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THE INTRODUCTION OF ROAD PRICING POLICY AND FORMATION OF SOCIAL CONSENSUS

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Abstract

Road congestion and physical pollution have become a severe problem in cities around the world, especially in cities in Japan. An immediate solution is being called for. Policies to restrain traffic volume in city downtown areas were announced in Tokyo last year. This paper focuses on the problems of forming the social consensus, which is the major hurdle to be overcome in introducing road pricing. It will examine how public consensus is formed by analyzing the influence of road pricing on traffic behavior and the recent changes in social consciousness concerning road pricing in Japan. This paper will focus on the following: the necessity of car traffic restraint policy, the influence of road pricing policy on traffic behavior, and changes in social consciousness concerning road pricing and how this social consensus may be formed

INTRODUCTION

As car traffic is increasing, traffic congestion and car pollution are becoming more and more severe in cities around the world. This is especially true in highly populated countries such as Japan, and a solution is badly needed. At last, the Tokyo Metropolitan Government announced the TDM policy last year in order to restrict the traffic volumes in the center of Tokyo. Through this policy, the Government aims to reduce traffic volumes by the year 2000 through various measures including road pricing, and park and ride systems.

This paper focuses on the problems of forming the social consensus which is a major hurdle to be overcome in introducing road pricing. It will examine how public consensus is formed by analyzing the influence of road pricing on traffic behavior and the recent changes in social consciousness concerning road pricing in Japan.

The SEVERE CAR TRAFFIC PROBLEMS IN CITIES

In recent years, car traffic problems, road congestion and physical pollution, have become a more severe problem as traffic volume has increased in cities, especially in big cities in Japan. I'll explain the present condition of road congestion and air pollution in Tokyo and Kamakura.

First, let's survey the present condition of traffic congestion in Tokyo. The volume of vehicles has increased by 16% between 1987 and 1996, with a total of 4.25 million vehicles (excluding motorcycle) registered within the city in 1996. In particular, the volume of private cars has been increasing at the highest rate, at 28% over the same period of time. Next, while it should be noted that the volume of traffic in the city decreased by 2.7% between 1992 and 1996 it increased by 1.5% between 1987 and 1996 according to the Tokyo Metropolitan Police Department. Furthermore, on the Metropolitan Expressway it increased 25%. In addition, the total length of congestion in the city increased 5% between 1993 and 1996, while on the Metropolitan Expressway it increased 8%.

Thus, in spite of decreasing of traffic volumes in recent years, road congestion in Tokyo is still a severe problem not only in quantity of the length of congestion but also in the degree of the congestion. Needless to say, in Japan, air pollution is also a severe problem. The density of nitrogen oxides (NO_x) especially is going from bad to worse. Emissions regulations introduced in 1973 have reduced the density of hydrocarbons and carbon monoxide. But the density of NO_x averages about 0.04 ppm per year, and it has shown little reduction during the last 20 years, and furthermore it has begun to rise in recent years. As cities grow in Japan, NO_x emissions are increasing and only half of the cities officially surveyed in the Tokyo, Osaka, and Yokohama areas meet the government standards for NO₂ limits. This low rate of success has hardly changed in the last 5 years, and this is especially due to the increase in the number of diesel vehicles. In Tokyo, the percentage of diesel trucks has risen by 61.8% and diesel cars by 7.1% and diesel vehicles accounted for 20% of the total number of vehicles in 1996. Thus unfortunately, in spite of government efforts to reduce NO_x, the situation is not improving.

Next, let's survey the present condition of traffic congestion in Kamakura during holidays. Kamakura is an ancient city of historical attraction and now it has become a tourist city with a population of 200,000. According to Kamakura City government research, the volume of traffic in the city averages 38,000 vehicles per every 12 hours during both weekdays and holidays. During holidays, however, most of the routes increasing the center of the city experience traffic jams, especially the routes which go through Wakamiyaouji in the downtown areas. The congestion in

this area is remarkable with as many as 9,600 vehicles over a 12 hour period. Road congestion along other routes also is severe, and there are even cases in which travelling time increases to 4 times over the amount of time required during uncongested periods. There are ten entrances to Kamakura and six of them including Wakamiyaouji are major ones. Visitors to Kamakura account for 47% of holiday traffic and 22% is through traffic with a total of about 70% of traffic originating from outside city. Thus, as can be seen in the case of Kamakura, it is apparent that road congestion during holidays is due to the increase of an inbound visitors intending to tour.

