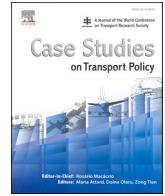


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Achievement of privatization objectives of Japanese expressway companies

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ABSTRACT

In 2005, Japan's four road-related public corporations were privatized into expressway companies to achieve three main objectives: steady repayment of interest-bearing debt, early and inexpensive construction of expressways, and provision of various services. Currently, all shares of the three Nippon Expressway Companies are owned by the Japanese government; however, the government plans to consider listing its shares in the future. To promote discussion on further privatization of expressway companies, examining the status of the original objectives and the factors that have contributed to their achievement or non-achievement is imperative. By analyzing the Japan Expressway Holding and Debt Repayment Agency agreement documents and investor relations information, this study clarifies the achievement status of the aforementioned objectives and identifies factors that have contributed to their attainment. The findings indicate that while the objective of repaying interest-bearing debt has been achieved, there is still ambiguity regarding the early and inexpensive construction of the expressway objective. Furthermore, the objective of providing various services has not been achieved. The results indicate that identifying the factors related to the achievement or non-achievement of the objectives can help further privatize these companies more efficiently.

1. Introduction

1.1. Background and objectives

Six expressway companies manage expressways in Japan. These were created in October 2005 through the privatization of four road-related public corporations, including the Japan Highway Public Corporation. Privatization was achieved through the transition from public corporations to joint-stock companies. However, as of February 2023, the three Nippon Expressway Companies (NEXCOs) are wholly owned by the Ministry of Finance, Japan.

The government and ruling party set the basic framework for privatizing the four road-related public corporations on December 22, 2003, with three objectives:

To ensure the repayment of interest-bearing debts amounting to about 40 trillion yen.

To promptly construct necessary expressways while minimizing the fiscal burden on the public and respecting the autonomy of the companies.

To provide diverse and flexible pricing options and services to expressway users by leveraging private sector expertise.

Additionally, the expressway companies aim to be listed on the stock exchange in the future. However, concrete discussions on this matter have yet to take place, and the situation remains at a stalemate.

According to the law regarding the development of highway-related laws in connection with the privatization of the Japan Highway Public Corporation, the achievement status of the three objectives must be examined within ten years of privatization. In May to July 2015, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) appointed the "Expressway Agency and Companies Business Inspection Study Group" for this purpose (MLIT, 2015). The study group evaluated the steady repayment of interest-bearing debt, the accelerated completion of the line, and cost reductions. However, the factors contributing to the attainment of these goals were not mentioned. Although the study group acknowledged improvements in service provision, such as the implementation of diverse and flexible pricing options, store diversification, and enhancements of rest area facilities, the scale of new projects outside the rest area business remained small. Furthermore, the factors causing the limited expansion of new businesses were not addressed. In privatization, understanding and clarifying the factors that create differences between the initial objectives and the actual conditions, including stock listing, is crucial.

The purpose of this study is to identify the impact of the privatization

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of Japan’s expressways. Therefore, we analyze the current achievement or non-achievement status of the three objectives formulated during the privatization of expressway companies. Specifically, we assess the status of interest-bearing debt repayment, the duration and budget of new expressway construction projects, and related business revenues. Additionally, we examine the underlying factors influencing these outcomes.

1.2. Scheme of Japanese expressway companies

In 1956, the Japan Highway Public Corporation was established as a public organization responsible for managing highways in Japan. Following its establishment, highway construction in Japan accelerated. Subsequently, the Metropolitan Expressway Public Corporation was established in 1959, followed by the Hanshin Expressway Public Corporation in 1962, and the Honshu-Shikoku Bridge Authority in 1970. These organizations were responsible for building and managing the Tokyo urban expressway, the Osaka urban expressway, and the Honshu-Shikoku Bridge, respectively, which connected the main island of Japan with the Shikoku region. In 2005, these four public corporations were privatized and divided into six expressway companies (refer to Table 1 and Fig. 1). The privatization process is regulated by the following laws:

- Expressway Company Law (referred to as “the Company Law”)
- Japan Expressway Holding and Debt Repayment Agency Law (referred to as “the Agency Law”)
- Law regarding the development of highway-related laws in connection with the privatization of the Japan Highway Public Corporation Act for Enforcement of Acts Related to Privatization of the Japan Highway Public Corporation, etc.

These laws established the expressway companies, which are responsible for the construction, management, and operation of expressways, as well as the Japan Expressway Holding and Debt Repayment Agency (referred to as “the Agency”), an independent administrative agency. The Agency holds the assets of the expressways and repays the debt incurred for their construction. Agreements on expressway businesses have been concluded between the expressway companies and the Agency. According to these agreements, the newly constructed expressway assets are owned by the companies, while the construction debt is taken over by the Agency. Additionally, the Agency lends the highway assets to the companies and receives a loan fee in return.

Table 1
Organizations before and after the privatization of the public corporations.

Former organization	Establishment date	Organization after privatization	Privatization date
Japan Highway Public Corporation	April 1956	East Nippon Expressway Company Limited Central Nippon Expressway Company Limited West Nippon Expressway Company Limited	October 2005
Metropolitan Expressway Public Corporation	June 1959	Metropolitan Expressway Company Limited	
Hanshin Expressway Public Corporation	May 1962	Hanshin Expressway Company Limited	
Honshu-Shikoku Bridge Authority	July 1970	Honshu-Shikoku Bridge Expressway Company Limited	

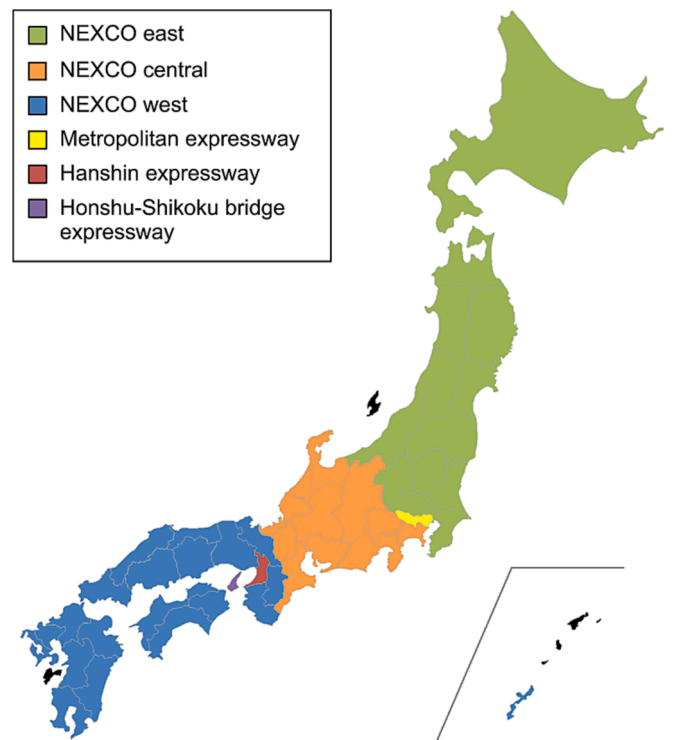


Fig. 1. Major areas of responsibility of each company.

