount of user charges is very small; per capital user charges were 19 Yuan in 2007, while total fiscal revenue was 293 Yuan. Also, these fees and user charges have some problems; some municipal authorities have overcharged the infrastructure services they provided (Wu, 1999, 2008). This is shown in the case of some 28 different fees imposed on various aspects of real estate development in Shanghai (Bird, 2005).

Land transfer fee. Land transfer fees, created in the 1980s, are the most important source of urban infrastructure finance. In this article, “land transfer fee” refers to revenues from leasing land use rights and charging land use fees. Since the introduction of land leasing in the 1980s, it has gradually become one of the most important revenue items for urban infrastructure for local government. The central government set its share of land-leasing revenues at 60% at the beginning and then gradually reduced to 40%, 32%, and 5% (Peterson, 2006). And, by 1994, all land-leasing revenues were assigned to municipal governments (Peterson, 2006). Land leasing is an important step towards fiscal decentralization because, since its initiation, local governments have found a revenue resource that is totally under their control. The land transfer fee has been the engine for the growth of fiscal revenue since 2001. It has an annual average growth rate of 54.3%, which is much higher than fiscal revenue's. Second, the land transfer fee fluctuated a lot in the past ten years. It increased dramatically starting in 2001, then experienced the bottom point at 2005, and increased again after that.

4.2 Market Financing

Debt financing. Debt financing includes domestic loans as well as other bonds. Domestic loans include bank loans and nationally issued bonds. The most important part of domestic loans is bank loans, which account for over 80% of domestic loans. Because local governments are not allowed to borrow

money directly from commercial banks, Urban Development and Investment Companies are established to justify this way of financing urban infrastructure. However, because infrastructure investment projects usually cannot recover cost within the maturity period of commercial bank loans, local government always “roll over the loans rather than repay them” (Su & Zhao, 2006, p.41). Since the implementation of higher credit standards for commercial banks, local governments’ political control over commercial banks has weakened and it has become harder to obtain loans from these banks (Su & Zhao, 2006). Domestic loans are the major source of growth in market financing. They account for a majority of market financing (50–60%). Their average annual growth rate from 1990 to 2005 is 24.0%, while the growth rate of the overall market financing is 17.1%.

From 1998, the Ministry of Finance began to increase nationally issued bonds and grant loans to provincial governments for the purpose of local economic and social development. The local governments are responsible for repaying capital with interest. Actually, borrowing from national bonds should have been used on environmental and other social projects unable to generate sufficient economic return; however, they are always invested to other economic development projects preferred by the local governments (Su & Zhao, 2006). In addition, the repayment of these loans is always waived in the process of political negotiation with central government (Su & Zhao, 2006).

Equity financing. Equity financing includes self-raised funds, foreign capital, and stock financing. Self-raised funds refer to those that come from the accumulated capital of enterprises and public institutions for the purposes of expanded reproduction (Ministry of Housing and Urban-Rural Development of PRC, 2001). Self-raised funds are not defined as a fee or fund (Wu, 2008; Bird & Wong, 2005). However, enterprises are forced to take the fiscal burdens to finance urban infrastructure investment through self-raised funds (Wu, 2008). For example, in Dongguan, Guangdong province, the local government created an energy and communications company to raise money for the construction of roads and power plants (Harral, 1992). This company also is responsible for “paying interests and repaying the capital by collecting user fees and tolls” (Wu, 2008, p.13). The average annual growth rate of self-raised fund is 14.3%, which is lower than the 17.1% of market financing. Estimated by Wang & Zhang (2009), in self-raised funds, about 2/3 of them come from the direct investment of private enterprises.

Foreign capital includes Foreign Direct Investments (FDI), foreign loans, and other foreign investment. After the economic reform and the implementation of opening policy in 1978, China attracted investments from foreign companies. In order to encourage these investments, the central government offers advantages to foreign investors including “tax advantages, customs duty exemptions, a wider variety of permitted activities, and relative operational

autonomy” (Wu, 1999, p.2272). Foreign investment usually takes the form of public-private partnerships, in which Chinese government provides the land and foreign companies provide the funds needed (Bird, 2005; Bellier & Zhou, 2003). Foreign capital has a relatively low proportion in total infrastructure funding, about 1–2%. Its average annual growth rate of 15.3% is also lower than 17.1% for market financing. Compared to other market financing approaches, the use of stock financing is minimal. In most years, it accounted less than 5% of the overall urban maintenance and construction revenues.

