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Public Bus Transport Reform and Service Contract in Arao

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Abstract

Confronting with declined passengers and increased subsidy, Arao city government has taken a plan for reforming public bus transport since 2005. The monopoly operating right of public bus transport service was transferred to one private company. This paper summarizes the valuable experience of public transport reforms by analyzing the subsidy and efficiency before and after the reform in Arao. The reform has proven to be influential on reducing subsidy. However, it is hard to balance the service level and cost thus subsidy. By summarizing the characteristic of the reform, results show that introduction of competitive tendering is necessary in a long time in the reform afterward. Moreover, an appropriate contract and regulatory rules that contract parties both operator and authority in the provision of the services are important as well.

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Keywords: Public bus transport; Regulatory reform; Privatization; Subsidy

1. Introduction

Facing the increasing price of fuel, many nations are set up goals to reduce energy consumption. Energy related to individual transportation and housing is a big contributor to energy consumption. With increasing in the standard of living, the world is shifting toward faster traffic modes, which also are more energy intensive. Many problems are caused by road transportation, such as energy dependency, air pollution. A number of policies are developed to mitigate these problems, such as TDM (Travel Demand

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Management) techniques, ITS (Intelligent Transportation Systems), and changes in land use [1][2][3]. Promoting transit usage is one policy option since it contributes to use less energy and fewer emissions per passenger moved. Indeed, private vehicles consume around 2-3 MJ/pkm (106 J/pkm) while diesel buses are close to 1 MJ/pkm and electric trolley buses or light rail system are at 0.3 MJ/pkm [4].

As an integral and important component of local transportation systems, public transport should be managed well in order to satisfy the need of community and contribute more to a friendly living environment. However, local governments are facing decreased usage of public transport and meanwhile reduced revenues. Inefficiency of service together with poor service quality and quantity make low availability of local public transport service in many countries[5][6]. Therefore, countermeasures and reform should be made to improve the operation efficiency of public transport. Although lots of studies analyze public transportation reform, most analyze the topic theoretically [7][8]. Very few studies investigate the actual practical experience by analyzing characteristics of reform cases in different countries. Learning from cases is essential for further reform afterward.

This paper intends to study the reform of public bus transportation services in Arao with the goal of learning valuable lessons for public transportation reform. The paper starts with introduction of public bus transport of Arao in Section 2. A brief comparative analysis of the reform is shown in Section 3. Section 4 proposes some strategies to reduce the subsidy of public bus transport in Arao.

2. Public Transport Reform

Arao is a city in Kumamoto Prefecture, Japan. According to the census of 2010 census, there is a number of 55,321 residents live in the total area of 57.15 km² in Arao [9]. 28.4% of population are elders that over 65. In comparison with the 21% of aging rate in Kumamoto, Arao faces serious aging problem. Arao is a small city. Public transport in Arao city is based on the operation of bus and railway. Public bus transport service in Arao is confronting challenges such as declined bus passengers due to the influence of motorization and declined population. Number of bus passengers decrease year by year. The number of passengers drops from 606 thousand in 2003 to 341 thousand in 2010. 43% of passengers decreased during six years. Moreover, the public bus transport sector faces serious deficit. More additional subsidy from Arao government is needed to support its public transport service. The subsidy reaches to 154 million yen in 2003 before the reform.

In order to increase the operation efficiency of public bus service, Arao city government handed over its publicly bus operation to the a private bus company called Kyushu Sankou Bus Company in April 2005. Arao intends to transfer the government management of public bus transport service to the private management. It takes two steps to carry on the privation process. At the first step from 2005 to 2008, all buses and related facilities were sold to the private company. All bus stops and facilities were freely been transferred to the private bus company too. Moreover, the private bus company was allowed to use bus terminal and bus garage with the condition that the company should pay the rent to Arao city for using the land of garage and keep maintaining the building of the bus garage as well. Meanwhile, the private company has to make sure to keep the service level as before at the first three years after privation transfer. Key elements of services, such as routes, frequencies of buses, and fare should not be changed from April, 2005 to March, 2008 to ensure a smooth transfer. To compensate for maintaining the service level, Arao city government gave subsidy to the private company through providing amount of 30 yen per running kilometer, rather than fixed amount of subsidy to the private company at one time.