THE NECESSITY OF CAR TRAFFIC RESTRAINT POLICY

Why is car traffic restraint policy needed now ? First, the greatest reason is that air pollution is going from bad to worse as traffic volumes increase, and local, regional and global environmental pollution is becoming severe (Martin,1992.Ohta,1994). Air pollution due to NO₂ is also going from bad to worse wide areas, and global warming due to CO₂ is becoming severe in the big cities of Japan. Therefore reducing NO₂ and CO₂ through the direct reduction of the traffic volumes is badly needed. It isn't enough to merely mitigate congested areas through policies such as optimizing traffic signals and more effective use of existing road space through supplying traffic information. Such measures only serve to invite more extra traffic to areas previously hindered by congestion, especially in large cities. Thus to reduce air pollution in addition to road congestion, policies to directly restrict the amount of traffic itself entering the city are badly needed(Martin,1992).

The 2nd reason is that car traffic restraint policy is needed is to help relieve the financial demands that burden many cities of the world. Construction of loop roads has been noted as the most effective measure to reduce road congestion and to raise efficiency of road transport, but constructions would be financially difficult and many environmental problems would have to be overcome. This is especially true in big cities in Japan, where the cost of land for roads accounts for about 70% of road construction even in spite of the fact that the price of land has fallen due to collapse of the bubble economy.

Furthermore as it is impossible to easily increase road capacity in the central areas of large cities to meet ever increasing user demand, the benefits of using cars is becoming more and more oligarchic (Hirsch,1976).This problem is often mentioned but seldom resolved. When road congestion becomes to occur due to social scarcities, road capacity cannot be easily increased. Therefore, demand side policies are important in restraining excess demand against the oligarchic benefit in using cars.

To sum up, demand side policies are badly needed to restrain traffic, in order to help reduce air pollution, the number of cars entering the cities, financial burdens and oligarchic demand.

THE INFLUENCE OF ROAD PRICING POLICY ON TRAFFIC BEHAVIOR

This section examines the influence of road pricing on traffic behavior as opposed to " the entrance ban " banned private cars, then it discusses the influence of no entry on traffic behavior in Nara. Finally the possibilities of diversion from car user for commuting purposes to use of train and subway, bus, and also from truck or wagon use for both working and commuting in Tokyo, and for touring purposes in Kamakura.

I'd like to contrast the influence of road pricing on traffic behavior as opposed the entrance ban. First, road pricing discriminates according to income distribution, while the entrance ban doesn't. In the case of the entrance ban, car users are obliged to change their traffic behavior regardless of their level of income. But in the case of road pricing, those who can afford to pay the fee are not as

obliged to charge their traffic behavior as low income users are. Second, the entrance ban has a greater influence on traffic behavior than road pricing does. The entrance ban is more effective in diverting road users to public modes of transportation. Third, in the case of road pricing the local government can receive fee revenues, but in case of an entrance ban it cannot. In the case of road pricing, if the government uses its revenues to develop public transport services, it is possible to effectively increase possible diversion to public transportation. Fourth, the cost of implementing an entrance ban is minimal as opposed to implementing road pricing. Finally, while both road pricing and entrance bans bring increased revenues to public transportation service companies, revenue increases are bigger than entrance bans.

Now, let's take a look at Nara City, which has successfully introduced the entrance ban. Nara City, an ancient capital of Japan, has a population of 365,000. Until recently, road congestion was severe because most of roads to the main railway station are narrow. This was especially true along the north-south road to Gakuenmae station where road congestion had serious influences on bus commuters during rush hours in the morning. However, efforts to widen this road were so difficult that an entrance ban was introduced along a 3.1 km stretch of the road in March 1985.

The entrance ban restricts traffic for one hour between 7:15 and 8:15 in the morning except for Sundays and holidays. All vehicles are denied entry except for buses (including private minibuses) taxis, and motorcycles. Cars users are directed away from the area by " No Entry " road signs which specify permitted vehicles and the times of the entrance ban. Moreover, banners reading " Entrance Ban In Effect " are hung at the north and entrances throughout the period of the entrance ban.

