

Does privatization influence on public service equity? Evidence from urban public bus services in China

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ABSTRACT: *Since the late 1970s, privatization has been adopted as a major strategy of China's public service reforms. Much of the attention has been paid to the question how privatization affects economic performance, while few studies have discussed how privatization influences public service equity. In order to examine this question, China's urban public bus service is taken as an example; the Coefficient of Variation (CV) method is used to measure equity, and multiple-regression is used to test the relationship between equity and privatization. The results show that privatization could influence bus service equity by two key factors: competition and market accessibility. But ownership (being public or private) does not affect bus service equity significantly. The research also shows that a reversal of privatization does not have a clearly demonstrable impact on bus service equity.*

KEYWORDS: *NPM, privatization, equity, public bus service, reversal*

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1. Introduction

Since the late 1970s, governments all over the world have shifted toward market orientation and reform. In China, the local governments also turned to the market mechanism to supply public services and enhanced value for public money since that time (Jing & Chen, 2012). The market mechanism involves various privatization strategies, including contracting out, franchise, grants, subsidies, vouchers, free market and so on (Liang et al., 2007). Since the conception of privatization is so vast scholars have given it different interpretations ever since. In Europe, privatization simply refers to the transfer or sale of public enterprises to the private sector. While in North America, it also includes the various kinds of loosening government controls (Ohemeng & Grant, 2008). In this paper, privatization in the urban public bus transport field is regarded as a process that aims at shifting functions and responsibilities, as in part, from the governments to the private sectors. It regards the delegation of operation to private entities, under a regulatory design that specifies design of bus lines, bus stops, quality of buses and performance standards. And the operators have the freedom to create the timetables, vehicle types. If the operator needs to change the bus lines, it should apply to the local authority. If the authority approves it, then the operator can make the change. This means local authority would regulate the operators. The privatization can take place on single lines (in a city, some bus lines are operated by private firms, while other lines are operated by public firms) or to urban mobility as a whole (in a city, all lines are operated by private firms). Besides, it is necessary to distinguish the liberalization, which is leaving market forces free to decide where, when and how to run a bus line service.

Jing (2007; 2008) estimated that from 2002 to 2004 in China, about one third of government service expenditures were outsourced. The motives for privatization in China are different from

Western countries. On one hand, the increased demand for public service resulted from the marketization reform, urbanization and modernization development in China, caused public service expenditure to expand quickly. On the other hand, Chinese governments continued to downsize and deregulate, which made them to become more and more reliant on the market to supply public services. The two above aspects reflected the process of economic transformation and public governance reform in the past 30 years.

Advocates have emphasized the advantages of privatization strategies, such as enhanced efficiency, cost savings, improved effectiveness, better quality of services, smaller size of governments, greater discretion and flexibility, and expanded voice for consumers (Rho, 2013). However, critics have also pointed out many flaws, such as poor accountability mechanisms, the devaluation of public sector value, and sacrificed service equity and fairness (Brewer, 2000; Walker et al., 2011). For instance, China's urban public services face the predicament of unequal distribution among different social classes, and the uneven distribution in different geographical areas (Gao et al., 2011). But Savas (2000) has argued that institutional arrangements favoring privatization could improve public service economic equity and social equity. Equity implies a distribution that is proportionate to some objective measure such as need (Ashley, 2014). There is an unequal distribution of public service between urban districts and suburban areas. The reason is that there is a tension between efficiency and equity. In public transport field, throughout most of the 20th century, transportation goals were almost entirely mobility-based. Its focus was to efficiently move people. It was a utilitarian to plan bus lines to make the total benefits maximization. But since the early 2000s, equity issues became important. Local authorities

attempted to improve the transport situation of those worse-off as much as possible (Thomopoulos et al., 2009; Manaugh et al., 2015).

A lot of researchers have touched on the effects of privatization by examining economic performance such as efficiency and effectiveness, including the transport privatization policy (Preston & Robins, 2013). And most of them have researched on equity concept and the measurement methods of equity, but there has been a paradoxical lack of interest to test the relationship between privatization and social equity (Hansen, 2010). So, our research question is how privatization in public services affects social equity, and we will address the following topics in more specific discussions:

- Does privatization lead to a higher equity? What mechanisms are involved in this outcome?
- Does reversal of privatization lead to a higher equity?

We apply the theory to privatization and public service equity evaluation. In the second section, we give a brief literature review on privatization and public service equity. In the third section, we elaborate on the concept of public service equity and the relationship between privatization and equity, resulting in two research hypotheses. The fourth section, dedicated to research methods, data and variables, is followed by a summary and discussion of the findings. The final section presents conclusions and a discussion of the research results.

