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Privatization of the Japan Highway Public Corporation: Policy Assessment

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Paper for the 46th Congress for the European Regional Science Association

**Privatization of the Japan Highway Public Corporation:
Policy Assessment***

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[Abstract] In October 2005, the Japan Highway Public Corporation was privatized and separated into three expressway companies. Three other public corporations were privatized as well: the Metropolitan Expressway Public Corporation, the Hanshin Expressway Public Corporation, and the Honshu-Shikoku Bridge authority. The main purpose of this study is to assess the privatization policy taken by the government. We will focus especially on policy issues such as regional subdivision, vertical separation, and regulatory changes, comparing the before-privatization and after-privatization periods of the Japan Expressway Public Corporation. Evaluations will be based on empirical investigation and theory, as well as on lessons learned from the privatization of the Japan National Railway.

[JEL Classification] R4, H5

[Key Word] Privatization, Highways, Public Corporation, Investment

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Privatization of the Japan Highway Public Corporation: Policy Assessment

Fumitoshi Mizutani and Shuji Uranishi

1. Introduction

Unlike the expressway systems of the U.S. and Europe, where road use is largely free of charge, the Japanese expressway system consists mostly of toll roads. The toll expressway system was instituted after World War II to expedite construction of a nation-wide expressway network. Originally it was intended that the system ultimately become free of charge, as soon as the national expressway network was completed and construction debts repaid. Although expressway tolls are collected based on each individual route, tolls are included within the same budget and pooled for the construction of other routes, in what is called a pool system. However, problems have occurred in such a system. Expressway users have been required to continue paying expressway tolls along trunk expressways near big cities where construction costs have long been completely repaid. Furthermore, in rural areas where the demand for expressway use is low, the system continues to construct expressways simply because rural residents expect them to be constructed. Users have also been dissatisfied with the high price of expressway use, attributing the cost to what they have perceived as the monopolistic nature of the public corporation system, which, like the former Japan National Railway, had no competition.

In this environment, Prime Minister Koizumi appointed a special committee to define the role of the Japan Highway Public Corporation and to determine whether or not it should be privatized, and the issue of highway privatization became controversial in Japan. Although there were effective arguments pro and con, it was decided that the corporation be privatized. In October 2005, the Japan Highway Public Corporation was privatized and separated into three expressway companies, and the following companies were also privatized: the Metropolitan Expressway Public Corporation, the Hanshin Expressway Public Corporation, and the Honshu-Shikoku Bridge authority.

The main purpose of this study is to assess the privatization policy taken by the government. We will focus especially on policy issues such as (1) ownership, (2) regional subdivision, (3) vertical separation, (4) cost structure, (5) investment behavior, (6) the pricing system, (7) the management and incentive system of internal organization, (8) public regulations, and political intervention. We will evaluate these aspects comparing the before-privatization and after-privatization periods of the Japan Expressway Public Corporation. As the performance results of the new organization are not available yet because privatization is quite recent, our conceptual outcomes will be based on theory, and on the lessons learned from the privatization of the Japan National Railway, information about which the authors obtained from a series of studies, such as

Mizutani and Nakamura (1997, 2004) and Mizutani (1999).

2. International Comparison of Highway Systems

In this section, in order to delineate the characteristics of the Japanese highway system, we compare highway systems in four major industrial countries: the USA, Germany, the UK, and France. Table 1 shows the basic features of road transportation. Japan's land area is slightly larger than Germany's but only 70% of France's. Moreover, 70% of Japan's total land area is mountainous, so that intercity highways must incorporate a large number of tunnels and elevated bridges.

The total population of Japan is about 128 million, about 55% larger than Germany's. The majority of the population is concentrated in the Tokyo, Osaka and Nagoya metropolitan areas, but the entire Pacific corridor of Tokyo-Nagoya-Osaka-Hiroshima-Fukuoka is highly congested, with the main trunk lines thus being located along this corridor.

While the dominant mode of transportation in Japan is the automobile, rail transportation is still a quite vital transportation mode, especially in the large metropolitan areas of Tokyo and Osaka and on the intercity trunk line between Tokyo and Osaka, where railways still retain a large share of the transportation market. The heavy use of rail transport in these areas affects the ratio of traffic volume (vehicle-km) to registered cars in Japan, making the ratio lower than in other countries.

Country	National land (thousand km ²)	Population (thousand)	GDP (million US\$)	Registered car (thousand)	Vehicle-km annually (million)
USA	9,629	285,318	11,004,100	230,428	4,462,811
Germany	357	82,541	2,403,160	47,696	639,100
UK	243	59,511	1,797,677	29,291	484,722
France	552	59,762	1,759,029	35,642	546,500
Japan	378	127,619	4,302,557	74,218	790,829

(Source): Road Economic Research Institute and Research Circle of Road Transport Economics (2006), p.247.

Table 2 shows an international comparison of highway length among five countries. Although Germany's famous "Autobahn" highway system, for example, was built before World War II, the Japanese highway system dates back only 50 years, to 1956. From the beginning, highways in Japan were not freeways, but toll roads. Even with the sharp increase in highway construction over the past fifty years, the number and capacity of highways has been deemed insufficient. In some measures such as highway length per population, per GDP, per registered car and per annual vehicle-km, the figures for Japan are lower than those of other countries. Although there are many

outspoken critics of further highway construction, statistics show that in comparison with other countries, Japan does not have enough highways..

Country	Highway Length				
	Per national land (km /km ²)	Per population (km/thousand person)	Per GDP (km/million US\$)	Per registered car (km/ thousand car)	Per annual vehicle-km (km/million vehicle-km)
USA	9.33	314.94	8.17	389.97	20.14
Germany	33.72	148.83	5.00	252.37	18.83
UK	14.30	58.40	1.93	118.67	7.17
France	18.82	173.86	5.90	291.51	19.01
Japan	19.30	57.17	1.70	98.30	9.23

(Source): Road Economic Research Institute and Research Circle of Road Transport Economics (2006), p.248.