The government’s shareholding in the three expressway companies was discussed at the time of the preliminary privatization study. It was noted that the companies had “a strong public nature” and were needed to “bear part of the remaining 2,300 km of construction work, or if they are to shorten the redemption period, etc., tax reductions or exemptions, government guarantees of debt, or government stock ownership” (MLIT, 2001). The privatization study, the construction of a new expressway network was considered necessary, as the government was required to ensure its maintenance as a national policy. The government most likely took the form of a 100 % shareholding.

1.3. Previous studies and positioning of the current study

Privatization offers several advantages, such as eliminating rent-seeking and politically motivated resource allocation (Shleifer, 1998) and fostering innovation through invention patents (Tan et al., 2020). However, it also brings certain disadvantages, including pressure from the financial market, where security analysts may discourage investment in long-term projects to achieve short-term goals (He and Tian, 2013). Furthermore, privatization can have negative environmental impacts when markets are not perfectly competitive (Beladi and Chao, 2006).

Previous studies on the effects of privatization on social infrastructure have utilized data development analysis and other approaches to examine railroads (Sueyoshi et al., 1997; Tomikawa and Goto, 2022), airports (Yokomi, 2003), and ports (Tongzon and Heng, 2005). These studies show that privatization generally has a positive effect on management efficiency, although the outcomes vary in specific cases. Albalade et al. (2009) focus on the privatization of toll vehicles (concession) in Europe and note that deregulation and privatization often lead to a paradoxical situation where the state re-regulates the market to retain its ability to intervene after losing ownership. Winston and Yan (2011) develop and test a model for a U.S. highway in California, assuming its sale to a private operator. They find that a private operator’s incentives to reduce congestion and address management issues caused by accidents were expected to be greater. Daito and

Gifford (2014) examine 53 public–private partnership (PPP) and non-PPP projects that employed a design-build approach, similar to privatization, and find no significant efficiency difference. They point out that while PPP was originally proposed to improve efficiency in project execution, it remains unclear whether the assumption of cost reduction holds true in actual projects. However, these studies primarily focus on overseas expressways, and each country’s scheme varies, necessitating a case-by-case examination.

Regarding Japan, Kimura et al. (2013) and Kim et al. (2014) discuss the effects of expressway privatization by comparing management efficiency before and after using data envelopment analysis and other methods. Kimura et al.(2013) compares the effects before and after privatization using data from Japanese expressway companies between 2002 and 2011. They employ a data envelopment analysis and Tobit models, with service extensions and assets as inputs and operating revenues as outputs. Their study demonstrates an improvement in efficiency before and after privatization. Kim et al. (2014) also compares results before and after privatization using data from Japanese expressway companies between 2000 and 2010. They employ a data envelopment analysis to calculate the Malmquist index using costs and assets as inputs and revenues and service extension as outputs. In contrast to Kimura et al. (2013), these results do not show an improvement in efficiency before and after privatization. Additionally, Mizutani and Uranishi (2008) point out that the six-company split privatization falls short of the network size that minimizes costs, suggesting the need for reorganization after formulating maintenance costs using data from 1963 to 2003.

None of these studies thoroughly examine this issue in the context of the original objectives of privatization. Only the study conducted by the ministry (MLIT, 2015) discusses the achievement or non-achievement status of the objectives at the time of expressway company privatization. MLIT does not, however, provide detailed references to the underlying factors.

In light of this, this study contributes to the existing literature by specifically focusing on the three objectives set during the privatization of expressway companies: the repayment of interest-bearing debt, the efficient and timely construction of expressways, and the provision of diverse services.

The remainder of this paper is organized as follows: Section 2 discusses the data utilized in this study, while Section 3 centers on the first of the three objectives. Sections 4 and 5 examine the second and third objectives, respectively. Section 6 presents the findings of the study, and Section 7 concludes the paper.

2. Materials and methods

This study utilizes two main types of data: (1) information on investor relations (IR) obtained from the annual securities reports of East Nippon Expressway Company Limited (NEXCO East), Central Nippon Expressway Company Limited (NEXCO Central), and West Nippon Expressway Company Limited (NEXCO West); and (2) information on agreements between the Agency and expressway companies regarding expressway business. This information is publicly available on the companies’ websites.

The agreement documents pertain to two agreements: (1) the initial agreement concluded on March 31, 2006 (referred to as the “initial agreement” hereafter) and (2) the agreement concluded on March 25, 2022 (referred to as the “financial year (FY) 2021 agreement” hereafter). The Agency and the companies enter into agreements based on the “national expressway network,” “regional expressway networks,” and “independent general toll roads.” This study focuses on the national expressway network, which constitutes approximately 94 % of the total expressway length of 10,423 km (or approximately 9,825 km) as of March 31, 2022.

3. Repayment of interest-bearing debt

3.1. Outstanding interest-bearing debt

Fig. 2 displays the balance of interest-bearing debt as of March 2022, encompassing the sum of the national and regional expressway networks as well as independent general toll roads. In 2014, the term of maturity was extended from 2050 to 2065 to accommodate expressway renewal projects. At the time of privatization on October 1, 2005, the unredeemed interest-bearing debt balance was approximately 37.4 trillion yen.

Upon comparing the initial and FY2021 agreements, it can be observed that the outstanding debt has decreased by approximately 7.9 trillion yen on an actual basis as of the beginning of FY2021. This finding is consistent with that of the study group, indicating that the objectives set at the time of privatization are still being met.

3.2. Factors influencing the decrease in outstanding interest-bearing debt

To clarify the factors contributing to the decrease in outstanding debt, we use the following formulas to calculate the outstanding debt, debt repayments, and loan fees for each year:

$$\text{Outstanding debt} = \text{Prior year outstanding debt} - \text{Debt service} + \text{Assumed debt} - \text{Convenience projects}$$

$$\text{Debt repayment} = \text{Loan fees} + \text{Occupancy fees, and so on} - \text{Administrative fees, and so on.} - \text{Interest expense}$$

$$\text{Loan fees} = \text{Fee income} - \text{Operation costs}$$

In this study, we analyze the large amounts of loan fees, assumed liabilities, and interest expenses for the national expressway network based on the original plan and actual results through FY2020. Considering that the expressways of the Honshu-Shikoku Bridge Expressway Company (JB) were reorganized from regional to national expressway networks in 2014, we compare the amounts in the initial plan with those in the regional expressway networks of JB.