The second step of the reform takes place three years later. New countermeasures were carried out. Most importantly, the private bus company could reorganize routes and frequencies of public bus transport service since 2008. Considering the bus service level and the opinion of residents, the key

elements of bus service such as route, frequency, and Working kilometer were changed again in 2009[10]. The detail characteristics of the reform are shown in Table 1.

Table 1 Characteristics of the reform

Year	2005	2008	2009
Number of bus	17	17	17
Number of bus stop	260	255	255
number of route	22	14	18
frequency in weekday	28	32	58
frequency at weekend	31.5	29	35
Working kilometer (km)	273	171	206
Total running kilometer	419078	364484	422567

3. Results

3.1. Subsidy, cost, and revenue

The reform increases operation efficiency of public bus service. The amount of subsidy for public bus operation decreases. As shown in Fig.1, the annual cost and revenue of bus operation declined as well. However, problems, such as increasing subsidy thereafter, decreasing of passenger, and no competitive circumstances of its public bus operation, still exist. After the privatization of public bus company, the number of subsidy still increase over the years in Arao city. Despite it decreased sharply by 67.19 percent at the beginning of the reform in 2005, it still shows increased trend thereafter.

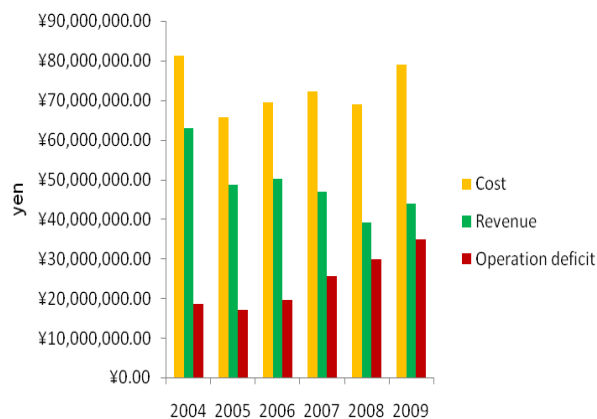


Fig. 1. Cost, revenue, and deficit from 2004 to 2009

The average cost of public bus operation shows the trend of decline. The revenue per running kilometer decreased from 150 yen per kilometer in 2004 to 104 yen per kilometer in 2009. 194 yen is needed for running one kilometer by public transport in 2004. It reduces to 177 yen per kilometer in 2006. Although a little increase of cost is found in 2007 and afterward, the cost still falls compared to the value before reform. The average operation revenue also shows a trend of decline. It decreases to 133,411 yen

in 2005 from 172,218 yen in 2004. With less running kilometers, the daily revenue reduces to 107,073 yen in 2008. However, it increases again in 2009 after the reorganization of routes.

3.2. Service level

The service level is an important element that affects both cost and passenger number thus revenue. It is hard to find a balance of cost and revenue. Although the number of passengers declines due to decreasing population, it is vital to attract more bus users based on good service. However, the reform put it a challenge. The nature of private company makes it focus on the profit. We analyze the service level just from the aspect of accessibility, rather than the travel time or distance since there are few serious traffic jams in a small city as Arao.

Table 2. The service level before and after the reform

An example of a column heading	2005	2008	2009
Operating kilometer per day (km)	1016	998	1158
Average frequency (times/day)	29	31	51
Density of bus line (km/km ²)	4.78	3.00	3.61
Density of bus stops (number/km ²)	4.55	4.16	4.16

4. Discussion

It is acknowledged that the privatization reform of public bus transport takes effect in Arao. The subsidy decreases after the reform. Although the amount of subsidy had decreased sharply in the early of privatization in 2005, it still shows the increasingly trend after that.