This entrance ban has shown a dramatic decrease in traffic volumes (see Figure 1). Traffic volumes fell down 1068 vehicles (in March 1983) during a typical peak hour to only 130-140 per hour after the entrance ban was put into effect. Also, one hour preceding the ban 235 vehicles entered the area from the north and 348 through the south, and during the ban 42 vehicles and 72 did respectively in March 1985. There are some commuters who has advanced their commuting time, but the majority of private car users have diverted to buses, so it is apparent that this measure has had a large influence on traffic behavior. In addition, this restriction has not adversely affected bus users, who account for two third of Gakuenmae-station users.

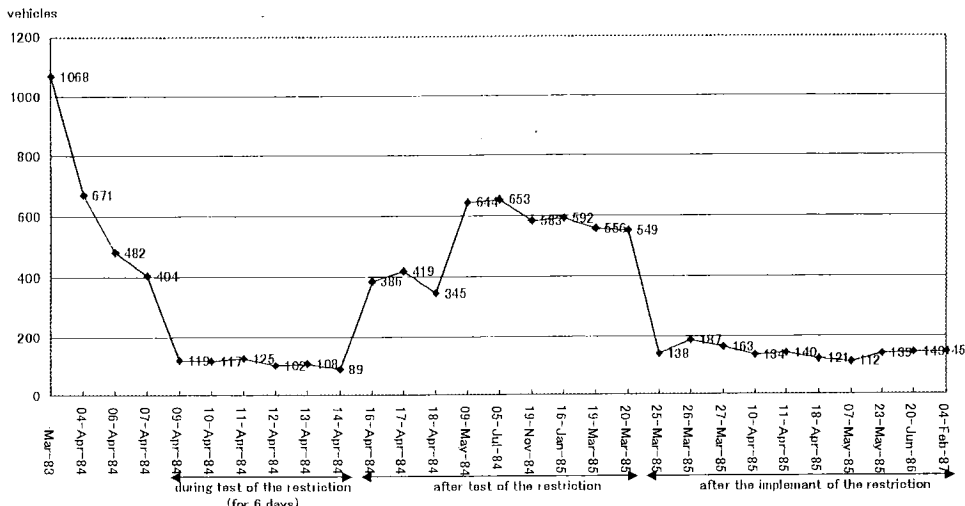
Generally, while car commuters usually strongly oppose changing over to using public transportation, most private car users were commuters through a kiss and ride system. Such users found that diverting to bus use would shorten their commuting times. Also, when this restriction was introduced, the number of buses were increased, new routes were opened and express buses were added. The number of buses increased by 33% and 4 new routes were added. Bus users increased by 20%.

Measures such as increasing the number of buses, number of bus services and bus routes are found many examples not only in Japanese cities but also Asia and Europe.

Next, let's examine the influence of road pricing on traffic behavior as concerns diversion from private car use for commuting and the use of trucks and wagons for working and commuting to public modes of transportation. The possibility of introducing road pricing along parts of the TDM in Tokyo are now under investigation. The ratio of cars to trucks and wagons is approximately 4:6 on some roads entering the city during peak periods in the morning. Trucks and wagons form the majority of traffic. Since most of vehicles are carrying building materials and working tools for business or working, and commuting purposes, it is impossible to divert users to other modes. Therefore creating restricted periods will merely cause these users to advance their commuting time to before the period. Also, in the case of road pricing, they will opt to bear the fees rather than stop business.

Even now, most trucks involved with transport are now entering the center of the city of their own accord before peak periods in order to avoid congestion. Therefore they won't be influenced by the introduction of road pricing during peak periods. This being the case, it is private car users who will be making the change to other modes of transportation. To what extent is this change possible? Introduction of a park and ride system with road pricing would be quite difficult as it is necessary to construct huge parking lot. This is impossible for a land scarce city such as Tokyo.

In the case of Kamakura-city, however, this may be a feasible option. In 1995, the Kamakura Region Traffic Plan Committee proposed the traffic plan which includes the introduction of road pricing with a park and ride system mostly for the purpose of reducing road congestion on holidays. Two surveys concerning public response have been conducted. The second, conducted in 1996, showed that proposed road pricing fees would be more expensive than car users had estimated. 18% of those surveyed said they would convert to bus use and 20.7% would make use of the park and ride system. 8.5% responded that they would be obliged to pay fees and 25.5% said they would opt to pay the fees to retain the privilege of private car use. 27.3% responded that they would cease to go to Kamakura. The survey also showed that 36.3% of those coming from a long distance, especially from areas such as Tokyo and Chiba are favorable to using a park and ride system. Thus, while road pricing is in general somewhat less effective than an entrance ban, it still holds high possibilities for Kamakura City and about 40% of car users, including users of a park and ride system, could be diverted.