Fig. 3 shows the initial plan and actual results for toll revenues and planned administrative expenses, which determine the loan fees. Toll revenues were approximately 33.25 and 30.99 trillion yen in the initial and actual plans, respectively, which is approximately 2.26 trillion yen less than the initial plan. The planned administrative expenses were approximately 7.25 and 7.69 trillion yen in the initial and actual plans, respectively, which is approximately 0.44 trillion yen more than the initial plan. Based on the difference between fee revenues and planned administrative expenses, loan fees are approximately 2.7 trillion yen lower than the initial amount. The significant difference in toll revenues

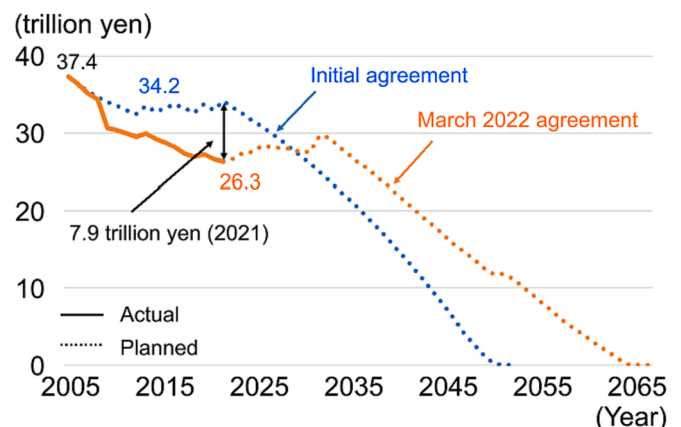


Fig. 2. Planned and actual outstanding interest-bearing debt.

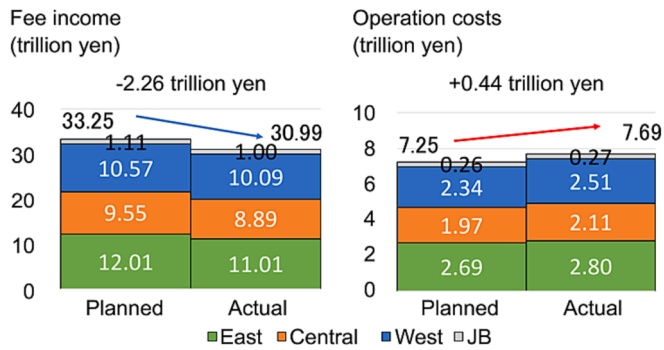


Fig. 3. Fee income (left) and planned management costs (right) through FY2020.

is due to the 2.75 trillion yen in assumed debt from the government through the “Convenience improvement project,” which was implemented in 2009 as part of Japan’s economic stimulus measures and reduced by the toll discounts funded by this debt.

Fig. 4 illustrates a comparison between the initial plan and the actual results of assumed debt and interest expenses. The initial and actual amounts of assumed debts were approximately 14.05 trillion yen and 11.77 trillion yen, respectively, representing a reduction of approximately 2.28 trillion yen from the initial amount. Similarly, the interest expenses were approximately 10.38 trillion yen and 4.97 trillion yen at the beginning and end of the study period, respectively, resulting in a reduction of approximately 5.41 trillion yen from the initial amount. This decrease in interest expenses has led to an increase in debt repayments by approximately 3.8 trillion yen.

As mentioned above, while the amount of debt repayment increased, the amount of assumed debt decreased, resulting in a decrease in outstanding debt compared to the initial plan.

3.3. Factors behind the deviation in interest expense

The reasons for the deviation from the initial plan for interest expenses, which is the primary factor contributing to the increase in debt repayment, are discussed as follows: Fig. 5 illustrates the future interest rates for the national expressway network as specified in the initial agreement, the FY2021 agreement, and the actual interest rates. In the initial agreement, the interest rate was set at 4.0 % after 2009, but the actual rate turned out to be less than 1 %. This difference in interest rates resulted in a decrease in the amount of interest paid.

The FY2021 agreement also sets the future funding interest rate at 4.0 % after 2025. However, this rate was set conservatively considering the Cabinet Office’s announcement on January 14, 2022, projecting a nominal long-term interest rate of 3.0 % in 2031 under the assumption of growth realization. Yamakoshi (2019) emphasizes the increase in interest rate differentials, and our findings support this observation.

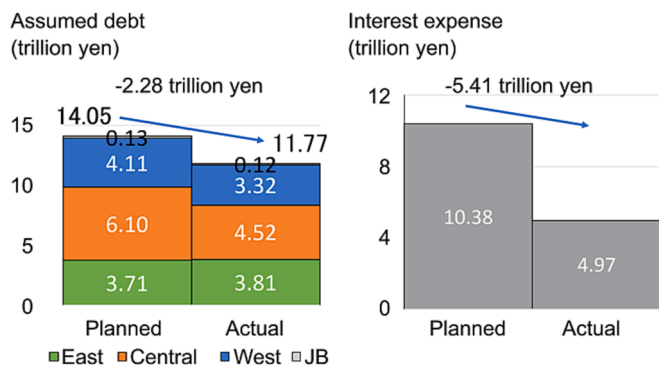


Fig. 4. Assumed debt (left) and interest expense (right) through FY2020.

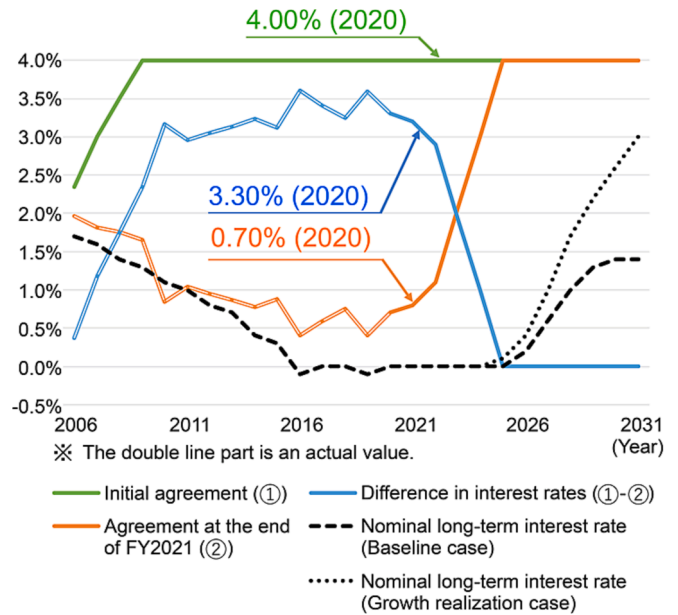


Fig. 5. Future funding and actual interest rates in the national expressway network.

However, interest rate differentials are influenced by various factors, such as the macroeconomic environment, monetary policies, and societal trends. Therefore, it cannot be concluded that privatization alone has led to a reduction in interest payments.

4. Early and inexpensive highway construction

4.1. Status of project completion days

Fig. 6 displays the average number of days required to complete projects for the national expressway network. The dataset includes 251 projects from the initial agreement on expressway construction, encompassing currently unopened sections, as well as 192 projects completed by March 2022.

In the initial agreement, there was only one completion date specified, whereas the FY2021 agreement introduced two dates: the start of service and the completion of remaining work. “Remaining work” refers to activities such as property clearance and additional construction work that are carried out after the project is put into service. As the initial agreement refers to the date of completion of all projects, including the remaining work, we compare the completion of the remaining work between the initial and FY2021 agreements.