2. Literature review

Traditional public administration has often been described as an administrative monster generating low efficiency. New Public Management (NPM) theory and practice has focused on

redefining and restructuring the organizations and mechanisms to improve efficiency. It implies a greater reliance on market forces to supply public services and an opening up to competition at all levels (Simonet, forthcoming). The privatization process is one of such mechanisms to realize public sector reforms. Then, with the development of governance theories at the end of the 20th century, social equity was brought to the fore as being equally important among the traditional public administration values as efficiency and effectiveness. This encouraged researchers and practitioners to pay more attention to social equity. In this vein, it appeared inevitable to avoid discussion of the most important social consequences of the NPM. And there is now a long list of articles about this topic, which can roughly be divided into two categories.

Category one is about the relationships between privatization and public service performance. There are many articles that provide an empirical analysis of effects of privatization with a focus on economic and financial consequences, such as cost savings, efficiency, etc (Zullo, 2008; Smirnova et al., 2008). Much effort has been put into examining the question about how privatization affects economic performance, such as cost, revenue, and passenger numbers (Preston & Robins, 2013). Different theories provide different reasons. Public choice theory came first in arguing that private firms are more efficient than governments because of larger scale of economies and higher level of labor productivity. Public choice theory was that the self-interested bureaucrats responsible for both policy advice and service provision had an inbuilt incentive to maximize budgets. With the separation of purchaser and provider, policy-makers would no longer be motivated to enlarge the resources expended on services, but rather to ensure the efficiency delivery (O'Flynn & Alford, 2008). Privatization makes the purchaser and provider separation, and it is believed to lead to lower expenditure and higher efficiency. But some empirical studies do

not find cost savings (Bel et al., 2010). Transaction cost theory can explain it. The transaction cost was incurred in the process of making an economic exchange. It can be divided into three broad categories: search and information costs, bargaining costs, policing and enforcement costs. Besides, principal-agent theory also provides explanations on how monitoring affects the performance of agents and the involved costs. If monitoring costs for private agents more than offset the inefficiencies of public sector delivery, governments would lose the incentive to privatization and decide to contract back (Hefetz & Warner, 2004; 2012). Some claim that the above research does not capture the social values such as equity and fairness (Denhardt & Denhardt, 2000), but Andrews and van de Walle (2013) examined the relationship between NPM practices (e.g. public-private relationships) and citizens' perceptions of performance (efficiency, equity, effectiveness and responsiveness). Whether citizen perceptions of service delivery are accurate and useful in assessing the performance of public agencies are still under debate (Schachter, 2010).

Category two is about the public service equity examination and its determining factors.

Equity can be understood and examined from a variety of perspectives. Authors from different disciplines tend to focus on different ways to realize equity. For instance, in the disciplines of urban planning and urban geography, the issue of the spatial equity of urban public facilities has been investigated over the past two decades (Chang & Liao, 2011). Authors often use the Geographic Information System (GIS) method (e.g. spatial mapping) and spatial analysis models to measure the spatial mismatch between housing and public facilities, and suggest to promote equity through blueprint planning (Pham et al., 2012). In public finance field, researchers assess different regions of public service fiscal equalization with the Gini Coefficient, Theil index and

the Coefficient of Variation (Jia, 2011; Davis et al., 2013). The study of this field suggests a move towards public expenditure equalization. While in public transport field, some specific measures or indicators of transport equity includes the accessibility to destinations, the journey times for different income groups, and the transport distribution by Thiel index or Lorenz curves (Thomopoulos et al., 2009; Manaugh et al., 2015; Ricciardi et al., 2015). Besides, some studies have focused on measures of equity by understanding the relationship between transport supply and demand. This method was also meaningful (Currie, 2010).

The great majority of empirical research on the notion of equity in the distribution of public service has focused on measuring what equity is and how to realize it. Relatively little effort has been made to studies of the determinants of equity. First, some of the studies argue the government planning and policies playing an important role in providing an equitable public service system (Ahmed et al., 2008).

In China, the transport planning process does not consult the poor people and offers few benefits to them. Some local governments do not subsidize transport fares for low-income groups. Second, some of the studies focus on the institutional factors that impact public service equity (Liu, 2008). For instance, the inter-governmental fiscal transfer payment system did not make public service equalization in China (Wang, 2006). Coproduction could increase equity in public service delivery (Jakobsen & Andersen, 2013). Third, some social factor also could impact the public service equity. For example, Pham et al. (2012) show the environmental inequity between low-income people and affluent groups. Besides, Andrews and Van de Walle's (2013) add some control variables to test their impact on equity, such as deprivation, age diversity, ethnic diversity, population density and district council.