Sources: Nara-nishi Police

Fig.1 Volumes of private cars entering to the restricted route

CHANGES IN SOCIAL CONSCIOUSNESS CONCERNING ROAD PRICING AND HOW SOCIAL CONSENSUS MAY BE FORMED

As far as recent social consciousness in Japan is concerned, those in opposition are decreasing, while those in favor are increasing, though the opposition is still a slight majority. This section looks at how social consensus was gained in Nara for support of the entrance ban. It then goes on to discuss social consensus in relation to road pricing.

From the beginning, Nara City was able to obtain a high degree of social consensus. A one week test run of the entrance ban in 1984 showed very effective results with an approval rating of 58% and an opposition of only 36% according to a survey of commuters at Gakuenmae Station.

Social consensus was high for several reasons. First, and most important, two third of those who use Gakuenmae Station were bus users. Road congestion was heavy that buses couldn't keep up with timetables. Second, most private car users were commuters who made use of kiss and ride. Generally, through traffic is a problem in reducing road congestion, but in this case was not enough to pose a significant problem. Third, although there were no detours available, and the police department did not give any other options to an entrance ban, there was little opposition because citizens were able to see how an entrance ban would be of benefit to them. Fourth, there was a large-scale public campaign to educate citizens concerning the priority of bus use. Fifth, the introduction of the entrance ban was well-managed by a very ardent leader from the Nara Police Department. Sixth, there are no gas stations or stores along the route which open as early as the entrance ban period. Opposition of business along routes in shopping areas is often a problem, but it was not in this case. Finally, it was not necessary to revise any laws in order to introduce this restriction. Revision of laws would have made it necessary for Nara to gain the cooperation of national government, which probably would have been a difficult process.

Gaining social consensus for road pricing has proven to be more difficult. The greatest reason is that road pricing, unlike entrance bans, has influences on income distribution (Frankena,1979). It is completely disadvantageous to those whose income is low. Second, policies that use road pricing solely for the purpose of reducing congestion have experienced much opposition. However, the public has been more favorably disposed to road pricing policies whose aim also includes a reduction of air pollution as well as use of revenue for public transportation services.

Now, let's examine policies concerning forming social consensus, which is the greatest problem in introducing road pricing. A package approach (Jones, 1991; Nitta, 1991; Shibata, 1995) which addresses several aims is becoming more popular. This approach uses road pricing to achieve not the single aim of relief of road congestion, but several aims such as reduction of air pollution, maintaining of funds to construct roads, and the improvement of public transport. Social consensus has especially been gained by making clear uses of the revenue in order to maintain funds to construct roads and improve public transport. The rate of public approval concerning the introduction of road pricing according to some recent surveys in Japan has becoming high. In Norway, social consensus of road pricing called the " toll ring " has been gained through using revenues mainly to construct roads and to improve public transport services. In Sweden, social consensus had been gained at one time because a loop road was to be constructed with revenues from road pricing (The Denis Plan). However, the Denis Plan was rejected in the autumn of 1997 due to the danger it would pose to the environment.

The package approach has been somewhat successfully adopted to gain social consensus. Measures to achieve the aims also have become to use packaged measures (Doi,1993). Therefore " policy mix approach " is badly needed to gain social consensus of road pricing. In the policy mix approach the aims of introducing road pricing consist of relief of road congestion, reduction of air pollution, the improvement of public transport services, maintaining of funds to construct roads and to adjust traffic surroundings, modal shift to public transport, and lowering of public transport fares. The main measures to attain these aims consist of road pricing, fuel taxes as economic measures, and entrance bans, zone regulation, regulating types of cars, HOV lanes as legal measures, and ridesharing such car pool and van pool, park and ride systems, and staggered commuting as non-economic measures.

A policy mix approach road pricing system which incorporates measures such as car pooling is more likely to gain public support as car pooling allows low income users to participate. For example,

social consensus was gained for the introduction of the Area License Scheme (ALS) in Singapore due to a measure which allowed car pools carrying 4 passengers or more to waive road pricing fees. The decrease of traffic volumes through use of car pools also contribute a reduction of air pollution. But since the type of road pricing of the future will be transacted through, such measures will be difficult to achieve as ERP cannot count the number of persons in a car and it will be more difficult to gain social consensus for such a policy mix.