For the 251 projects mentioned earlier, the project duration under the initial agreement is approximately 13.15 years, while it extends to around 16.72 years under the FY2021 agreement, representing an increase of approximately 3.57 years. Similarly, the duration of the 192 completed projects has increased by approximately 2.20 years, from 11.22 years in the initial agreement to 13.42 years in the FY2021 agreement. These findings suggest that the objectives set at the time of privatization have not yet been fully achieved. The 2015 study group suggested that they were ahead by four months in terms of the opening date; however, this comparison included the completion of the remaining work specified in the original agreement.

In Section 3, Fig. 2 illustrates that the outstanding debt remains unchanged until around 2020 in the initial agreement, but it remains unchanged until around 2030 in the FY2021 agreement. The debt balance does not decrease because the commencement of new debt repayments has been postponed due to the extension of the project duration discussed in this section. Consequently, there is a difference in the timing of the debt balance reduction.

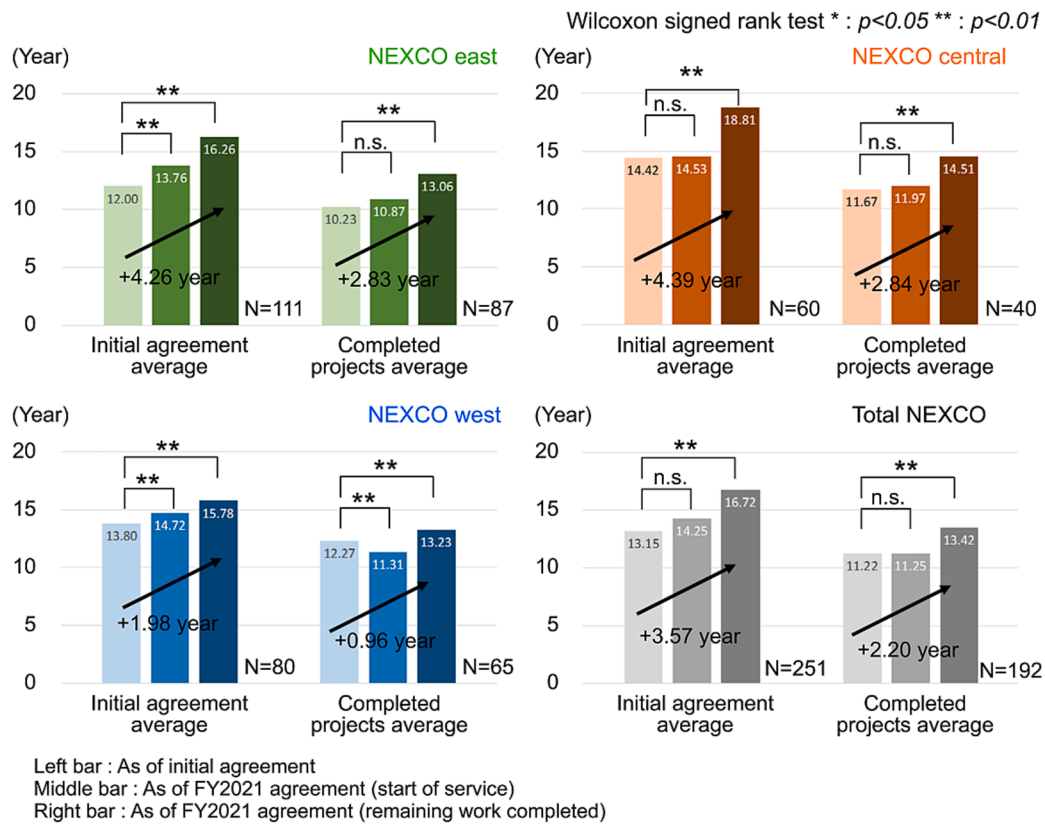


Fig. 6. Number of days of construction completed in the national expressway network.

4.2. Factors causing the postponement of project completion

According to a survey conducted by the [Japan Federation of Construction Contractors in, 2022](#), it was found that 55 % of the 242 construction sites ordered by expressway companies experienced temporary suspensions due to various factors. The most significant factor contributing to these suspensions was a lack of consultation regarding the relevant period. This study focuses on the period before and after privatization and aims to discuss how the transition from a public corporation to a joint-stock company may have led to delays in the consultation procedures for the relevant period. To illustrate this point, we examine the cases of road occupancy and agricultural land conversion.

When a public corporation occupies a public road for construction, it is only necessary to consult with the road administrator as a special case under Article 35 of the Road Law. However, once the entity becomes a joint-stock corporation, the process changes. The requirement to obtain a road use permit from the national or local government under Article 35 of the Road Law no longer applies, and instead, a license must be obtained in accordance with Article 32 of the Road Law. Similarly, when a public company intends to convert agricultural land under Article 4 of the Agricultural Land Law, there is no requirement for permission from the national or prefectural government. However, a private company is now obligated to seek permission. These additional administrative procedures were not anticipated in the initial agreement signed immediately after privatization and may be responsible for project delays.

4.3. Project budget

Fig. 7 illustrates the average per-project amount of the debt assumption limit (project budget) and the amount of debt assumption (project completion amount) based on the initial agreement. This analysis is focused on the 86 projects completed by the three NEXCOs for

which the debt assumption amount has been announced. The total assumed debt for these projects is approximately 19.2 billion yen, compared to the limit of 25.2 billion yen per project set in the initial agreement. As a result, there is a reduction of 6.1 billion yen (approximately 24 %) between the assumed debt and the limit. This significant difference indicates that the objectives set at the time of privatization are still being achieved today. It is worth noting that the project period for these 86 projects has been extended by approximately 2.63 years, considering the completion of the remaining work.

4.4. Factors leading to a decrease in the project budget

Generally, extending the project period typically leads to increased general and administrative expenses, which subsequently increase the project budget. However, the findings of this study demonstrate a significant decrease in the amount of assumed debt despite the extension of project periods. This can be attributed to two main factors: (1) initial project costs were conservatively estimated to account for risks, and (2) project costs were reduced through management efforts resulting from privatization. A notable indicator of these management efforts is the incentive subsidy system (Fig. 8), which provides subsidies to companies that achieve cost reductions through effective management practices ([Japan Expressway Holding and Debt Repayment Agency, 2021](#)). Under this system, half of the recognized cost reduction achieved through management efforts is granted as an incentive subsidy, with pre-determined eligibility criteria for subsidy amounts. Examples of such cost reductions include the implementation of new technologies to reduce construction costs.