To sum up, in research on the relation between privatization and public service performance, most of the literature discusses how privatization affects cost saving, efficiency (for an exception, see the research by Andrews and van de Walle cited earlier in this paper). But there are few studies with a focus on the impact of privatization on equity. Moreover, the traditional literature on the determinants of public service equity is primarily based on a governmental supply perspective. This means that governments use the tools of planning, public policy and financial transfer institution to ensure the equalization. Hence it is necessary to take into account the aspects relating to the market mechanism for equity. Causal factors and institutional arrangements to promote equity are rarely examined. This paper aims at bridging the gap between privatization and equity, and providing opportunities to contribute to public administration theory by suggesting institutional incentives on how this can be accomplished.

3. Privatization and equity

Different definitions of equity can result in different priorities for service allocation. There are generally two kinds of equity: horizontal equity and vertical equity (Peters & Gordon, 2008; Delbosc & Currie, 2011; Litman, 2015). Horizontal equity refers to fairness and egalitarianism, which provides equal service to individuals disregarding their financial and ability. It does not favor one individual over another. The public service is provided equally regardless of mobility need or ability. Vertical equity means social justice and social inclusion. It is concerned with the distribution of impacts between individuals that differ in abilities, mobility needs, income and social class. For example, in public transport planning, the focus in the former is on distributing services to the maximum number of passengers, while the latter focused on providing transit

access to those without private vehicles (such as low-income groups) (Murray & Davis, 2001). In addition, we could define equity in other ways, such as equity of opportunity and equity of outcome (Litman, 2006). Equity of opportunity means that disadvantaged people have adequate access to public service opportunities. Equity of outcome means that society ensures that disadvantaged people actually get the same public service (Litman, 2006). In essence, these two kinds of classifications for equity amount to roughly the same. More specifically, equity of opportunity closely resembles vertical equity meaning that all people have adequate access to public service opportunities (van Wee & Geurs, 2011); likewise, the meaning of horizontal equity is in conformity with equity of outcome. In 2012, China's central government promulgated *The 12th Five-Year Plan for National System of Basic Public Services (The 12th Five-Year Plan)*, which defined the public service equity as the equity of opportunity. The goal of *The 12th Five-Year Plan* is to secure that everyone has the same opportunities to get public services. This paper defines the equity according to *The 12th Five-Year Plan*, i.e. equity of opportunity. It refers to local governments treating all types of people fairly to access public service (Andrews & van de Walle, 2013). Two kinds of equity of opportunity exist. One is public expenditure equalization, and the other is public service output equalization (Wang, 2011). Public expenditure equalization does not necessarily produce public service output equalization. Thus, we define output equalization as public service equity in this paper, whereas equity is related to a result where different groups receive their due (Ashley, 2014). Output equalization is the result of that type of equity of opportunity. For urban public bus service, the output equalization means there are more bus lines and more bus stops per area than before. Anyone in these areas has the chance to take the buses. And it makes people in these areas have more chance to take other public service than

before. For instance, a study conducted by the UK Social Exclusion Unit (SEU) identified that lack of transport as a significant barrier to get other public services, such as health care, employment (SEU, 2003). So, in this paper, the bus transport output equalization belongs to vertical equity and equity of opportunity.

Privatization is one of strategies that NPM has emphasized (Brewer, 2000). And privatization is believed to be the fundamental source for governments that opt to “buy” rather than “make” (Savas, 2000). To carry out this strategy, governments employ various managerial tools (competitive tendering, outsourcing etc.) aimed at bringing in more market competition and more private capital to achieve efficiency, effectiveness and flexibility (Savas, 2000; Walker et al., 2011). In a competitive market environment, the use of market mechanisms to inject providers with competitive pressures is thought to promote service providers not only improving public service quality but getting lower prices (Andrews & Entwistle, 2013). This is because citizens can vote with their feet by moving onto other providers or jurisdictions which strike a better balance between charge and public service delivery. For bus service, if one operator could not provide high quality bus services, then passengers could select the bus lines of other operators or select the taxi service. The private sectors who provide the public service must balance the needs and desires of each stakeholder, which may not maximize efficiency, but instead value equity (Leland & Smirnova, 2009).