3. Japanese Highway System

3.1 Brief History of Japan Highway Public Corporation

According to the Editorial Board of “A 30-Year History of the Japan Highway Public Corporation” (1986), the Japan Highway Public Corporation was established in April, 1956, as a special public corporation by the national government. During that time, as Japan was emerging into sharp economic growth from the reconstruction period after World War II, the demand for car usage was increasing sharply by the year. However, the road network in Japan was not well developed: the main intercity road network among large cities was not well built and the pavement ratio of national roads did not reach even 20%¹.

To address the need perceived by the government for a national road network, in 1952 the government revised the Road Law (*Doro-ho*), which was the main regulation for road policy, and set up a system for constructing the highway network. Furthermore, the national government enacted new laws such as the Road Improvement Special Law (*Doro Seibi Tokubetsu Sochiho*) and the Special Road Improvement Accounting Law (*Tokutei Doro Seibi Jigyo Tokubetsu Kaikoho*) in order to borrow money from postal savings because the national government’s general account was insufficient to finance construction of a road network. The enactment of these laws saw a shift in road policy from the traditional view that roads should be free, to the idea that tolls should be imposed to support the maintenance and expansion of the road network (Imahashi and Takeda, 1992).

¹ Based upon each year’s statistics issued by Ministry of Land, Infrastructure and Transport, the pavement ratio of national roads was 17.2% at the end of FY1955 and 32.6% in FY1960.

Between 1952 and 1956, highways as portions of a toll road system were constructed in 8 places by the national government and in 27 places by local governments. Such activity spurred further construction, but progress was not without problems, such as difficulties among governments in coordinating administration as well as in financing the highways. There arose a demand for a central organization which would systematically construct a highway network. As a result, the Japan Highway Public Corporation Law (*Nihon Doro Kodanho*) was approved in March 1956, and the Japan Highway Public Corporation was established in April of the same year.

3.2 Public Corporation

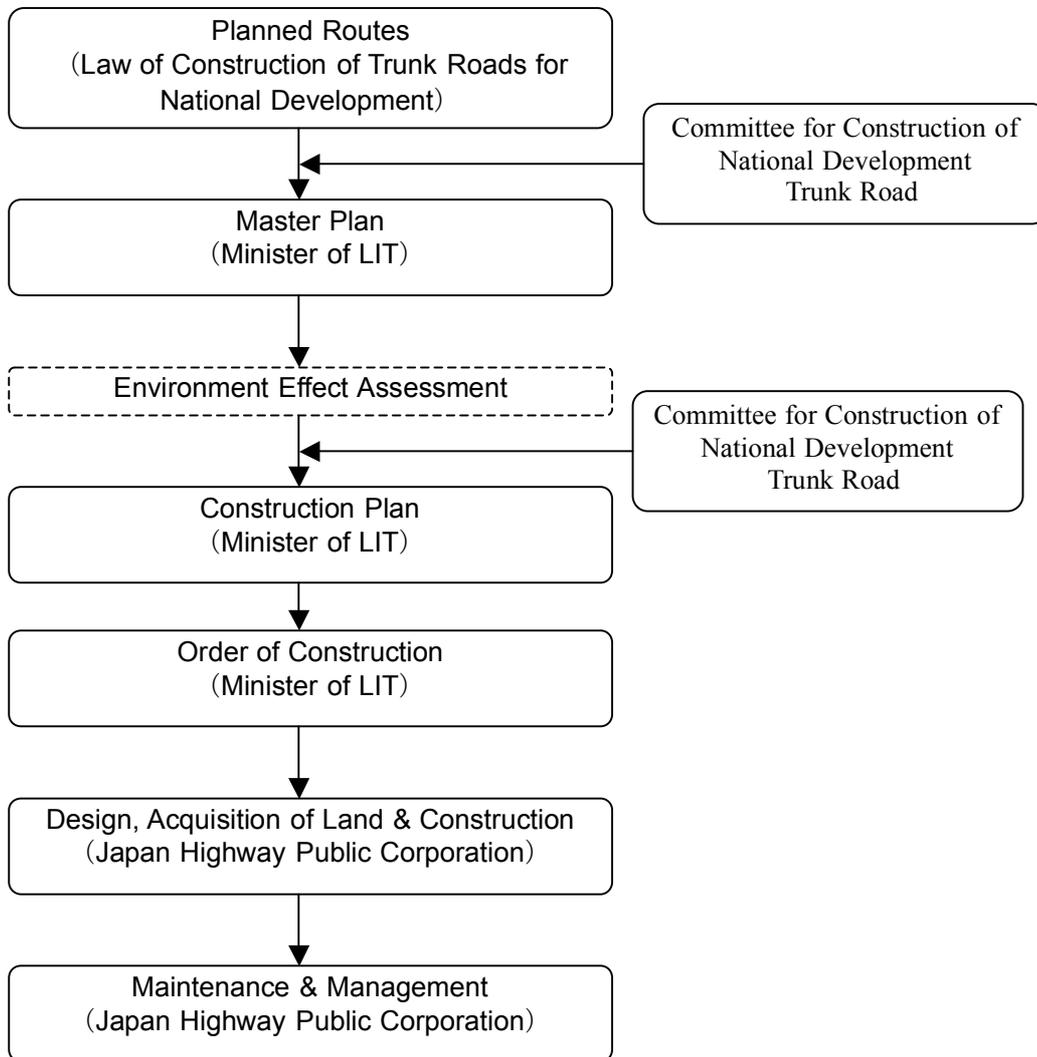
The Japan Highway Public Corporation, a special corporation with 100% national government investment, was established in 1956. According to the Editorial Board of “A 30-Year History of the Japan Highway Public Corporation” (1986), before the corporation was established, there was argument about what kind of management form the national government should take. A condition of financial self-support was decided, making it necessary for the organization to be managerially independent from the government, as there were plans for the organization to construct highways using not only public money but also a private fund.