Table 2 highlights projects that exhibit significant differences between the initial debt assumption limit (project budget) and the actual amount of assumed debt among the selected projects. For instance, the Kuki Shiraoka Junction (JCT) new construction project had an initial debt assumption limit of 22,782 million yen, but the final amount of

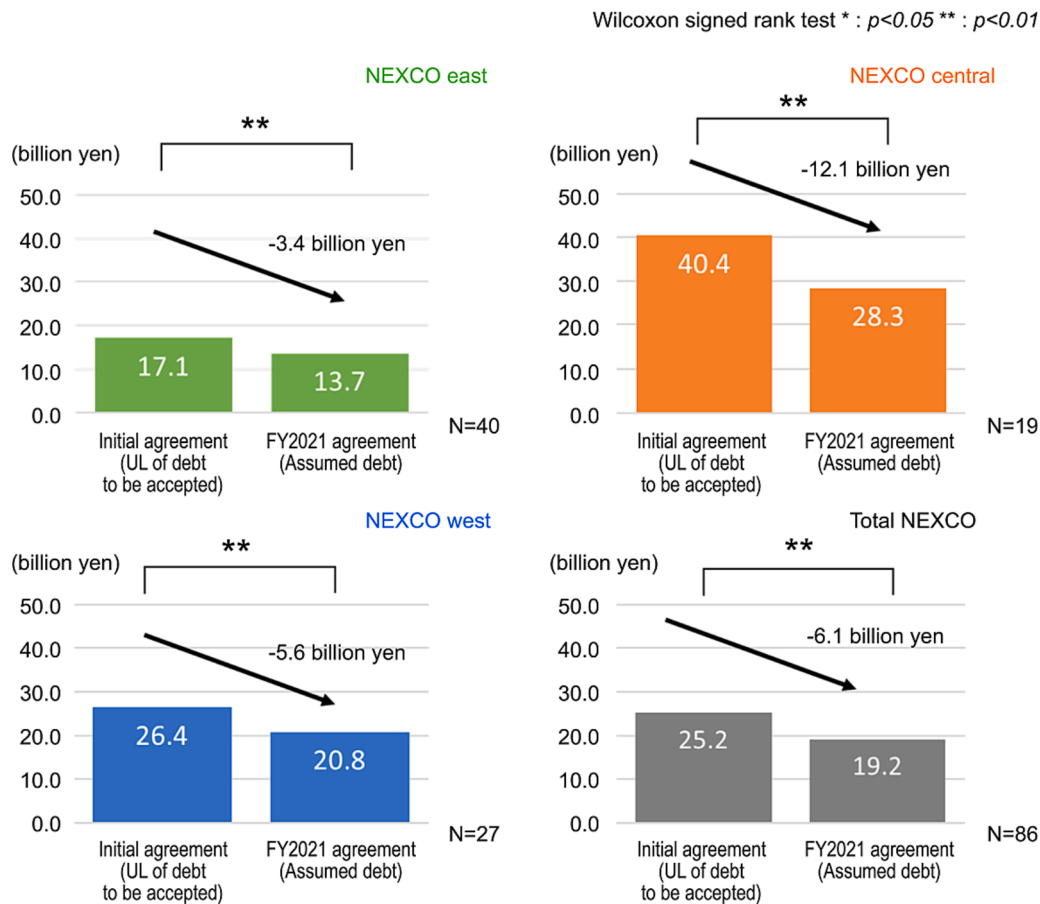


Fig. 7. Average assumed debt for NEXCO completion projects.

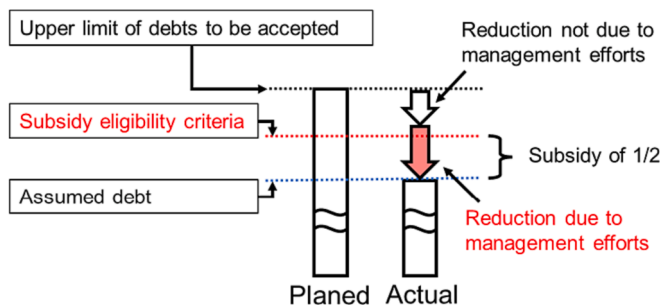


Fig. 8. Overview of the incentive subsidy program.

assumed debt was 5,832 million yen, resulting in a difference of 16,950 million yen (-74.4 %). Similarly, the new Metropolitan Inter-City Expressway (Shobu IC - Kuki Shiraoka JCT) project had an initial debt assumption limit of 24,026 million yen, but the final amount of assumed debt was 10,749 million yen, resulting in a difference of 13,277 million yen (-55.3 %). Notably, despite significant reductions in construction costs for the former project, no or minimal incentive subsidy was provided. In contrast, the latter project received only 1 million yen as an incentive subsidy, equivalent to approximately 2 million yen when considering the cost reduction achieved through efficient management practices. Consequently, the initial project costs for these two projects were set considerably higher to mitigate risks, and it cannot be concluded that project costs were significantly reduced solely through management efficiency resulting from privatization.

Table 3 presents the amount of incentive subsidies provided by the three NEXCOs thus far. Over a 15-year period from FY2007 to FY2021, a

Table 2

Examples of projects completed with significant budget cuts.

	Project "Metropolitan Inter-City Expressway, Kuki Shiraoka JCT"	Project "Metropolitan Inter-City Expressway (Shobu IC - Kuki Shiraoka JCT)"
Upper limit of debt to be accepted	22,782 million yen	24,026 million yen
Assumed debt	5,832 million yen	10,749 million yen
Amount of difference	16,950 million yen	13,277 million yen
Amount of subsidy	-	1 million yen
Number of days of planned construction completion	2,403 days	1,672 days
Number of days of actual construction completion	3,498 days	3,132 days
Difference in number of days	1,095 days	1,460 days

total of 225 subsidies amounting to approximately 6.3 billion yen were granted. However, the reduction achieved through management efforts was at least twice that amount, reaching 12.6 billion yen. Nevertheless, when considering the total initial debt assumption limit for the 192 projects slated for completion by FY2021, which amounts to approximately 40.547 billion yen, the reduction resulting from management efforts accounts for approximately 0.3 %. This represents a significant deviation from the 24 % reduction in project costs depicted in Fig. 7. Consequently, the majority of the reduction in project costs can be attributed to factors other than management efforts, indicating that

Table 3
Incentive subsidy amounts through FY2021.

Company	Number of projects	Total initial debt assumption limit	Base amount to be subsidized at the time of initial agreement	Subsidy (cases)
NEXCO East	87	1,532,372 million yen	1,500,321 million yen	2,028 million yen (108 cases)
NEXCO Central	40	1,001,508 million yen	978,173 million yen	2,109 million yen (49 cases)
NEXCO West	65	1,520,794 million yen	1,462,961 million yen	2,180 million yen (68 cases)
Total	192	4,054,674 million yen	3,941,455 million yen	6,317 million yen (225 cases)

while management efforts have contributed to cost reduction, their impact on reducing project budgets is limited. Moreover, there is no evidence to suggest that privatization has significantly reduced project costs through improved management efficiency.

5. Provision of diverse services

5.1. Composition of operating revenue

To assess the status of various services provided after privatization, we analyze the relationship between the core and other businesses based on the composition of operating revenues. For this purpose, we compare the three privatized Japan Railway (JR) main island companies, namely JR East, JR Central, and JR West, with NEXCO, as they are all capital-intensive transportation infrastructure companies similar to NEXCO.