However, some empirical results contradict the NPM ideas, and they found that private sector participation in the delivery of public service did not lead to a better use of resources, lower user prices or higher quality services (Silvestre, 2012; Smirnova & Leland, forthcoming). Privatization often “sacrifices quality for efficiency in public services, deliberately hides the true costs for

service delivery, and ultimately hollows out government service capacity while undermining the principles of democratic accountability” (Ward, 2007). Critics argue that other values (such as equity, citizen participation and democracy) are at least as important as efficiency (Grandy, 2009). They agree that privatization has indeed improved the efficiency and responsiveness of the public service, but they believe these positive results have been eroded by other unfair consequences, such as growing inequality in distribution. For example, for bus service privatization in China, private operators could not supply high quality bus services for the places of less people. Usually, these bus lines operate the old buses. They increase bus lines and buy new vehicles only to locations of profit potential. Their focus is to efficiently move the largest numbers of people. However, local governments do not have effective regulations over that kind of cream-skimming behavior. Inequity is arguably the largest concern with privatization (McDonald & Ruiters, 2012). If the privatization reform brought about inequity, then there were defects in the reform. So, whether privatization strategy can improve public service equity is one of the evaluation criteria for testing whether NPM has been successful or not. We suggest the following hypothesis 1:

H1: Privatization has a negative effect on public service equity.

After about 30 years’ development worldwide, many countries have begun to reverse privatization. Local government managers bring previously contracted services back in house in a process of reverse privatization. For example, compulsory competitive tendering was abolished in the UK and Australia (Warner, 2008), and many European cities are now bringing water contracts back under public control (Hall et al., 2013; Chong et al., 2012). It means a reassertion of the public role in the provision of public services and happens in a wide range of public services from health to transit to water, in countries from Asia to Europe and the US (Ramesh et al., 2010). It

turns to a zero-level of privatization. Reversals have also been found in China. The market reform of some kinds of public service is now recognized as a failure (Huang & Ye, 2011), and local governments are playing more important roles in public service supply once again. In urban public bus transport service, the public sector is now dominating the service system provision (Zou, 2009). *Shiyan* municipality, located in Hubei Province, regained its operational right for public bus transport service from a private franchise in 2008 after citizens' daily lives were severely negatively influenced by four strikes during the privatization period. Until 2009, all the private firms in *Chongqing* and *Shanghai* municipalities had withdrawn from the public bus transport market (Wang et al., 2014). Other municipalities in China, such as *Guangzhou*, *Changsha* and *Zhuhai* also cleared out the private firms and brought their public bus enterprises back under state control (Wang et al., 2014). In essence, these reversals aim to emphasize the responsibility of local government. One of the reasons for the reversal is that the expectation evoked by neo-liberal promises that privatization will lead to better efficiency, but this advocates often fail to be materialized (Warner, 2012). Not surprisingly, providing services equally is an important objective of the privatization reform, if not realize, alternative service delivery experiments (McDonald & Ruiters, 2012). Whether or not the reassertion of state in public service will succeed in promoting equity is still subject to debate, the process of new remunicipalization in China has one critical element, a search for public interest and equity. Advocates argue that the provision of public services by local authorities and their municipal companies (remunicipalization) has the potential to combine the political and the economic operational logic (Wollmann, 2012). In the past, privatization only pursued profit, as a consequence, neglected social value concerns. Thus, our second hypothesis reads:

H2: Reversal has a positive effect on public service equity.

4. Variables, methods and data

4.1 Unit of Analysis

This study selects China's urban public bus service for testing our hypothesis. The reasons are as follows. Firstly, public bus service is a basic facility and has a history of privatization and reversal in China. Since the 1990s, the public bus system underwent a thorough reform and was subject to the market mechanism. Many municipal governments used different privatization tools (contracting out, franchise etc.) to deregulate the market. Thus, the reform in the public bus system is an important indicator for public service reform at large. However, since 2008, public bus services in many municipalities have been re-appropriated within the public realm, a reversal of the original privatization. The reasons for the reversal include economic factors (e.g. transaction cost and insufficient competition), political factors (e.g. Chinese political incentive structure), social factors (e.g. loss of public interest), management factors (e.g. lack of monitoring from governments and lack of knowledge regarding privatization) and others (e.g. expiry of concession and policy learning). Public bus services are provided again by local authorities and/or their municipal companies. Secondly, the distribution of bus service in China is unequal. The public bus stops are often unevenly distributed within different metro status (metro core, suburb). And buses are often overcrowded. Low-income segments of the population lack access to benefits provided by bus operators. This kind of disproportionate distribution is especially serious in large cities (Hou et al., 2012). The reason is that at the present stage of rapid urban growth in China, it shows the fast growth of population, but the lack of public service. In this situation, the urban public bus

service is distributed to the maximum number of users (metro core). Thirdly, the public bus service can easily be measured. Many information and data can be collected from Chinese official policy documents. This gives us a unique opportunity to test the level of equity from the influence of privatization. Given previous evidence on privatization reform and disparities in China's urban public bus service, we have selected 246 cities as our sample. In the mainland of China, there are three kinds of cities: *cities directly under the central government* (4 cities, *Beijing, Shanghai, Tianjin and Chongqing*), *sub-provincial cities* (15 cities, *Guangzhou, Shenzhen, Shenyang, Changchun, Harbin, Nanjing, Hangzhou, Wuhan, Chengdu* etc.), and *prefecture-level cities* (nearly 270 cities, some of them are the provincial capital, such as *Nanchang, Taiyuan* etc.). The latter two kinds of cities are directly under the control of different provinces. In 2012, there were 288 cities. But we could not find the data of some cities, such as *Lhasa* city. So, we selected 246 cities at last.