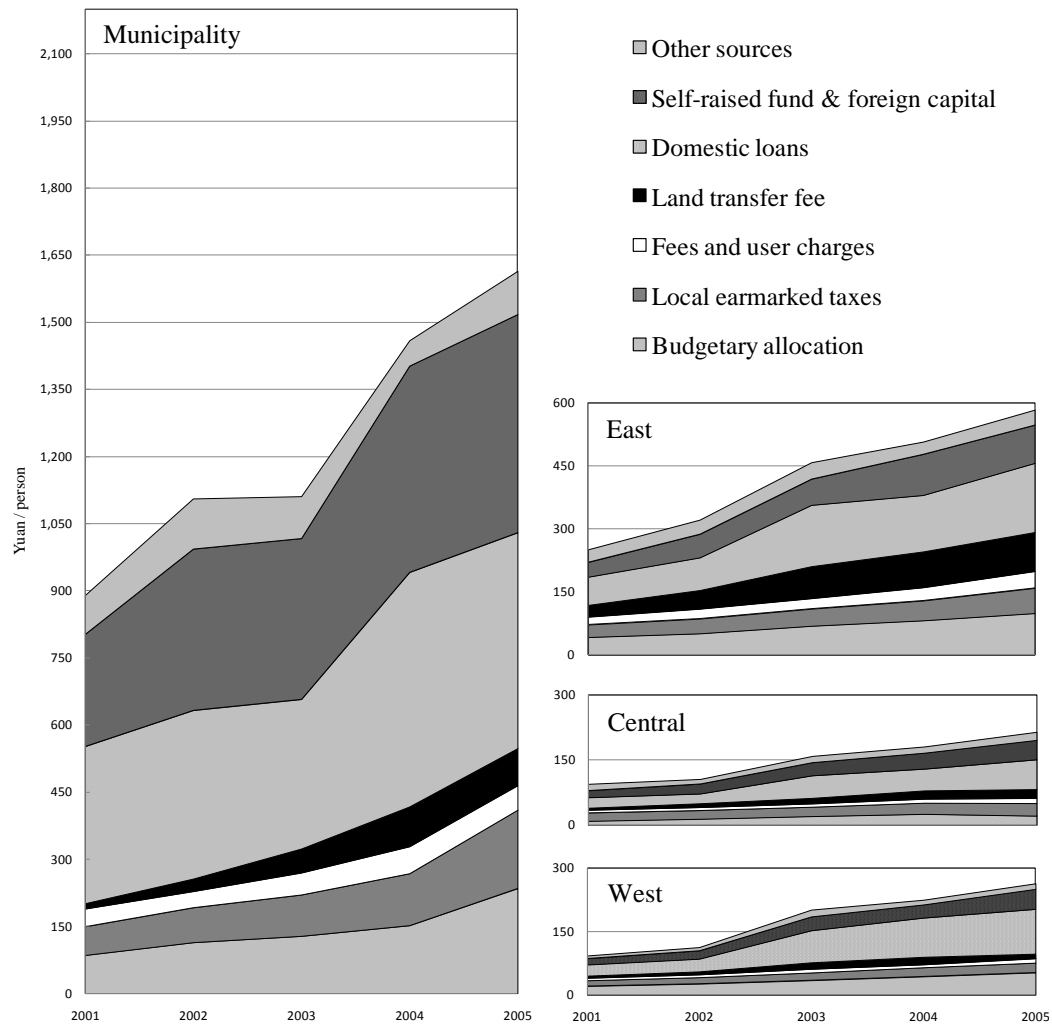
4.3 Regional Disparities in Urban Infrastructure Investment

There are significant regional disparities in urban infrastructure finance when we group the provinces into Municipalities, eastern, central, and western regions (see Figure 1 and Table 2)⁸. Regionally, the Municipalities have by far the highest per capita urban infrastructure investment. In 2005, Shanghai, Tianjin, and Chongqing are ranked 1st, 2nd, and 5th, respectively, among 29 provinces in per capita total infrastructure revenue. To see the gap more clearly, per capita infrastructure revenue in Shanghai is 34 times of Guizhou, which is a western province. One important pattern in the Municipalities is the high proportion of market financing in total revenue. Within market financing, nationally issued bonds are the most significant factor contributing to the big regional gap: in 2005, nationally issued bonds were 172 Yuan/person in the Municipalities, which is 19 times of the eastern provinces, and close to 100 times to the central and western provinces. Although nationally issued bonds are categorized as market financing, they are apparently one way of central government subsidy—the Municipalities are favored by the central government in the process of development and urbanization. In addition, land transfer fees are not as significant to the Municipalities as to some other provinces. The Eastern Region has the second highest amount of per capita urban infrastructure investment. In Figure 1, we see that eastern and coastal provinces tend to a high reliance on land transfer fees. Zhejiang Province has the highest per capita land transfer fee among all the provinces. The provincial gap of land transfer fees is much higher than total revenue: the highest (Zhejiang) is 123 times of the lowest (Yunnan, a western province).