Fig. 9 illustrates the ratio of operating revenues from the core and related businesses for the three JR main island companies and NEXCO in the consolidated financial results for FY2019. In this context, the core business refers to the transportation and expressway segments for JR and NEXCO, respectively. On average, related businesses account for

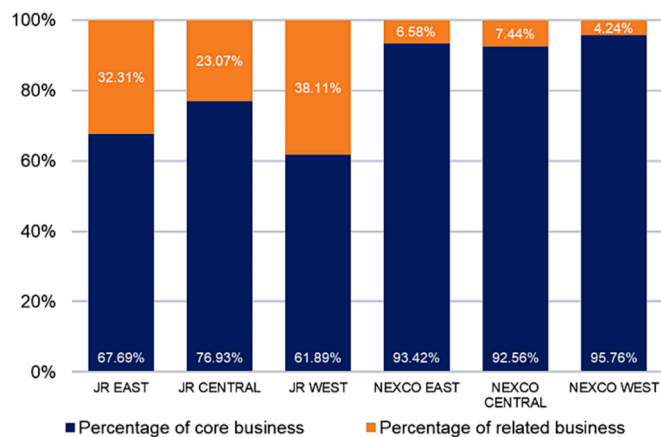


Fig. 9. Percentage of core business operating revenues of the three JR main island companies and the three NEXCOs.

approximately 31 % and 6 % of the total operating revenues for the three JR main island companies and NEXCO, respectively.

Fig. 10 presents the ratio of related businesses to total revenues for the three JR main island companies and NEXCO, based on the number of years since privatization. For instance, JR East’s ratio of related business increased from 11 % in the fifth year (FY1991) to 30 % in the 15th year (FY2001) and reached 31 % in the 30th year after privatization (FY2016). In the 34th year, which corresponds to FY2020 and was impacted by the COVID-19 pandemic, the share of related businesses increased for all three JR main island companies, indicating diversification into businesses beyond their core railroad operations. However, NEXCO’s ratio of related businesses, excluding its core road business, has remained unchanged since its privatization in 2005. For example, NEXCO East Japan’s ratio was approximately 7 % in the fifth year (FY2009) and the 15th year (FY2019) after privatization. Notably, in the 16th year (FY2020), which was affected by the COVID-19 pandemic, there was no significant change in the ratio of related businesses for all three companies.

Consequently, it is not possible to conclude that NEXCO has placed a greater focus on related businesses compared to the three privatized JR main island companies.

5.2. Revenue composition of related businesses

Table 4 provides a breakdown of revenues from related businesses of the three NEXCO companies. It presents the most recent data available for the period preceding the COVID-19 pandemic, specifically data for NEXCO Central for FY2016 and for NEXCO East/West Japan for FY2019. Contracted projects refer to those commissioned by the national or local governments, such as the inspection of bridges over expressway main lines. Other businesses include truck terminals, overseas operations, and new businesses. The ratio of other businesses to each company is less than 10 %, and there has been no change in the “small scale of new businesses,” as highlighted by the study group.

Fig. 11 shows the revenue/expenses and profit of other businesses, indicating that NEXCO East, Central, and West have incurred losses of approximately 2, 6.5, and 10 billion yen, respectively, from FY2006 to FY2020. Since privatization, the three NEXCO companies have not been able to generate significant profits. Therefore, it is important for the NEXCO companies to become profitable in order to be considered for a stock listing.

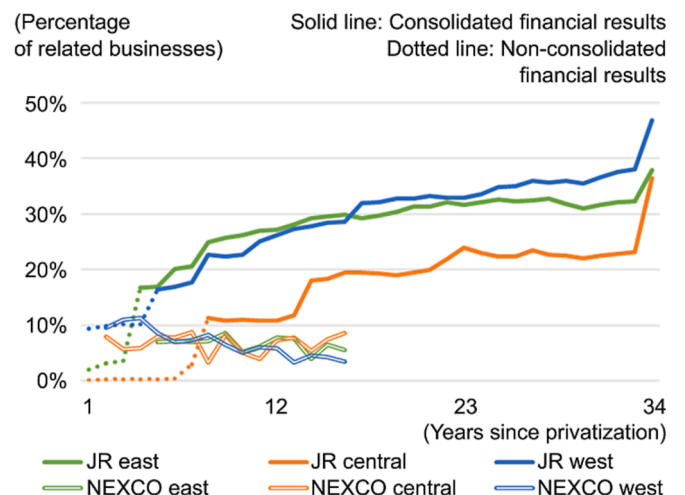


Fig. 10. Percentage of related businesses of the three JR main island companies and the three NEXCOs.

Table 4
Breakdown of revenues from related businesses (Unit: million yen).

	NEXCO East	NEXCO Central	NEXCO West
Commissioned business	43,532	27,722	5,632
Rest area business	10,643	13,651	10,700
Other business	1,817	1,214	1,292
Percentage of other businesses	3.35 %	2.93 %	7.91 %

5.3. Factors causing sluggish growth in other businesses

The factors contributing to the sluggish growth of other businesses are discussed from the perspective of the restrictions imposed by being a stock company and the legal aspects involved.

One area where expressway companies could leverage their road management expertise for new business entry is the utilization of their expertise. However, in the 2015 Aichi Prefecture toll road concession, expressway companies, as stipulated in Article 2, paragraph 4 of the Road Maintenance Special Measures Law, were not allowed to participate in the competition if they had capital ties. The reason provided was that they were not considered purely private companies, as stated by the Governor of Aichi Prefecture on October 13, 2015. As long as expressway companies remain wholly owned by the government, they will face limitations in competing for similar projects in Japan.

From a legal standpoint, Article 5, paragraph 5 of the Expressway Corporation Law states that a company may engage in other businesses “to the extent that it does not interfere with the construction and management of expressways and rest areas” with notification required to the MLIT. Fig. 12 illustrates the changes in road management costs per employee and the number of employees for each company. The average cost per employee for the three companies has increased by over 40 %, from approximately 63 million yen in 2006, the first year of privatization, to approximately 92 million yen per employee in 2020. However, the number of employees remained unchanged. This rise in costs may limit the resources available for new projects, considering that they should not interfere with the expressway business, especially considering the aging expressway system.

6. Discussion

6.1. Initial objective achievement and its factors

Table 5 summarizes the findings from sections 3 through 5, revealing that not all of the original objectives formulated at the time of privatization have been fully achieved.

One objective was “secure repayment of interest-bearing debts.” However, the future interest rate for the FY2021 agreement is much higher than the nominal long-term interest rate set by the Cabinet Office. This suggests that debt repayment will be made with a safety margin, which could lead to a decrease in outstanding debt due to factors other than improved management efficiency.