4.2 Dependent Variables: The Measurement of Public Bus Service Equity

This paper takes output of equalization as public service equity. For public bus services, governments and operators input finance and human resources to produce outputs, such as the number of bus lines, the length of bus line, the number of bus stops and so on. Because of the data, we only can get the number of bus lines in every district in a city, but could not get the length of bus lines and bus stops. So we take the number of bus lines to measure the equity, which means the spatial distribution of accessibilities across zone areas (Feng & Zhang, 2014). Equity issues have been examined in the literature under a variety of disciplines. A primary focus has been on the distribution of services around a region or among a population (Welch, 2013). This paper focuses on the former issue. Specifically, *we use the Coefficient of Variation (CV) method to*

measure the bus lines' disproportionate distribution among different regions (metro core, suburb etc.) in a city. In probability theory and statistics, the CV is a normalized measure of dispersion of a probability distribution. It could refer to tailor bus service provision to meet the needs of the diverse regions of citizens that they serve. The CV is defined as the ratio of the standard deviation σ to the mean μ . It shows the extent of variability in relation to the mean.

$$cv = \frac{\sigma}{\mu}$$

Where the mean μ is the average number of bus lines among different regions (metro core, suburb et al.) in a city. The standard deviation σ is the number of bus lines among different regions (metro core, suburb etc.) in a city. Of course, the CV does not work well if the mean value is close to zero, since it would make the CV quite high and volatile. Distributions with $CV < 1$ are considered low-variance, while those with $CV > 1$ are considered high-variance. So, if the CV has a larger value, it means there is a great variation of the bus lines among different districts in a city, and it implies a higher level of unfairness among the different districts. On the contrary, if the CV has a smaller value, it means more equity. In the field of Chinese urban public bus service, this claim is true. Normally, the price of urban public bus service is one or two *yuan* RMB. Private-operators' bus tickets could not be more expensive than the public-operators. These revenues from tickets can not suffice to recover the cost. According to the contracts, local governments pay the subsidies to the operators every year. These subsidies are related in the service performance and operation cost.

The data on the bus lines for different regions were taken from the 8684 website (www.8684.cn) and the cities' statistical information is in 2012.

4.3 Independent Variables

There are two kinds of independent variables, *privatization* and *remunicipalization*. They are used to test the above two hypotheses. The former variable is to test the relationship between privatization and equity, the latter is to test whether reversal of privatization improves equity.

For *privatization*, it tries to bring competition and market function to supply public service. There are three dimensions to describe privatization. They are market access, competition and ownership. Market access in the privatization means whether private companies could be included in this field. When private companies could participate in this market, governments could select the most qualified candidates to supply the public services. These candidates can make the equity goal become true. Competition in privatization means the operators get their contracts and market share by tendering process. The proponents of privatization tend to emphasize the crucial role of competition (Rainey, 2004). Private participation is associated with a tendering process, while direct public administration is not subject to such competitive pressures (Roy & Yvrande-Billon, 2007). Competition issues therefore reinforce the expectation that public service provision tends to be more equity. Ownership in the privatization means there are many kinds of ownership companies in the market, such as the public-owned operators and the private-owned ones. The objective of a private firm is to gain profits. While the objective of a public-owned operator is for the public interest. So we anticipate that the public operators can make the bus service more equity. With the result that this paper thus selects 3 indicators, *the ratio of private providers to existing agencies* (Leland & Smirnova, 2009), *tendering process or not*, *the ratio of private ownership' bus lines to all lines*, to measure *privatization*, respectively.

- The first indicator, *the ratio of private providers to existing agencies*, is used to measure how many private bus service providers there are in a city. More private providers mean that local

governments have a more open stance and attitude to private operators. They have more chance to access the public bus transport field. A private provider is defined as an entity holding a minimum of 50 per cent of the shares in private hands (Scheffler et al., 2013). The data of bus service providers' information comes from local government reports and bus companies' websites in 2012.

- The second indicator, *presence or absence of a tendering process*, is used to measure the market mechanism. A market-oriented strategy often implies that a competitive tendering process is used to select operators. This is a kind of competition for the field, not competition in the field. It follows a market-based, principal-agent type of relationship where monitoring, reporting, evaluation are used to enforce contractual terms (Jing & Chen, 2012). It is believed to be the fundamental source of efficiency for governments that opt to buy rather than make. Government-oriented strategies often use a negotiation process to select operators. So, *privatization* implies the presence of a tendering process. In this paper, *tenders* are a dummy variable that assumes the value 1 if there is a tendering process, and assume the value 0 if there is a negotiation process. This indicator stands for the competition *for* the market. The data comes from local government reports in 2012.