There were three alternatives for management form: (i) a public corporation (*Kosha*), (ii) a special company (*Tokushu Kaisya*), (iii) a non-commercialized public corporation (*Kodan*). The public corporation is a commercial based public corporation invested in by the government. Although the public corporation (*Kosha*) type has a public purpose, it also recognizes the importance of providing services with a commercial basis (Sasaki, 1994). Typical examples of this management form were the former Japan National Railways (now the JR companies) and the Nippon Telephone and Telegram (now NTT). A special company (*Tokushu Kaisya*) is a joint stock company type invested in by the government. This type is more commercial oriented but there is a public purpose. An example of this type is Electric Power Development Company. Finally, while the non-commercialized public corporation (*Kodan*) has a more public purpose, the organization is separated from the governmental body in order to acquire managerial independence or financial self-support. Japan Housing and Urban Development Corporation is an example of this type.

Among these alternatives, the special company type was excluded because the management form is different from a “governmental organization” and the road law would have to regulate the “governmental organization”. Finally, the plan and construction of a highway network would be decided by the Diet and more governmental intervention was deemed necessary. Therefore, the non-commercialized public corporation type was chosen.

3.3 Process of Highway Construction

The process of the highway plan to construction is summarized in Figure 1.



(Note): This figure was made by the authors based on several sources from the Ministry of Land, Infrastructure and Transport.

Figure 1 Process of Highway Construction

There are two important considerations regarding decisions whether highways should be constructed. First, it is not the highway related public corporation which has control over which highways are constructed. The final decision rests with the Ministry of Land, Infrastructure and Transport, and it is this Ministry which orders the Public Corporation to construct the highway in question. Therefore, the problem of overinvestment in highways does not originate with the Japan Public Corporation and should be separated from discussion of its problems.

Second, as we can see in the flow chart, in the process of highway construction, political intervention exists in the stages of making master and construction plans to the Ministry of Land, Infrastructure and Transport. Politicians care about the construction of highways because they believe that highways are necessary conditions for the economic development of rural areas. Another reason for politicians' promotion of highway construction in rural areas is that construction is an important industry there. While the decision to construct a highway is evaluated on the basis of a cost-benefit analysis, the final decision of whether to construct is made in the Diet, so that political intervention is not inevitable.

3.4 Pricing System

As we mentioned before, the Japanese highway system is basically a toll road system, with users required to pay. There are two important points in the pricing system of highways. One is the full repayment principle and the other is the pooling system of toll revenues.

Full Repayment Principle

The full repayment principle is the basic concept for designing the price level of highways. The basic concept is that the total costs of the construction of highways, including costs of land acquisition and interest payments, and highway service costs such as maintenance costs including administration costs, must be repaid by toll revenues collected over certain time ranges. After the repayment of all construction costs, the highways are converted to toll-free roads.

The full repayment principle is based on the idea that a highway is part of a social infrastructure which the government should provide without collecting user charges, as the government does not charge for the use of other infrastructure. However, because of budget constraints in the general account, the full repayment principle was selected as an alternative approach, in which the highway network is constructed by moneys borrowed and debts are repaid with the tolls of highway users.

Pooling System of Toll Revenues

The second important point is the pooling system of toll revenues. In the Japan Highway Public Corporation, toll revenues from each highway route are pooled in the same place and then used for repayment of all highways in the network. The toll level, then, is not designated by each route but it is determined by the situation of the whole network. Therefore, the toll level is designated by equalizing the total toll revenues from all routes for a set of time period to the total costs of highways. For an ordinary toll road, the toll level is designated to match each route's toll revenue to each route's costs. Certainly, in the highway network, cross-subsidy among routes and generation is taking place.

Highway Toll Charge

The highway toll is decided with regard to the full repayment principle and the pooling system of toll revenue. According to Miyagawa (2006), the highway toll is calculated as follows:

$$P_{ij} = (p \text{ TL} + p_t) (1 + t), \quad (3.1)$$

Where P_{ij} : Highway toll between lamp i and lamp j

p : Unit price per km

TL : Travel length (km)

p_t : Terminal charge

t_c : Consumption tax (5%)

The unit price of highway toll, p , is set to attain total costs of all highway network equal to total toll revenues of all highway networks for 45 to 50 years. In this case, highway network means the total 9,064km which the national government decided to construct in 1987. Of course, tolls differ according to vehicle type, but the calculation method is the same. According to Miyagawa (2006), the current unit price of a highway toll (p) is 24.6 yen and the terminal charge (p_t) is 150 yen..

The toll level of the Japanese highway system is much higher than in other countries. For example, in Japan the unit toll level is 24.6 yen per km, but it is 6.4 yen in France, 5.1 yen in Italy and 3.7 yen in Korea (Miyagawa, 2006). The following reasons might explain higher construction costs leading to higher tolls. Japan is mountainous, so that more expensive infrastructure such as tunnels and bridges are required to construct highways. The prevalence and frequency of earthquakes also require more expensive anti-earthquake infrastructure. Although these natural conditions might partly explain the higher toll level in Japan, some have claimed that the full repayment principle and the pooling system are causing unnecessarily expensive tolls.

4. Financial Structure of Japan Highway Public Corporation

4.1 Costs and Revenues of Japan Highway Public Corporation

In this section, we will overview the figures for the Japan Highway Public Corporation based on the available data set. First, Table 3 shows trends in road length and number of vehicles using the roads of the Japan Highway Public Corporation. The Japan Highway Public Corporation provides not only highway roads but general toll roads, although the total length of general toll roads is not large. The national government's plan for the highway network in 1987 was 9,064km, and 81% of the highway network was completed by the end of 2003.