Several actions and strategies could be implemented for the future reform to balance the service level and deficit. Firstly, it is reasonable to seize upon service contracts system by involving more private operators in the provision of public bus transport service with competitive tendering. A legal framework is required which allows and protects property rights and fair trade for competitive tendering under service contract system. Even though the current road transport law in Japan allows for local authority to have more discretion to plan and organize its public bus transport service inside its own municipal boundaries, it does not explicitly regulate competitive tendering. Therefore, there must be clear transport objectives in which competition takes place. Moreover, this approach needs the availability of fund for the viability. Strong executive power for conducting this approach should be left to the hands of local authority. Other concerns in terms of implementing this approach is the availability of legislation that guarantees the succession of employee when operator who win the contract changes. Indeed the availability reasonable operators who are likely interested in bidding to run the service should concern as well.

Secondly, an appropriate contract and regulatory rules of the contracting parties both operator and authority in the provision of the services are important as well. The relationship between Arao city authority and private bus company in the provision of public bus transport service is taken place without employing the characteristic of contracting fully. Except renting the land and maintaining the building of bus depot or garage, there is no final contract in detail to order the right and obligation between Arao city and the private bus company. The profit of private bus company is independent of its cost. The fare revenue is not linked to cost of production and commercial revenue. Therefore there is little incentive of the bus company to improve the efficiency of service. This is particularly a costly post-contractual effort

in term both production and revenue risk. Contracts should be designed in such a way that they effectively put pressure on service suppliers to achieve the required levels of service, and should be main instrument used to ensure the continuity and stability of services. For better result, it needs to conduct monitoring effectively.

5. Conclusion

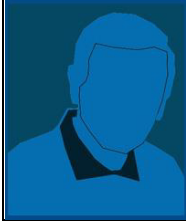
This paper introduces the reform of public bus transport since 2005 in Arao city. The monopoly operating right of public bus transport service was transferred to one private company. By analyzing the process and challenges after privatization reform from 2005 to 2009, findings suggest the implementation of competitive tendering is vital. However, it needs policy support, legal framework, institutional capacity, and expected bidders to take part in. In case of it could not be realized immediately, as a short term solution, the current subsidy scheme should be rearranged in order to reduce losses. The introducing of a clearer transfer standard becomes of great importance. Key performance indicators in the event of inadequate performance, along with penalty would assist the maintenance of efficient performance. It could reduce amount of subsidy.

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References

- [1] Yin Y, Mizokami S, Maroyama T. An analysis of the influence of urban form on energy consumption by individual consumption behaviors from a microeconomic viewpoint. *Energy Policy* 2013; **61**: 909-919.
- [2] Yin Y, Mizokami S, Aikawa K.. Compact development and energy consumption: Scenario analysis of urban structures based on behavior simulation. *Applied Energy* 2015; **159**: 449-457.
- [3] Yin Y, Chen T, Du Z, Mizokami S. The impact of transport pricing policy on individual energy consumption: A modeling case study in Kumamoto. *Journal of Advanced Transportation* 2016, In press, DIO: 10.1002/atr.1354.
- [4] Schafer A, Victor D. Global passenger travel: implications for carbon dioxide emissions. *Energy* 1999; **24 (8)**: 657-79.
- [5] Altshuler A. Limitation of Competition in and for the Public Transportation Market in Developing Countries: Lessons from Latin American Cities. Transportation Research Record: *Journal of the Transportation Research Board* 2008; **2048**: 8-15.
- [6] Amaral M., Saussie S, Yvrande A. Auction procedures and competition in public services: The case of urban public transport in France and London, *Utilities Policy* 2009; **17**: 166-175.
- [7] Brendan F. Advancing Urban Passenger Transport Reform in the Europe and Central Asia Region. Reform Options Report for word bank, 31st December 2003.
- [8] Yutaro M. A study on incentive subsidy scheme considering elastic demand for local public transportation. Thesis for master degree at Kumamoto University. 2012.
- [9] http://www.pref.kumamoto.jp/uploaded/life/2808_1015153_misc.pdf. Accessed May 17, 2004.
- [10] Hamis Juli Emri. A Comparative Study on Regulatory Reform and Service Contracts in Public Transport. Thesis for Ph.D at Kumamoto University, 2012.

**Biography**

Assistant Professor at Ningbo University in China. Research interest area includes traffic policy, land use policy, and compact city strategy.