- The third indicator, *the ratio of private ownership' bus lines to all lines*, is used to measure the role of the private owners of bus services, and the ownership structure in the bus service market. A private operator is defined as an entity of which a minimum of 50% of the shares is in private hands. The higher the ratio is, the stronger is the private control. The data on the bus lines have been taken from the 8684 website and the *China City Statistical Yearbook 2012*.

For *remunicipalization*, it tries to bring government function and public owners' role to

supply public service. In China, many urban public services made the reversals happen after 2008.

Thus, in this paper one indicator is selected to measure *remunicipalization*, which is the *presence or absence of (privatization) reversal*.

● *Presence or absence of (privatization) reversal*, is a dummy variable, which assumes value 1 if there is privatization reversal since 2008 for a given city, and assumes value 0 if there is not privatization reversal since 2008 for a given city. This indicator is used to measure the effects of a reversal. The data comes from local government reports.

4.4 Control Variables

Four measures are used to control for the effects of external circumstances, which may influence the relation between privatization and equity of local public bus service provision. First, we include the *government level of a city*. This is an instrument used to gauge the levels of economic and social development in a citywide. It also can capture the potential heterogeneity observed areas. Normally, higher *government level of a city* in China would have a higher of economic and social development. This is a dummy variable, which assumes value 1 if a city belongs to *cities directly under the central government, sub-provincial cities or provincial capitals*. And it assumes value 0 if a city belongs to *prefecture-level cities* (except the *provincial capitals*). Earlier research by Andrews and van de Walle (2013) showed that the deprivation (to gauge level of socio-economic disadvantage in an area) is negatively related to public service equity. We thus anticipate that areas with higher *government level of a city* will have lower level of CV value. An alternative argument could be that in more developed cities, expectations about public bus service are more equity.

Next, we include *the proportion of the downtown to the whole city in population* in 2012.

This is an instrument used to gauge the levels of demographic diversity in a citywide. In China, the city can be divided into several districts, some districts are in the downtown areas, and some other districts are in suburb. This variable also could reflect two contrasting perspectives in public transport planning. One focus is to efficiently move the largest numbers of people, particularly for urban districts. The other focus is to provide transit access to those with greatest “need”, such as those suburban areas without other competing transportation options (Delbosc & Currie, 2011). In China, the public transport planning perspective is the former. Thus we anticipate that higher level of *proportion of the downtown to the whole city in population* will have higher level of CV value.

In addition, we enter a dummy variable, *rail transit*, which assumes value 1 if there were rail transits in 2012, and assumes value 0 if there were no rail transits in 2012. We expect to discover whether other competing transportation options impact on the public bus service equity.

At last, we include *the proportion of people without a car in the whole city's population*. The data was in 2012 and come from the yearbooks of those cities. The variable is to measure the bus service demand across different cities. We naturally hypothesize that this variable impact on equity. The high level of the variable would have a higher expectation of equity.

A summary of the obtained statistics for the variables are given in Table 1 to Table 5. These data have been analyzed through an ordinary least square (OLS) regression.

Tables 1 to Table 4 are here

5. Findings

The relationship between public service equity and privatization is neither a simple linear one, nor the one between public service equity and remunicipalization. We make squared forms of *the ratio of private providers to existing agencies* and *the ratio of private ownership' bus lines to all*

lines as indicators of independent variables. The nonlinear relationship analysis helps understand the influence of privatization on equity better. To test the two hypotheses above, we make the multiple regression models to estimate the effects of the privatization and remunicipalization on the dependent variable measuring public service equity (see Table 6). In each of the models, the dependent variable is the value of CV. In model 1, the independent variables are indicators of privatization and the indicator of remunicipalization. In model 2, we add the control variable of *the government level of a city*. In model 3, we replace *the government level of a city* by *proportion of the downtown to the whole city in population*. In model 4, we replace it by *rail transit*. In model 5, we replace it by *the proportion of people without a car in the whole city's population*. And in the model 6, we add the four control variables together.

Table 6 is here

Table 6 provides a good test of the privatization-equity hypothesis because the independent variables are a multidimensional measure of privatization. In these models (from model 1 to model 6), only the first three indicators of the independent variables reach statistical significance. *The ratio of private providers to existing agencies* and its squared form are significant. Meanwhile, the slope of the linear form is positively correlated with the CV value, while the slope of the squared form is negatively correlated with the value. This indicates that the relationship between *the ratio of private providers to existing agencies* and the CV value has an “inverted U” shape. The number of private providers could bring about a low value for the CV when it reaches a certain number. A lower value for the CV means more equity. So it means the relationship between *the ratio of private providers to existing agencies* and equity is a “U” shape. From the result we can infer that a more open market (more private providers) actually helps realize equity. More

citizens could select the service providers through exit strategies.