FY	Road Length (km)		Number of Routes		Number of Vehicles (thousand car)	
	Highway	General Toll Road	Highway	General Toll Road	Highway	General Toll Road
1956	-	95	-	17	-	4,885
1960	-	369	-	45	-	26,565
1965	190	623	1	65	13,703	121,531
1970	649	799	5	62	117,473	248,301
1975	1,888	737	18	53	278,015	312,239
1980	2,860	805	19	55	452,216	414,722
1985	3,721	621	25	51	628,569	493,453
1990	4,869	660	36	48	1,008,648	652,872
1995	5,930	634	43	50	1,383,894	676,245
2000	6,851	824	48	65	1,466,234	781,275
2003	7,343	921	55	66	n.a.	n.a.
'00/'70	10.6	1.0	9.6	1.0	12.5	3.1

(Note): This table was made by the authors based on Japan Highway Public Corporation's FY2003 Annual Statistics and FY2003 Business Reports.

Next, we would like to summarize the financial structure of the Japan Highway Public Corporation. Table 4 shows the revenue structure and Table 4.3 shows the cost structure of the Japan Highway Public Corporation. Statistics for both tables are obtained from the profit and loss statements of the corporation. On an annual basis, these total revenues are almost equal to the total costs.

FY	Service Revenues			Government Subsidy	Others	Total Revenues	Service /Total Revenues
	Toll Revenues	Other User Charges	Sub Total				
1956	261	0	261	-	113	374	69.8%
1960	2,253	74	2,327	-	268	2,595	89.7%
1965	14,832	420	15,252	-	340	15,592	97.8%
1970	78,989	1,139	80,128	-	1,247	81,375	98.5%
1975	248,169	2,041	250,210	12,811	1,831	264,852	94.5%
1980	504,915	3,788	508,703	38,231	4,316	551,250	92.3%
1985	839,115	4,234	843,349	88,773	7,876	939,998	89.7%
1990	1,421,425	79,375	1,500,800	10,891	5,738	1,517,429	98.9%
1995	1,913,348	7,948	1,921,296	132,585	7,053	2,060,934	93.2%
2000	2,096,233	12,999	2,109,232	87,716	8,889	2,205,837	95.6%
2003	2,069,939	15,258	2,085,197	-	23,718	2,108,915	98.9%
'00/'70	26.5	11.4	26.3	6.8*	7.1	27.1	0.97

(Note):

- (1) This table was made by the authors based on the Japan Highway Public Corporation's Annual Profit and Loss Statement.
- (2) Unit: million yen
- (3) "Other User Charges" include (i) user charge for exclusive use of road, (ii) revenues from parking lots, (iii) revenues from SA, (iv) revenues from truck terminals, and so on.
- (4) "Others" include (i) revenues by contracted-in, (ii) revenues from non-road service revenues, etc.

As for the revenue structure, there are three main sources of revenue: (i) service revenue from highway and facility users, (ii) government subsidies, (iii) others. Service revenues consist of toll revenues and other user charges, such as revenue from parking lots and tenant revenues of the JH etc. And “others” include (i) revenues by contracted-in, and (ii) revenues from non-road service revenues, etc. Service revenues account for 98.9% of total revenues.

On the other hand, the cost structure of the current financial statement is not as simple as for the revenue structure. We summarize the cost structure in Table 5. As this table shows, the accounting system changed in 1986. First, we will explain each category of costs. The total costs are classified into (i) Road Service Costs, (ii) Depreciation, (iii) Non-road Service Costs, (iv) Reserves, and (v) Repayment Fund. First, “Road Service Costs” consist of general administration costs and maintenance costs of highways. Therefore, these costs are considered as the maintenance activity costs for already constructed highway networks. Second, “Non-road Service Costs” comprise the costs of interest payment on bonds and loans, etc. As this table shows, accounting rules were changed in 1986, after which the depreciation of highway facilities was not accounted for, replaced by the item “Repayment Fund,” which refers to pooled money for repayment of debts.

As for the cost structure, the most important thing is that road service costs are only 17 to 18% of the total costs and have remained fairly steady since the 1980s. Most of JH’s costs are capital costs. Although it is said that the JH has a huge amount of debts, its financial structure might actually be healthy if it were to stop new construction. In the next section, we explore the relationship between debts and construction expenditures.

FY	Road Service Costs	Depreciation	Non-road Service Costs	Reserves	Repayment Preparing Money	Total	Road Service/ Total
1956	172	28	288	0	-	488	35.2%
1960	746	529	1,744	146	-	3,165	23.6%
1965	3,326	3,421	12,347	1,357	-	20,451	16.3%
1970	11,110	10,801	49,726	5,661	-	77,298	14.2%
1975	45,560	75,827	142,527	5,988	-	269,902	16.9%
1980	102,346	167,576	283,315	8,483	-	561,720	18.2%
1985	166,296	202,739	572,742	19,188	-	960,965	17.3%
1990	267,407	14,093	765,482	25,510	443,074	1,515,566	17.6%
1995	346,892	19,648	958,668	30,411	704,615	2,060,234	16.8%
2000	398,633	24,282	817,085	39,233	924,561	2,203,794	18.1%
2003	366,198	26,811	556,483	46,015	1,112,065	2,107,572	17.4%
'00/'70	35.9	2.2	16.4	6.9	-	28.5	1.3

(Note):
 (1) This table was made by the authors based on the Japan Highway Public Corporation’s Annual Profit and Loss Statement.
 (2) Unit: million yen
 (3) Road Service Costs consist of general administration costs and maintenance costs of highways.
 (4) Non-road Service Costs are interest payments on bonds and loans, etc.
 (5) Repayment Fund is pooled money for the repayment of debts.