Infrastructure revenues are much lower in central and western provinces. Against normal expectations, the central provinces are even lower in urban

⁸ The Municipalities include Tianjin, Shanghai, and Chongqing. (Beijing is not included in this analysis because of missing data). The eastern provinces include Hebei, Fujian, Hainan, Shandong, Guangdong, Liaoning, Jiangsu, and Zhejiang. The central provinces include Hubei, Henan, Jilin, Heilongjiang, Jiangxi, Hunan, Anhui, and Shanxi. The western provinces include Yunnan, Sichuan, Qinghai, Gansu, Guizhou, Xinjiang, Ningxia, Shaanxi, Neimenggu, and Gangxi. (Tibet is not included due to missing data).

Figure 1. Regional Trends and Patterns of Urban Infrastructure Finance, 2001-2005



infrastructure investment than the western provinces. The lowest provinces in the central region include Shanxi, Henan, Anhui, and Jiangxi, while the lowest in the western region include Qinghai, Gansu, Yunnan, and Guizhou. The gap between the west and the central is mainly due to bank loans. While bank loans in the western region in 2005 are about 105 Yuan/person, they are only about 67 Yuan/person in the central region. This may happen because of the Western Development policy in recent years, in which the central government actively promoted more investment in the western region. It may also be due to the fact that western provinces in general have higher per capita governmental expenditures than central provinces, either because many of these provinces are minority autonomous areas that enjoy special central government subsidies, or because these areas have higher per capita cost of public service delivery because of much lower population densities (Zhao, 2009). One noticeable pattern is that the further away from the east coast, the lower

percentage land transfer fees account for the total urban infrastructure finance. This might be related to the fact that the land value drops significantly moving from the east coast provinces to the western ones.

Table 2: Provincial Rank of Per Capita Infrastructure Revenue (Yuan/Person), 2005

Region	Province	Total Infrastructure		Fiscal Revenue		Land Transfer Fee		Market Financing	
		Rank	Per Capita	Rank	Per Capita	Rank	Per Capita	Rank	Per Capita
Municipality	Shanghai	1	2766	1	599	2	179	1	1938
	Tianjin	2	1779	2	515	19	17	2	1179
	Chongqing	5	821	3	362	7	47	4	396
East	Zhejiang	3	961	4	357	1	245	5	317
	Jiangsu	4	906	5	289	3	156	3	429
	Liaoning	6	597	6	251	4	102	9	226
	Shandong	7	524	8	198	6	56	8	232
	Guangdong	8	486	9	146	5	64	13	208
	Hainan	13	342	20	74	8	47	11	221
	Fujian	15	331	11	120	9	36	17	167
Hebei	16	319	16	85	12	33	15	187	
Central	Jilin	12	355	18	80	20	16	7	236
	Hubei	17	303	22	66	28	3	14	195
	Heilongjiang	18	302	13	105	16	21	22	131
	Hunan	21	230	25	49	13	26	21	138
	Jiangxi	23	200	21	72	15	22	25	84
	Anhui	24	181	24	50	11	33	24	89
	Shanxi	26	161	19	75	10	35	27	44
Henan	27	122	27	45	21	14	26	59	
West	Ningxia	9	419	7	224	22	13	16	176
	Neimenggu	10	391	12	118	17	18	6	242
	Sichuan	11	371	10	122	27	5	10	225
	Shaanxi	14	333	15	86	18	17	12	217
	Xinjiang	19	289	14	102	23	11	18	160
	Guangxi	20	284	17	85	14	24	19	154
	Gansu	22	205	23	51	25	5	20	146
	Qinghai	25	176	28	44	26	5	23	111
	Yunnan	28	87	26	45	29	2	29	32
Guizhou	29	81	29	36	24	7	28	33	
Federal Ratio		7.9		8.0		31.2		9.8	

5. FUNDING URBAN INFRASTRUCTURE DEVELOPMENT, CHINA STYLE

5.1 The W5s Benefit Framework for Infrastructure Finance

To better understand the unique characteristics of urban infrastructure finance, we start from a theoretical framework, which may be called the “W5s Benefit Framework” for infrastructure finance. From a “user pays” or “beneficiary pays” perspective, investment for public infrastructure is more efficient and equitable when the costs of the infrastructure are closely linked to its beneficiaries. Therefore, key decisions about public infrastructure investments may be governed by five benefit-related questions that start with the letter “W”— “Who, Where, and When to benefit, to be paid back by, What mechanism, and at Which level?”