The indicator, *presence of a tender*, has a negative influence on the CV value. And it is statistically significant. The tendering process actually decreases the CV value. This is evidence that the competitive tendering process might improve equity. Local governments select the most suitable providers, which can supply services at lower costs, higher quality and higher accountability than after a non-competitive negotiation process.

The indicators, *the ratio of private ownership' bus lines to all lines* and its squared form, neither have significant relations with the CV value. This indicates that the relationship between private ownership and the CV is insignificant.

Then, from the table 6, we also can see that the measure for reversal, the *presence of reversal*, does not have a statistically significant influence on the CV value except the model 2. The significant value of *presence of reversal* in model 2 is 0.098, which is nearly insignificant. More precisely, remunicipalization of public bus services does not seem to improve equity. The result is somewhat surprising given the fact that privatization did have a significant (positive) effect.

In terms of external influences on public bus service equity, we see that *the government level of a city* has a negative influence on the CV value. And it is statistically significant. It implies that a higher government level of a city would have a higher equity of bus service. In China, a higher government level means a higher economic and social development level. In those cities, citizens have more ways to express their opinions. And the governments also respect their opinions more. This kind of participation could make the bus service more equity. However, other three control variables are insignificant from model 2 to model 6. These indicate that the population distribution, transportation options and bus service demand could not impact on bus service equity.

In sum, based on the models above, it is noteworthy that hypothesis 1 is not supported. Neither is hypothesis 2. Under the influence of tendering process and market accessibility, private providers have made inroads into local public bus service markets, providing services such as investment, operation and maintenance. These movements could improve service equity. The findings seem to support Savas' claim (2000) that institutional arrangements that encourage privatization have a significant and positive effect on equity. However, we should know that whether the operators are public or private ownership, the key factors for equity are competition and accessibility of market.

6. Conclusion and discussion

In the past few years, China has been trying to build an inclusive and harmonious society. In bus service provision, there has been an obvious distributional inequality between densely populated urban cores and suburban neighborhoods when it comes to the quality and quantity of public service. In this paper, an attempt has been made to define and measure public service equity of bus services in 246 cities along the directions of the *12th Five-Year Plan for National System of Basic Public Services in China*, taking equity of opportunity as a point of departure, which implies public service output of equalization rather than absolute egalitarianism. We have subsequently used quantitative methods (Coefficient of Variation and multiple regression analysis) to evaluate the equity of urban bus services following that definition.

From our sample, we conclude that public bus services privatization in Chinese cities could improve public service equity. This conclusion is determined by the indicators, *ratio of private providers to existing agencies* (market accessibility), *presence of a tendering process*

(competition), rather than *the ratio of private ownership' bus lines to all lines* (ownership). These results seem to contradict those of Andrews and van de Walle's (2013), who found that public-private relationships correlated negatively with citizen perceptions of equity. One reason for this conflicting result may lie in that equity in our paper is calculated following an objectified standard, while equity in their paper is of a more subjective nature. Another reason may be that their citizen's perception of public services refers to a generic attitude (which includes and may differ across various policy areas), while ours specifically targets bus services. A third possible reason can be that institutional context and starting position for the privatization in Chinese municipalities is so different (that is less advantageous) from those in Europe or North America that improvement through privatization is easier to generate or hard to compare.

A second key finding is that a reversal of bus service privatization does not have a clearly demonstrable impact on bus service equity. *Presence of reversal* appears to have an insignificant impact on public bus service equity. Although this seems a puzzling outcome at first sight, it may mean that the gains obtained by earlier privatization are undone by remunicipalization. The reasons are that competition and market accessibility (institutional, contractual and organizational incentives arrangement) are the key factors that determine equity outcomes rather than the mere fact of services being public or private (ownership). In China, the drive for remunicipalization derives mainly from a local political logic, where the role of local government in stimulating economic growth and regulating markets is emphasized. When it comes to efficiency and equity of public service provision, these policies may actually be based on erroneous assumptions.