4.3 Debts and the Expenditure on Highway Construction

As we explain later, one critical problem of the Japan Highway Public Corporation is that it holds a huge amount of debt. This debt became the trigger for the privatization of the Japan Highway Public Corporation. There are four main financial sources for highway construction: toll revenues, highway bonds, loans from banks, and government subsidies and social capital fund. Because the construction costs for highways are huge, it is impossible to pay the construction costs by user charges. In general, Miyagawa (2004) summarizes the highway business as follows. The two main costs which the JH incurs, “the construction costs of highways + the management costs of the JH” are financed by three sources: “highway bonds + loans from banks + government investment.” Also, the “principal + interest” for the debts is repaid by “toll revenues + government subsidies.” If the JH constructs more highways than its repaying ability can cover, using toll revenues and government subsidies, then its debts become larger because the JH has to depend on highway bonds and loans. As a result, accumulated debts become larger. In fact, at the end of 2003, the accumulated debts of the JH reached 2,070 billion yen, debts presumably caused by the reason mentioned above. Figure 2 shows the relationship of accumulated debts, construction expenditures, and service revenues (toll revenues etc) after subtracting road service costs. Certainly, construction expenditures are far above the service revenues before 1990. As a result, the accumulated debts are increasing. However, from the mid-1990s, the construction expenditures are suppressed and the increasing rate of the accumulated debts become decelerated.

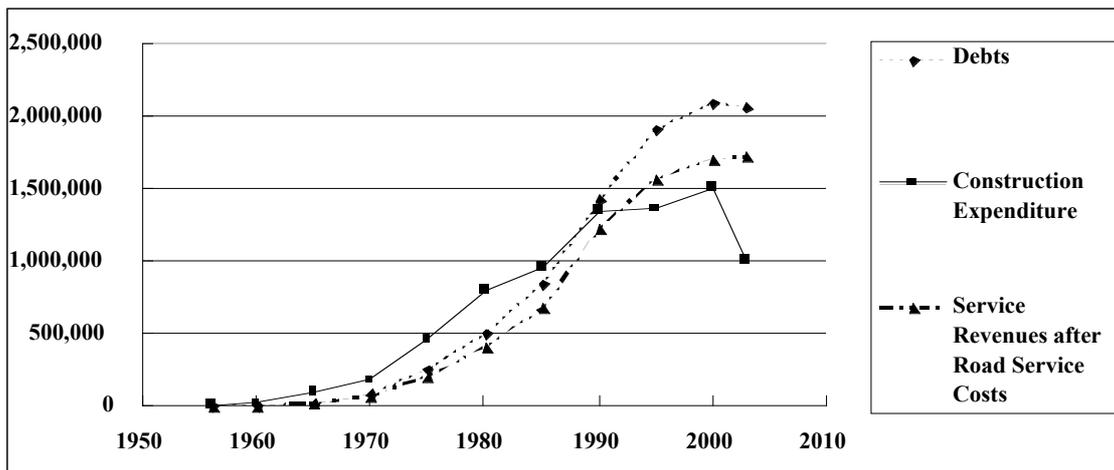


Figure 2 Debts, Construction Expenditure and Service Revenues

4.4 Cost Analysis of Highway Providing Service

In this section, we will estimate the cost function of highway maintenance service. There are mainly three purposes. First, we would like to know the cost profile of maintenance activity. We can find the structure of maintenance costs. Second, we can obtain the marginal cost of maintenance activity by using the estimated cost function. Third, in order to evaluate the minimum average cost, we will estimate the maintenance cost function of highway service. This is related to the horizontal separation issue discussed in the next section.

The cost function of maintenance service in this study is formulated as follows.

$$\ln C = \alpha_0 + \alpha_N \ln N + \alpha_i \alpha_i \ln w_i + \alpha_V \ln V + 1/2 \alpha_{NN} (\ln N)^2 + \alpha_i \alpha_{Ni} (\ln N)(\ln w_i) + \alpha_{NV} (\ln N)(\ln V) + 1/2 \alpha_{ij} \alpha_{ij} (\ln w_i)(\ln w_j) + \alpha_i \alpha_{iV} (\ln w_i)(\ln V) + 1/2 \alpha_{VV} (\ln V)^2, \quad (4.1)$$

Where C , maintenance activity costs; N , highway length; w_i , input factor price (i (or j) = L (labor) and M (material); V (number of vehicle).

In this model, we also impose the restriction on input factor prices such that $\alpha_i \alpha_i = 1$, $\alpha_i \alpha_{Ni} = 0$, $\alpha_i \alpha_{ij} = 0$, $\alpha_i \alpha_{iV} = 0$, $\alpha_{ij} = \alpha_{ji}$. Furthermore, we apply Shephard's Lemma from equation (4.1) and obtain the input share equation.

$$S_i = \alpha_i + \alpha_i \alpha_{Ni} (\ln N) + \alpha_{ij} \alpha_{ij} (\ln w_j) + \alpha_{iV} (\ln V) \quad (4.2)$$

where S_i , input i 's share of maintenance activity costs.

As for the estimation method, we apply SUR (Seemingly Unrelated Regression) for the cost function and input share equation. For estimation, we divide all observations of each variable by the sample mean.

The data for the analysis is obtained from documents of the Japan Highway Public Corporation. Observations are 48 in number, comprised of a time-series data set of the JH from 1956 to 2003. The maintenance costs consist of administration costs and management costs, in which depreciation and the construction costs of highways are not included. Wage is defined by dividing general administration costs by number of employees. The material price is defined by dividing the management costs by number of routes. Statistics of used variables are shown in Table 6 and the estimation result is shown in Table 7. In general, the estimation results as a first step are acceptable because the key variables such as network length (N) and input factor prices (w_L , w_M) show a reasonable sign and R^2 is rather high. Based on this analysis, the marginal costs of the maintenance activity is 140 million yen per km. If we divided this marginal cost by average traffic volume per day, which is 38 thousand cars per day in 1999, then the share of the marginal cost of maintenance becomes about 10 yen. Compared with toll price per km, which is 24.6 yen, the toll price is twice higher than the marginal costs.