Another objective, “Construction at an early date and little cost to the public.” cannot be definitively classified as achieved or unachieved. Significantly conservative budgets for construction projects may yield

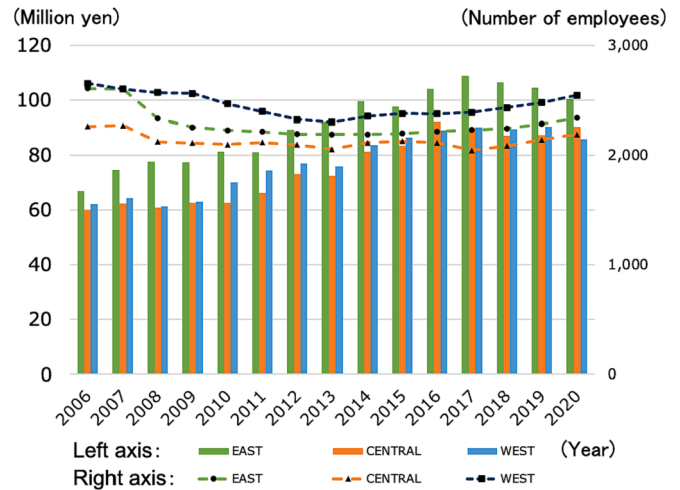


Fig. 12. Road management cost per capita (bar left axis) and number of employees (dashed right axis).

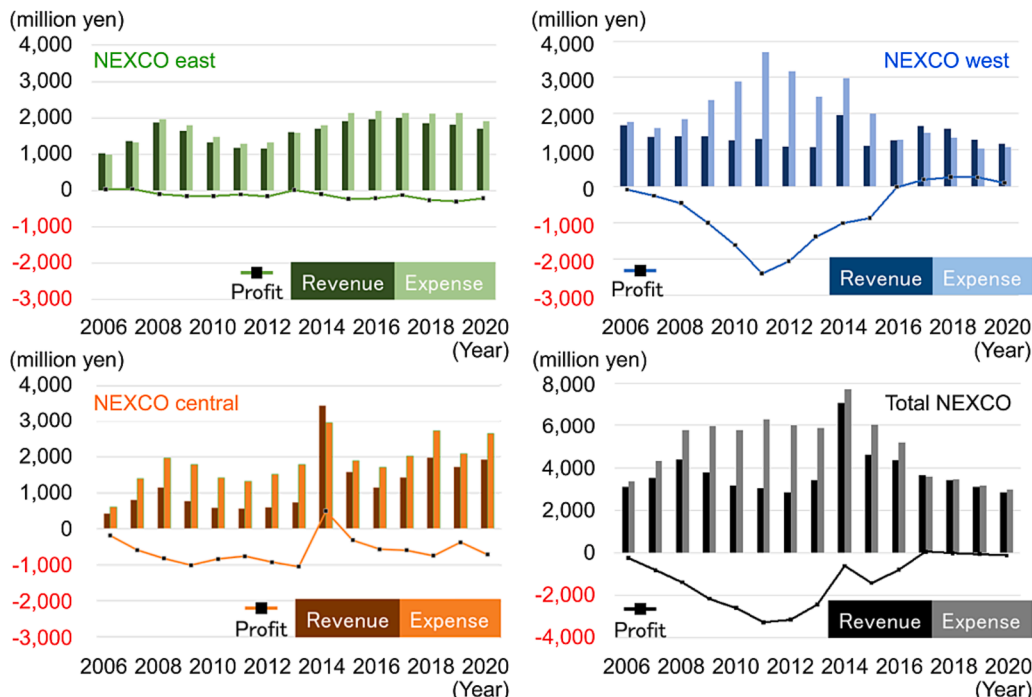


Fig. 11. Revenue and expenses (bars) and profit (broken line) of other businesses.

Table 5
Achievement of objectives and factors.

Objective	Achievements identified in this study	Achievement/non-achievement factors
Secure repayment of interest-bearing debt	○ Debt outstanding is lower than initial plan	Decrease in interest expense due to interest rate difference Decrease in assumed liabilities due to extension of project period
Construction at an early date and little cost to the public	○ Budget for new construction projects reduced	Initial budget set on the safe side
	× New construction project period extended	Increase in administrative procedures due to privatization
Providing a variety of services through private-sector know-how	× Percentage of sales from related businesses is stagnant. Almost no profit from other businesses.	Restrictions due to government ownership of shares Restrictions due to related laws

different results in cost-benefit analysis, potentially resulting in misjudged investment decisions. Additionally, administrative procedures, when taking into consideration the extended project periods, have increased due to privatization. Therefore, simplifying administrative procedures by treating highly public expressway projects as national projects may be necessary.

Furthermore, an objective that remains unachieved is the provision of a variety of services using private sector expertise. This may be due to restrictions imposed by the law and the company's joint-stock corporation status. The number of PPP/private finance initiative cases, such as the Aichi prefecture road concession, is expected to increase in the future. To further develop their business, expressway companies should be listed on the stock exchange and be able to participate in competition instead of being 100 % owned by the government. In the past, the three JR main island companies also required ministerial approval to operate related businesses in accordance with Article 1, paragraph 3 of the Act on Passenger Railways Corporation and Japan Freight Railway Company. However, to establish a more independent and responsible management structure, the act was exempted in 2001. Exempting expressway companies from the Highway Company Act to increase the degree of management freedom may be imperative.

6.2. Toward further privatization of expressway companies

The current privatization process has transformed expressway public corporations into government-owned companies, resulting in little incentive to generate profits, especially in new ventures. To effectively manage both primary and related businesses, maximizing profits while also being accountable to general shareholders through going public is crucial.

According to Article 3 of the Expressway Corporation Law, the government must hold at least one-third of the voting rights in the company. However, even under the current law, as with Nippon Telegraph and Telephone Corporation (NTT), less than two-thirds of the shares can be made public. Moreover, a report by the Diet in 2004 indicated that the Agency did not impede public listing, as corporations holding significant assets related to their businesses were not obligated to list their shares (Diet Report No. 7, 160th Diet Session). Therefore, it would be necessary to consider a public offering of 66.6 % of the shares as a specific public offering method. If the goal is to give the public a hundred percent of the time while ensuring the public nature of the

company, a golden share issue could be used. One share of golden stock allows a company to reject a resolution at a general shareholders' meeting. For example, in Japan, the Japanese Minister of Economy, Trade, and Industry owns one share in INPEX, which deals in oil and natural gas energy. This is done to stabilize energy supply in Japan. This example will be helpful for the highway industry to consider in the future.

Furthermore, the current situation of the companies after debt redemption remains unclear, and it is ambiguous whether the companies can continue their expressway business indefinitely, making it difficult to attract buyers even if they go public. Therefore, a policy on the permanent tolling of expressways must be established to facilitate discussions on stock listing. One final recommendation would be to conduct monitoring (similar to what was done in this study) that tracks each mid-term management plan (every 5 years). Although there is no mention of highway maintenance in the original three objectives of privatization, considering the future aging of the infrastructure, this will be needed. It will thus be necessary to monitor this maintenance and management progress as well.