Next, we will look at a policy mix which aims to relieve road congestion, reduce air pollution, and improve of public transport services, in which the combination of measures consists of road pricing, car pool, and a park and ride system. Social consensus of ALS in Singapore had been gained due to this type of policy mix. It has especially played a major role in improving bus services, which has been the main mode of public transport service used to gain social consensus, though it hasn't been clear how revenues will be used.

Moreover, when not only traffic volumes of cars for commuting purposes but also that of trucks and wagons for working and commuting purposes are heavy during peak times in the morning in cities such as Tokyo, a policy mix for gaining social consensus should be a combination of aims that consists of reduction of road congestion and air pollution, the improvement of public transport services, and the maintaining of funds to construct roads. The combination of measures consists of road pricing, car pooling, and a park and ride system. The maintaining of funds to construct roads should also be added as an aim to gain social consensus from truck and wagon vehicle users for business and working purposes, because they are unable to divert to park and ride system and are unable to find any substitutional modes even if road pricing has been introduced. It will be difficult to gain their social consensus of them if the combination of aims includes only reduction of road congestion and air pollution.

Finally, when road congestion occurs due to the increase of traffic volumes for tourist purposes on holidays such as in Kamakura, a policy mix for gaining social consensus should be that the combination of aims consist of reduction of road congestion, construction of pedestrian facilities, the improvement of public transport services, and protection of natural environment, while the combination of measures consists of road pricing and park & ride. The greatest problem in gaining social consensus in a tourist city such Kamakura is whether or not storekeepers along shopping streets will consent. This is due to the fact that store profits might go down if the number of tourists decreases due to road pricing. According to a survey in 1996, only 20% of storekeepers would give their approval of a road pricing plan which reduce road congestion. 52% more would give approval if conditions are attached concerning the day of week and time period and time periods during the day, the amount of fees, and the smoothness of charging fees. 20%, however prefer no road pricing at all even if roads are congested. Therefore it is necessary to adjust and discuss thoroughly periods of restriction, setting of fees, and the method of charging fees in order to gain social consensus. If road congestion is solved with these consensus in mind, revenues of stores might even increase with as customers may be able to shop at a more relaxed pace due to a relief in road congestion.

Traffic surroundings must also be considered in gaining social consensus. According to the 1996 Kamakura survey, approvals were shown to be about only 40% for a road pricing policy which protects the historical and natural environment. However, when an explicit use of revenues for the construction of pedestrian facilities and the improvement of public transport services is included , the number of citizens approving is 60%. And 60% of this 60% approve to charging Kamakura residents with road pricing fees as well. Visitors to Kamakura by car have responded differently. As far as a simple approval or opposition, 33% approval and 61% are opposed. Approvals rise to 43% against an opposition of 48% when it is shown that an aim of road pricing will be to protect the natural environment in Kamakura. Furthermore, more social consensus will be gained from visitors if revenue is used to improve public transport systems and lower fares for systems such as the Enoshima Electric Railway and buses.

REFERENCES

- Doi,M.(1993)Urban Transport Problems and Policies Developing Countries. **Annual Report on Transportation Economics 1992**,1-15.
- Frankena,M.W.(1979)**Urban Transportation Economics**:Theory and Canadian Policy.43-45.Toronto.
- Jones,P.M.(1991)Gaining Public Support for Road Pricing through a Package Approach, **Traffic Engineering and Control**.
- Kamakura Area Traffic Plan Research Committee.(1996) **Proposals of Transportation Planning in Kamakura Area**.
- Kamakura Area Traffic Plan Research Committee.(1997)Report of Social Concensus Survey in 1996.
- Martin,D.and Michaelis,L.(1992)**Road Transport and the Environment**. Financial Times Business Information, London.
- Nitta,Y.(1991) Public Support for Road Pricing and its Gained Possibility. **Transportation & Economy 53**, 50-60.Institute of Transportation Economics, Tokyo.
- Ohta,K.(1994)Traffic Moderation Policy in Urban Area-Significance of Transportation Demand Management. **Annual Report on Transportation Economics 1993**,45-53.
- Shibata,T.et al(1995)**The Automobile Dependence Society**,342-360.
- Tokyo Metropolitan Police Department.(1996)**Metropolitan Police Yearbook**.
- Tokyo Government(1996)An **Environmental White Paper**.
- About the entrance ban in Nara City interview with Nara-nishi Police, City of Nara, and Nara Traffic in December 1997.