Table 6 Statistics of Used Variables						
	Variable	Unit	Mean	Standard Deviation	Minimum	Maximum
C	Maintenance cost	Million yen	184,384	162,505	2,841	478,961
w_L	Wage	Thousand yen	6,857	3,774	2,341	16,193
w_M	Material price	Million yen	1,419	1,213	10	3,221
N	Network	km	3,609	2,610	95	8,264
V	Number of vehicles	Million car	993	803	5	2,248
S_L	Share of labor cost	-	0.4750	0.2472	0.2171	0.9390
S_M	Share of material cost	-	0.5250	0.2472	0.0610	0.7829

Table 7 Estimation Results of Maintenance Cost Function: Coefficients and Standard Error			
Variable	Estimate	Variable	Estimate
Constant	11.9949*** (0.0178)	$(\ln w_L)^2$	0.1413*** (0.0145)
$\ln N$	0.7295*** (0.1271)	$(\ln w_L)(\ln w_M)$	-0.1413*** (0.0145)
$\ln w_L$	0.3547*** (0.0068)	$(\ln w_M)^2$	0.1413*** (0.0145)
$\ln w_M$	0.6453*** (0.0068)	$(\ln w_L)(\ln V)$	0.1244*** (0.0195)
$\ln V$	-0.4168*** (0.1051)	$(\ln w_M)(\ln V)$	-0.1244*** (0.0195)
$(\ln N)^2$	4.0914*** (0.6687)	$(\ln V)^2$	1.7072*** (0.2867)
$(\ln N)(\ln w_L)$	-0.2216*** (0.0315)	Number of observations	48
$(\ln N)(\ln w_M)$	0.2216*** (0.0315)	Log of likelihood	58.7473
$(\ln N)(\ln V)$	-2.7421*** (0.4361)	R^2	0.9978

5. Privatization of the Japan Highway Public Corporation

5.1 Reasons for Privatization

Four expressway public corporations—the Japan Highway Public Corporation, the Metropolitan Expressway Public Corporation, the Hanshin Expressway Public Corporation and the Honshu-Shikoku Bridge Authority--were privatized on October 1, 2005.

Roads for highway privatization were designated on December 19, 2001, when the “Reorganization and Reform Plan of Special Public Corporations” was approved at the Cabinet meeting of Prime Minister Koizumi on December 19, 2001 (Ministry of Land, Infrastructure and Transport, 2005). The basic policy of the plan was that whatever public services the private sector could provide without trouble should be contracted out to the private sector. Under the Prime Minister’s principle, the “Committee for Promoting Privatization of Four Highway-related Public Corporations” discussed the reform plan of these corporations. The committee addressed many issues, for example the huge amount of debt, the unstoppable nature of highway construction, the expensive toll level, the regional imbalance of highways (inadequate in large cities and redundant in rural areas), the inefficient management of the Public Corporation, the extra costs due to the Corporation’s family companies, and political intervention in highway construction.

On December 6, 2002, the committee’s final opinion report, in which it recommended as an organizational form so called vertical separation (highway service companies providing service to an infrastructure holding organization), was proposed to the Prime Minister (Ministry of Land, Infrastructure and Transport, 2005). Based on the committee’s opinion, the basic plan of the privatization of four highway-related public corporations was made in the joint-meeting of government and ruling parties on December 22, 2003, and the laws regarding the privatization of highway public corporations were approved in Diet on June 2, 2004 (Ministry of Land, Infrastructure and Transport, 2005).

According to the Ministry of Land, Infrastructure and Transport (2005), there are three main purposes for the privatization of the four highway public corporations:

- Secure repayment of interest-bearing debts, amounting to 40 trillion yen
- Construction, without delay, of genuinely needed expressways with a minimum burden on the general public, while paying due respect to autonomy of the companies
- Offering of diverse and flexible prices and services by utilizing the private sector’s know-how.

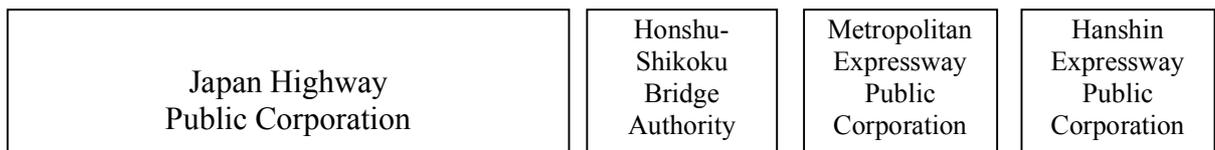
5.2 Organization Established by Privatization

In the privatization of four highway public corporations, the experiences of the privatization of Japan National Railway in 1987 were taken into account. The most important characteristics of the organizational reforms of these four expressway public corporations are regional subdivision and vertical separation. Figure 3 shows a comparison of organizational structure between before-privatization and after-privatization. There are two characteristics of organizational structure: Horizontal Separation and Vertical Separation.

First, the Japan Highway Public Corporation was privatized in October, 2005, and regionally separated into three expressway companies: East Nippon Expressway Company Ltd., Central Nippon Expressway Company Ltd. and West Nippon Expressway Company Ltd. Three

other public corporations were also privatized without subdivision: Metropolitan Expressway Company Ltd. (former Metropolitan Expressway Public Corporation), Hanshin Expressway Company Ltd. (former Hanshin Expressway Public Corporation), and Honshu-Shikoku Bridge Express Company Ltd. (Honshu-Shikoku Bridge authority). Metropolitan Expressway Company is providing services in the Tokyo metropolitan area and Hanshin Expressway Company is doing so in the Osaka metropolitan area. Honshu-Shikoku Bridge Express Company is planned to be merged to West Nippon Expressway Company after the management of the Honshu-Shikoku Company is stabilized. The main role of these six regionally separated expressway companies is providing express services by performing administration and maintenance of highway roads and service areas only by renting from the Japan Expressway Holding and Debt Repayment Agency. Table 8 shows a summary of the profile of these service providing companies. These six companies are joint-stock companies but all shares are still held by the government.