The study above has been one where the relationships between bus privatization (and reversal of privatization) and public bus service equity has been explored. Our definition of public

bus service equity has been taken from official Chinese policy documents. And our measurement of equity was based on regional/district distribution of bus services. On the one hand, it could measure the uneven distribution among different districts inside a city; On the other hand, it also could compare the degrees of bus service equity among different cities. These results could be used to make transport equity policies by local governments and central government. However, this measurement method is not the only conceivable one. It has been one of even geographic distribution, but bus services differentially provided across neighborhoods with different income groups was also a conceivable way to measure and might have generated different outcomes. However, there are some limitations for this method. For instance, it needs enormous amount of data about the information of different income groups (travel information and income for everyone). This needs do larger scale of investigation works inside a city. So, this method could be used to measure equity in a city, it is unfeasible to be used to compare the equity among different cities. We believe that future research should explore different possible outcomes for different definitions of equity, but also on the institutional, contractual and organizational conditions in which privatization and its reversal occur.

What needs to be pointed out is the findings are specific to China, because the geography of downtown areas and suburbs is dramatically different. China is a developing country. One of the characteristics of developing countries is the large regional differences. Some Asian countries have the same situation. So our studies could be useful for the urban bus transport privatization and equity policy making of these countries.

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Table 1 Descriptive statistics of variables

	Variables	Number of observation values	Min	Max	Mean	Standard deviation
Dependent variable	Coefficient of Variation (CV)	246	0.0143	2.0501	0.9695	0.3217
Independent variables	Ratio of private providers to existing agencies	246	0	1	0.1682	0.3543
	Presence of tender	246	0	1	0.09	0.286
	Ratio of private owned lines to all lines	246	0	1	0.1398	0.3313
	Presence of reversal	246	0	1	0.05	0.224
Control variables	The government level of a city	246	0	1	0.1016	0.30277
	The proportion of the downtown to the whole city in population	246	0.0438	0.9859	0.3077	0.1883
	Rail transit	246	0	1	0.05	0.216
	The proportion of people without a car in the whole city's population	246	0.2090	0.9793	0.8270	0.1327

Note: "whole city" includes the urban districts and suburban areas.

Table 2 Descriptive statistics of "presence of tender"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	224	91.1	91.1	91.1
	1	22	8.9	8.9	100.0
	Total	246	100.0	100.0	

Table 3 Descriptive statistics of "presence of reversal"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	233	94.7	94.7	94.7
	1	13	5.3	5.3	100.0
	Total	246	100.0	100.0	

Table 4 Descriptive statistics of "rail transit"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	234	95.1	95.1	95.1
	1	12	4.9	4.9	100.0
	Total	246	100.0	100.0	

Table 5 Descriptive statistics of "government level of a city"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	221	89.8	89.8	89.8
	1	25	10.2	10.2	100.0
	Total	246	100.0	100.0	

Table 6 Effects of privatization and remunicipalization on public bus service equity

Independents Variables	Dependent Variable (CV)					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	0.969*** (0.023)	0.976*** (0.023)	0.974*** (0.041)	0.968*** (0.023)	0.965*** (0.145)	1.040*** (0.156)
<i>Ratio of private providers to existing agencies</i>	2.914*** (0.743)	3.993*** (0.778)	2.949*** (0.763)	2.949*** (0.775)	2.918*** (0.764)	3.274*** (0.806)
<i>Squared form of the ratio of private providers to existing agencies</i>	-2.733*** (0.779)	-3.115*** (0.801)	-2.760*** (0.792)	-2.760*** (0.807)	-2.736*** (0.794)	-3.008*** (0.827)
<i>Presence of a tender</i>	-0.424*** (0.192)	-0.47*** (0.193)	-0.426*** (0.192)	-0.424*** (0.192)	-0.425*** (0.194)	-0.467** (0.195)
<i>Ratio of private bus lines to all lines</i>	-1.324 (0.984)	-1.210 (0.981)	-1.337 (0.988)	-1.335 (0.990)	-1.323 (0.988)	-1.119 (0.993)
<i>Squared form of the ratio of private bus lines to all lines</i>	1.304 (0.850)	1.107 (0.853)	1.310 (0.853)	1.313 (0.855)	1.303 (0.856)	1.096 (0.866)
<i>Presence of reversal</i>	0.115 (0.142)	0.171* (0.148)	0.119 (0.144)	0.119 (0.149)	0.116 (0.144)	0.127 (0.152)
Control variables						
<i>The government level of a city</i>		-0.149* (0.088)				-0.172* (0.098)
<i>The proportion of the downtown to the whole city in population</i>			-0.013 (0.119)			-0.013 (0.130)

<i>Rail transit</i>				-0.010 (0.124)		0.029 (0.129)
<i>The proportion of people without a car in the whole city's population</i>					0.002 (0.17)	-0.035 (0.177)
R ²	0.064	0.076	0.064	0.064	0.064	0.078
Adjusted R ²	0.04	0.049	0.036	0.036	0.036	0.038

Note: Standardize “beta” coefficients are reported. Standard errors are in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%.