First, the question regarding “who to benefit” is about the role of government and market in infrastructure provision. If an infrastructure improvement generates benefits that are mostly nonrival and nonexclusive, the case may be made for governmental provision of the infrastructure, because market provision of such facility will result in prices higher and quantities lower than the efficient level (Bator, 1958). Nonetheless, most infrastructure improvement will lead to some private benefits that can be easily identified and separated, such as direct usage of a utility. In this case, market-based mechanisms such as direct user fees may also be used (Fisher, 2007). Thus the investment of most infrastructures is the joint efforts of governmental provision and market mechanisms.

Second, to the extent that governmental provision may be involved with infrastructure, “where to benefit” affects the extent to which public-sector investment should be allocated across levels of governments. According to Wallace Oates’ *Correspondence Principle*, each public good is provided in the smallest (that is, lowest level) government consistent with no externality (Oates, 1972). On one hand, the variation in consumer demand and the concentration of similar demands in one area supports decentralized provision (Fisher, 2007). On the other hand, a “free rider” problem will arise when the spatial distribution of the costs (or benefits) of government services is not confined to the jurisdiction boundaries of the providing government. In such case, some control mechanisms (or subsidies) by higher-level governments are necessary to internalize the externalities (Fisher, 2007).

Third, regarding “when to benefit,” the timing of infrastructure benefits is related to the choice between pay-as-you-go financing and debt financing. Debt financing is usually desirable for infrastructure improvements that need relatively large initial expenditure, which pay-as-you-go budgetary funding would not be able to provide (Fisher, 2007). That is the case in a lot of urban infrastructure projects. The initial investment of public utilities (water supply and drainage, etc.) and capital spending in municipal works (roads and bridges, etc.) are often debt-financed, while budgetary funding is always applied to urban infrastructure maintenance and basic level road construction. In addition, debt financing is more appropriate regarding intergenerational equity, because capital infrastructures tend to have long-term benefits, which may be more equitable to be paid back by future users during the benefit period than totally by current taxpayers (Fisher, 2007). Nevertheless, debt financing is criticized sometimes as creating an incentive for overcapitalization by sub-national governments if the individual voters who approve projects do not perceive their future costs (Fisher, 2007).

The fourth question, “to be paid back by which mechanism,” focuses on public financial instruments such as general revenues, earmark revenues, user

fees/charges, or value capture strategies, which may be determined by different types of benefits and different governmental policy tools. Take transportation finance as an example, Iacono, Lari, Levinson, and Zhao (2009) identify three distinctive approaches: (1) assuming that transportation improvements enhance economic development and benefit general taxpayers, many European countries as well as US local governments use a general-revenue approach to support transportation; (2) considering that highway benefits may be linked to direct transportation users such as automobile operators, US federal and state governments heavily rely upon a user-pays approach (fuel taxes) to support highway development, and (3) since transportation investment also creates benefits to certain property owners or developers with locational advantages, a variety of value capture strategies may be used to supplement transportation investment.

The fifth issue is about the desirable pricing level of user charges, which is an important signal to both consumers and investors. Same as other goods and services, setting the price at marginal cost is always Pareto efficient. However, more complexity is caused by the problem of public goods and natural monopoly when setting price levels for urban infrastructures. For natural monopoly industries, it is impossible to have a single price equal to marginal cost and have the producer earn a profit (Fisher, 2007). Therefore, government needs to subsidize the production, especially for the initial investment (Fisher, 2007). In addition, setting user charges at a marginal cost level, (i.e. charging higher prices to consumers far away from existing services and, hence, costly to serve vs. charging lower prices to consumers who are closer,) would encourage more efficient land use because, if average costs are charged, urban sprawl would be encouraged by subsidizing people in outlying areas (Bird, 2005).