Before Privatization



After Privatization

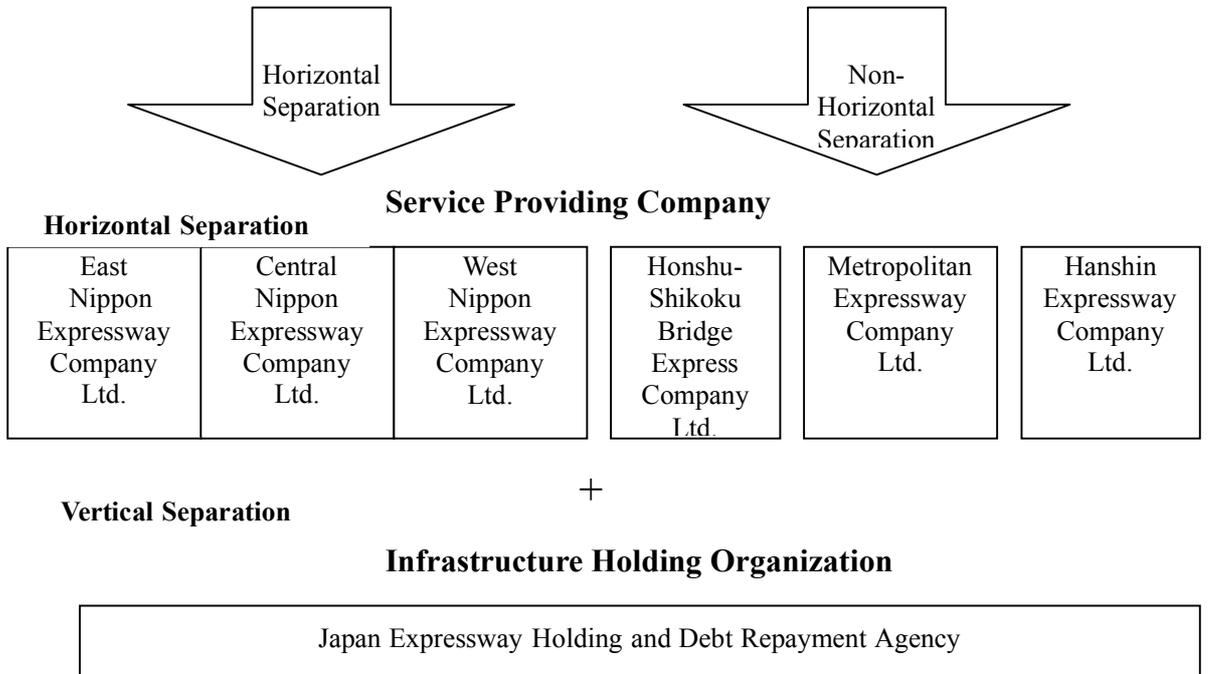


Figure 3 Organizational Change by Privatization

Table 8 Profile of Privatized Highway-Related Public Corporation					
Name of Company	Capital (billion yen)	Number of Employees (person)	Highway Length (km)	Number of SA and PA (place)	Traffic (thousand car/day)
East Nippon Expressway	52.5	2,800	3,350	265	2,300
Central Nippon Expressway	65.0	2,400	1,687	162	1,600
West Nippon Expressway	47.5	2,800	3,249	253	2,300
Metropolitan Expressway	13.5	1,250	283	6	1,120
Hanshin Expressway	10.0	830	234	15	910
Honshu-Shikoku Bridge	4.0	406	173	11	40
(Note): This table was made by the authors based on each company's corporate profiles and their business plan for FY'05 and FY'06.					

The second characteristic of highway reform is vertical separation between the highway service provider and the infrastructure holding organization. In order to achieve privatization of the four highway-related public corporations, a new organization was founded as an incorporated administrative organization in order to reduce the financial burden for highway companies and to support the successful operation of highway services for highway companies. The new organization, the Japan Expressway Holding and Debt Repayment (JEHDR) Agency, holds highway facilities and leases to expressway companies. This JEHDR Agency is a public organization and takes over the highway assets of four highway-related public corporations and debts. The JEHDR Agency plans to repay the debts of the former public corporations by collecting highway fees from six companies. After finishing the repayment in 45 years, the JEHDR Agency is slated to be dissolved. The relationship of the JEHDR Agency and the highway service providing companies is summarized in Figure 4.

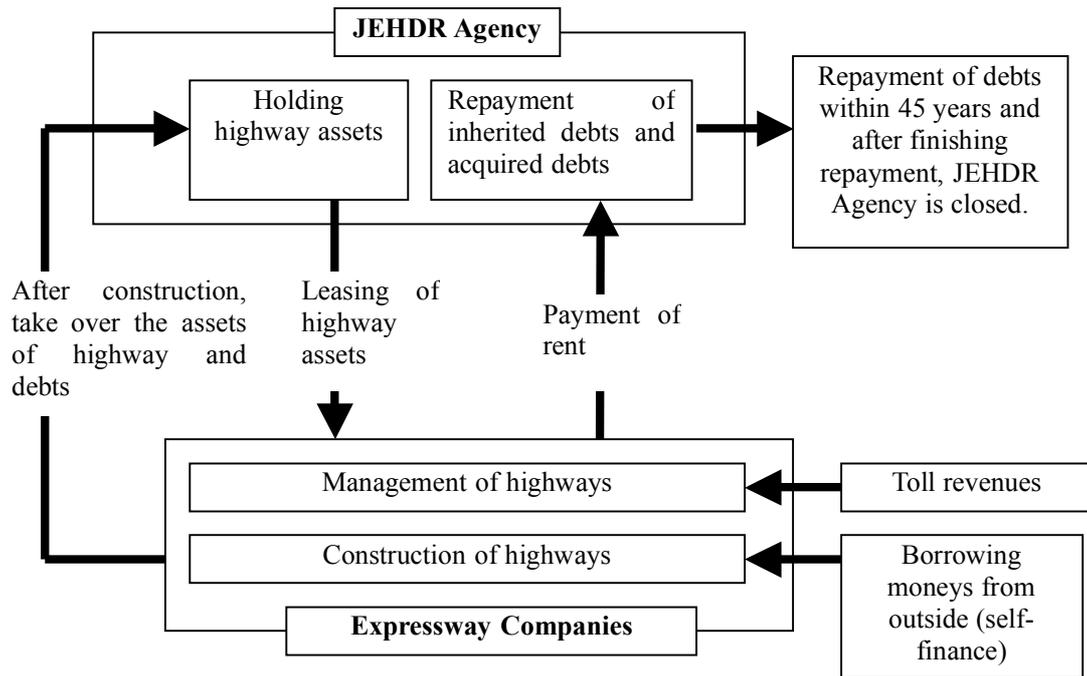


Figure 4 Relationship of JEHDR Agency and Service Providing Companies

6. Evaluations of Privatization of Japan Highway Public Corporation

6.1 Size of Horizontal Separation

As for horizontal separation, six highway service providing companies are created by subdividing the Japan Highway Public Corporation. Separation options were not made public, and the rationale is not clear for these six highway companies. One problem is regional variation in size and the other problem is the number of subdivisions. Indeed, in the case of the privatization of JNR, the size variation was big among JR companies. In the privatization of British railways, the service areas are divided into 25 regions (Preston, 1996). In this study, we evaluate the organizational size of a highway company. The methodology used here follows Mizutani (2004), which finds the size with the minimum average cost by using the estimated cost function.

The outline of the method is as follows. First, the average cost function is defined by using the highway maintenance costs, that is $AC = C/Q$, because the newly established highway company's main activity is considered the management of highway facilities by providing service to users. Second, by differentiating the average cost function by network length (N), we can obtain the result from the first order condition for the minimum average cost, that is $\partial AC/\partial N = 0$. Third, the main goal in this section is to find the size of network in which a highway company has the minimum average costs. Therefore, in this study, other factors except network related to costs are fixed at the sample mean point.

The shape of the average cost function is U-shaped, with the average cost declining sharply as the network size increases and it starts to go up from some point of the network size. When we calculate the point which attains the minimum average costs, we get the result in which the size of the highway network is about 1030km.

If we evaluate the size of the newly privatized highway companies, it seems that some highway companies are too large. For example, East Nippon Expressway's network length is 3,350km, which covers the eastern part of Japan. Similarly, West Nippon Expressway's network length is also large at 3,249km, which covers the western part of Japan. Based on calculation results, these organizations should be divided into two or three organizations.

6.2 Vertical Separation and Investment

Generally speaking, vertical separation has become a common policy in many public utility industries. Especially, in the rail industry in Europe, vertical separation is common. Nash (1997) discussed advantages and disadvantages in rail industries from a theoretical point of view. Although vertical separation in the rail industry is not quite the same as that in highways, some points are similar. Vertical separation in highways makes it easier to (1) promote a variety of service providing companies if we can divide them into the governmental franchise markets, (2) clarify intra-industry relationships and (3) specialize activities. On the other hand, vertical separation makes it difficult to (1) set up fair prices and monitor performance, (2) negotiate arrangements between two organizations.

One big advantage is that the debts of the JH are separated from the newly established highway service providing companies so that the new companies can be free from financial burden. This course of action most likely results from lessons in the privatization of JNR.

However, the newly established highway providing companies also have the role of constructing highways. We think that if a truly vertical separation policy is taken, the construction of highways should be done by the infrastructure holding organization. Under current conditions, benefits from specializing activities cannot be expected. Presumably, in order to control unlimited investment in highway construction, the new highway service provider should assume the role of highway construction.

Many things such as decisions regarding toll level, infrastructure charges, construction of highways, profit and so on are decided through negotiations between highway providing companies and the infrastructure organization, making transaction costs very large. Furthermore, agreements of both organizations are approved by the Ministry of Land, Infrastructure and Transport. One concern regards the decision to construct new highways. Seemingly, construction itself is the highway providing company's role so that the companies do not need to construct highways if they do not have enough money. However, as long as there is negotiation between the two organizations,

political intervention through the infrastructure holding company might be inevitable.

6.3 Other

Several problems remain. First, the privatization of the highway-related public corporations is not complete. One important concern is that partial privatization might invite unreasonable political intervention. In fact, in the case of the privatization of the JNR, after several years passed, the government asked the JR companies for extra payment toward left-over debts, producing resentment among the JR companies (Mizutani, 1999). On the other hand, an advantage of not fully privatizing at once is that stock can be sold after the partially privatized companies' performance increases. In general, it takes a few years to improve corporate performance. Therefore, full privatization taken after improved performance would contribute to the repayment of left-over debts.

Second, while the organizational reforms are accomplished, incentive regulations are not well designed. Each independent expressway company is actually a regional monopoly. The regulation method appears to be traditional regulation by the government, leaving expressway companies with few incentives to improve their performance. As Fujii (2005) also pointed out, one realistic method to employ the incentive regulation would be a yardstick regulation. In fact, in Japanese public utility industries such as railways and electric power industries, the yardstick regulation is already being applied, and this method should be used with regard to highway privatization as soon as possible.

Last, it is unclear how expensive highway tolls can be reduced. The privatization plan by the government merely mentioned the private company's management and use of new technology such as ETC. Although the increase of ETC can reduce labor, the decrease in cost might not be enough. As long as there remain in effect the full repayment principle and the pooling system of toll revenues, the toll level will not be reduced dramatically. Two possible ideas for reform would be the use of gasoline taxes for the construction of highways and/or a policy change from making roads toll-free after 45 years to making them toll-roads forever, but with a reduction in the price of the tolls.

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