5.2 Unique Characteristics of China's Urban Infrastructure Finance

We evaluate the China-style urban infrastructure finance based on the W5s Benefit Framework based on our data, personal observations, media coverage, and interviews. First, regarding the role of governmental provision vs. market mechanisms, Chinese governments have increasingly used market mechanisms such as land transfer fees, debt financing, and equity financing to fund urban infrastructure development. However, the distinction between governmental and market role is blurred in China. On one hand, local governments were often reported to acquire land from residents with force and low compensation, and then generated high amounts of land transfer fees through bidding or negotiation (Peterson, 2006). On the other hand, debt financing often incurred with governments borrowing from government-owned banks, and thus the transaction cannot be considered as a pure market operation in the western sense.

Second, regarding the level of governmental provision, local governments have played an increasingly important role in funding urban infrastructure. The reliance on central budgetary allocation remained low and very unbalanced across provinces. It fluctuated over time, starting from less than 2% in 1990, rising to about 10% in 2000, and then decreasing to less than 3% in 2007. It also varied significantly across regions, with by far the highest per capita amount for the Municipalities (reflecting the preferential treatments to these super cities), and slightly higher per capita amount for the western region (due to the western development policy or national security considerations).

Third, regarding the timing of financial resources, the reliance on pay-as-you-go fiscal revenues has dropped to below 50% in recent years, while governments got higher proportion of funding from debt financing or equity financing. Based on anecdotal observations and interviews, we suspect that much of the payback mechanisms for these financing activities are not included in the urban infrastructure fiscal revenues, and thus the concern of possible double counting is low. A high percentage of domestic loans are “national debt re-loan to localities,” which were borrowed by the central government and then allocated to local governments like intergovernmental grants. Equity financing such as self-raised funds or foreign capital are often used for marketable operations such as toll roads. Although land transfer fees are treated as one-time fiscal revenues, they are essentially a special kind of debt financing, because land transfer fees are collected from private developers who, in exchange, get usually 70 years of land usage rights. Overall, it seems that governments in China have relied heavily upon the use of future resources to support urban infrastructure development, which may raise serious concern about the sustainability of the current funding mechanisms.

Fourth, regarding financial instruments, the proportion of budgetary allocation (from general revenues) in total revenue is higher than local earmarked taxes, while fees and user charges are the lowest. However, as noted before, fees and charges here may not include tolling payments to pay back debt or equity financing and, thus, we do not have a clear picture of the extent to which direct user payments are used to fund China’s urban infrastructure. The increasing use of land transfer fees, especially in some eastern provinces, is worth noting. Zhao and Cao (2010) find that local governments tend to use land transfer fees for visible projects such as roads, bridges, or landscaping. Such physical improvements may enhance accessibility, create community amenities, and improve cityscapes, all of which may be translated into higher land transfer fees for future land leasing. In this case, the use of land transfer fees, should they be used appropriately, can be considered as a China-style value capture strategy that is widely experimenting in many Chinese cities.

The fifth question in the W5s Benefit Framework is about the pricing level of user fees and charges. Water and sewer services are operated by governments as public utilities. Other than that, there has been little discussion in China about moving toward dynamic value pricing such as congestion fees or parking regulations.

5.3 Additional Discussions about Land Transfer Fees and UDIC

Since the use of land transfer fees is a key feature of China's urban infrastructure finance, it is worth additional discussion. Land transfer fees have been an increasingly important source of revenue for Chinese local governments, not only for urban infrastructure but also for other operational activities. However, land transfer fees are vulnerable to high volatility, unevenly distributed across regions, and unsustainable for ongoing operations of local governments. Table 1 shows that land transfer fees for urban infrastructure increased from 13.1 to 77.9 Yuan/Person during 2001–2004 but then decreased almost 50% in 2005. In Table 2, we see that, among all revenue sources for urban infrastructure, land transfer fees have the highest provincial disparity, with the amount in Zhejiang Province more than 100 times of that in Yunnan Province. Lastly, land transfer fees are not a sustainable source of local revenue, for urban infrastructure, or other purposes, because the amounts tend to be collected at one time and used at one time while the public-owned land is leased for typically 70 years. Cities that aggressively engage in land leasing will see ample short-term revenues that, however, are collected at the cost of future service obligations. Therefore, there have been many discussions to replace one-time land transfer fees with ongoing annual property tax systems, but the Chinese governments are hesitant to move forward, except for having experiments in selected cities such as Shanghai and Chongqing.

Normally, land transfer fees are not directly administered by local government, but are collected through Urban Development and Investment Companies (UDIC), a unique type of quasi-governmental authorities that are allowed to bypass many governmental rules and to engage directly in market transactions, often with monopoly powers or preferential treatments provided by local governments (Wang & Zhang, 2009). UDICs were established in late 1990s when central government required that asset and liability should be managed by special enterprises rather than local governments (Su & Zhao, 2006). Therefore, UDICs function in most cities as a government extension to help manage the assets and transactions that local government cannot directly administer. UDICs often act on behalf of the government to borrow funds from financial institutes or other sources (including land transfer fees), issue bonds under supervision, supervise public-private partnership in infrastructure development, manage land and infrastructure assets (including sale, development), and administrate service provision (Su & Zhao, 2006). As quasi-governmental authorities, UDICs enjoy many special powers and advantag-

es in the real estate market. For example, they can often acquire farmlands on behalf of cities with lower compensation to farmers, and then convert farmlands into very profitable urban use (Peterson, 2006). They are allowed to borrow from banks for urban infrastructure improvements, with the loans guaranteed by local fiscal revenues (Wang & Zhang, 2009).

On one hand, the power and flexibility of UDICs have turned into tremendous amount of profits, which were often shared with local governments for further urban development, personal compensations, or other budgetary or extra-budgetary expenses. On the other hand, the questionable governmental-and-market double identity of UDIC and their untransparent operations have distorted market behavior, created inefficient rent seeking, and encouraged corruption. In recent years, there has been widespread discontent in China about skyrocketing land and property prices, and growing concerns about unsustainable local governmental borrowing. Many of these issues may be tied to the operation of UDICs (Deng, 2003; Anderson, 2011). However, more research efforts are in order to better understand UDICs, land transfer fees, and related policy effects.

6. CONCLUSIONS

China's urban infrastructure finance comes from both pay-as-you-go fiscal revenues and financing approaches. Fiscal revenues include budgetary allocation from the central or local governments, local earmarked taxes ("Two-item Funds"), fees and charges, and land transfer fees, etc. Financing approaches including debt financing, such as nationally issued bonds or other bank loans, and equity financing, such as self-raised funds, foreign capital investment, or stocks. In recent decades, local governments take strong initiatives to widen their revenue resources and diversify financing approaches. The overall funding level for urban infrastructure has grown significantly but with alarming regional disparities. The Municipalities and the eastern provinces gained a much larger share in the total resources due to their political importance and economic advantages. The western provinces, which used to be the area that developed the slowest, benefited from the central government's policy of prioritizing western development in the recent decade. Provinces in the central region, however, have seen the slowest urban infrastructure development due to lack of policy and financial support.

We posit that investment for public infrastructure is more efficient and equitable when the costs of the infrastructure are closely linked to its beneficiaries and, thus, key decisions about public infrastructure investments may be related to five benefit-related questions that start with "W"—"Who, Where, and When to benefit, to be paid back by What mechanism, and at Which level?" Based on this framework, we assess the unique characteristics of the China-style urban infrastructure finance.

First, Chinese governments have increasingly used market mechanisms to fund urban infrastructure development, but the distinction between governmental and market role is blurred in China. Second, investments for urban infrastructure in China are distributed very unevenly. Local governments have played an increasingly important role in funding urban infrastructure, and varied significantly in their financial portfolio. The reliance on central budgetary allocation is unbalanced, with preferential treatments to the Municipalities and western provinces. Third, the governments increasingly used future revenue strategies, including debt financing, equity financing, and local transfer fees, to fund urban infrastructure development. The strong reliance on market financing or other financial instruments with future obligations has led to questions about the sustainability of the current funding system. Fourth, experimentation with the use of land transfer fees is a China-style value capture strategy widely used in many localities of China, but there are serious concerns about volatility, disparity, and unsustainability of the land transfer fees, as well as related UDIC operations that are untransparent, prone to corruption, and difficult to be publicly accountable.

One of the limitations of this article is the lack of detailed data about financing approaches and their payback mechanisms. Based on anecdotal observations and interviews, we assume that equity financing and equity financing tend to be paid back with additional financial resources beyond the fiscal revenues analyzed in this article. In addition, we need reliable information sources to know more about land transfer fees and UDIC operations, whose practices vary significantly across localities and keep evolving. It seems that there are a tremendous amount of information shared by insider governmental authorities and developers but, for a variety of reasons, such knowledge is kept secret to the public and little of it has found its way into literature. Future inquiries along this line are in order to better understand China's urban infrastructure finance, its strength as well as challenges, and possible directions of policy evolution. In addition, we are continuing our research to analyze how China's urban infrastructure investment is allocated among different infrastructure types, how the investment has affected infrastructure conditions in different localities, and how it is related to economic development of China's local governments.

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