7. Conclusion

This study examines the extent to which the objectives formulated at the time of the privatization of the four road-related public corporations, such as the repayment of interest-bearing debts, the early and inexpensive construction of expressways, and the provision of various services, have been achieved. This study uses open data, such as agreements and IR documents between JB and the Agency.

The results of the study illustrate that not all privatization objectives have been achieved, and those that have been were not due to management efforts resulting from privatization. The study compares the original plan and the latest agreement on the repayment of interest-bearing debt, demonstrating that the debt balance has decreased due to social conditions such as interest rates and the postponement of projects rather than factors such as increased management efficiency occurring from privatization. Regarding the early and inexpensive construction of expressways, the study investigates the project periods of projects completed after privatization, revealing that completion was later than originally planned, highlighting the negative aspects of privatization. Additionally, this study finds that project budgets are generally lower than the initial project cost, indicating that the initial project cost settings may be overly conservative and not reflective of management efforts. Furthermore, the study shows that the ratio of revenues from various services provided by related businesses has remained unchanged since privatization. This may be due to factors such as the restrictions imposed by the Expressway Corporation Law and the state of incorporation.

We believe that the results of this study will assist in the privatization of companies in other countries and provide suggestions for public-private partnership (PPP) construction projects.

As the analysis in this study is limited to the national expressway network, it is necessary to expand the scope to include all expressways and their companies in the future so that the results can be generalized.

Data statement

All data used in this paper are publicly available.

Agreement Data: <https://www.jehdra.go.jp/kiko/kyoutei.html#keikaku> (in Japanese)

IR Information:

East-NEXCO <https://www.e-nexco.co.jp/en/ir/securities/>

Central-NEXCO https://www.c-nexco.co.jp/corporate/ir/securities_r/ (in Japanese)

West-NEXCO <https://corp.w-nexco.co.jp/ir/security/> (in Japanese)

CRedit authorship contribution statement

Tsubasa Kaino: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. **Kazuyoshi Hidaka:** Conceptualization, Methodology, Project administration, Supervision, Writing – review & editing.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Tsubasa Kaino has worked at an expressway company in Japan from 2014.

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References

- Albalade, D., Bel, G., Fageda, X., 2009. Privatization and regulatory reform of toll motorways in Europe. *Governance* 22, 295–318. <https://doi.org/10.1111/j.1468-0491.2009.01436.x>.
- Beladi, H., Chao, C.C., 2006. Does privatization improve the environment? *Econ. Lett.* 93, 343–347. <https://doi.org/10.1016/j.econlet.2006.06.005>.
- Daito, N., Gifford, J.L., 2014. U.S. highway public private partnerships: Are they more expensive or efficient than the traditional model? *Manag. Fin.* 40, 1131–1151. <https://doi.org/10.1108/MF-03-2014-0072>.
- He, J., Tian, X., 2013. The dark side of analyst coverage: The case of innovation. *J. Financ. Econ.* 109, 856–878. <https://doi.org/10.1016/j.jfineco.2013.04.001>.
- Japan Expressway Holding and Debt Repayment Agency, 2021. *Japan Expressway Holding and Debt Repayment Agency Fact Book 2021*.
- Japan Federation of Construction Contractors, 2022. Koukyou kouji no syokadai ni kansuru ikenkoukankai setsumeisiryou [Explanatory material for the meeting for exchange of opinions on various issues of public works]. https://www.nikkenren.com/doboku/ikenkoukan/assets/20220511100344IDderJzvmrQuSssotgTQBYNvjauEIWBT/file_20220511101847.pdf?edit=1. (Accessed May 14, 2023).
- Kim, H.J., Kim, S.W., Shin, J.S., 2014. Efficiency analysis of privatization using DEA and MPI. *Public Perform. Manag. Rev.* 38, 48–75. <https://doi.org/10.2753/PMR1530-9576380103>.
- Kimura, M., Akai, N., Kuramoto, T., 2013. Minneika ga kousokudourounei ni ataetaikyoku [Impact of privatization on expressway operations – DEA analysis]. *The Jpn. J. Transp. Econ.* 56, 115–122. https://www.jstage.jst.go.jp/article/koutsugakka/56/0/56_115/_article/-char/en.
- Mizutani, F., Uranishi, S., 2008. Privatization of the Japan Highway Public Corporation: Focusing on organizational structure change. *Transp. Rev.* 28, 469–493. <https://doi.org/10.1080/01441640701791749>.
- MLIT (Ministry of Land, Infrastructure, Transport and Tourism), 2001. Kousokujidoushakokudou no seibi no arikata kentouinikai chuukan torimatome [Committee for the study of the maintenance of expressway national highways interim summary]. <https://www.mlit.go.jp/road/singi/kousoku/i4-1.pdf>. (Accessed Jan 10, 2024).
- MLIT (Ministry of Land, Infrastructure, Transport and Tourism), 2015. Kousokudou kizou kaisya no gyomutenken [Highway organization and company business inspections]. https://www.mlit.go.jp/road/ir/ir-council/gyomu_tenken/pdf/honbun.pdf. (Accessed May 14, 2023).
- Shleifer, A., 1998. State versus private ownership. *J. Econ. Perspect.* 12, 133–150. <https://doi.org/10.1257/jep.12.4.133>.
- Sueyoshi, T., Machida, H., Sugiyama, M., Arai, T., Yamada, Y., 1997. Privatization of Japan national railways: DEA time series approaches. *J. Oper. Res. Soc. Jpn.* 40, 186–205. <https://doi.org/10.15807/jorsj.40.186>.
- Tan, Y., Tian, X., Zhang, X., Zhao, H., 2020. The real effect of partial privatization on corporate innovation: Evidence from China's split share structure reform. *J. Corp. Fin.* 64, 101661. <https://doi.org/10.1016/j.jcorpfin.2020.101661>.
- Tomikawa, T., Goto, M., 2022. Efficiency assessment of Japanese National Railways before and after privatization and divestiture using data envelopment analysis. *Transp. Policy* 118, 44–55. <https://doi.org/10.1016/j.tranpol.2022.01.012>.
- Tongzon, J., Heng, W., 2005. Port privatization, efficiency and competitiveness: Some empirical evidence from container ports (terminals). *Transp. Res. A* 39, 405–424. <https://doi.org/10.1016/j.tra.2005.02.001>.
- Winston, C., Yan, J., 2011. Can privatization of U.S. highways improve motorists' welfare? *J. Public Econ.* 95, 993–1005. <https://doi.org/10.1016/j.jpubeco.2011.01.005>.
- Yamakoshi, N., 2019. Is it possible to curb the public burden on expressways? ~Is it necessary to extend the new tolling period or increase highway tolls? [Kousoku douro no kokuminhutan no yokusei ha kanouka? ~aratana ryoukintyoushuukikan no entyou ya kousokudou ryoukin no hikiage ha hitsuyouka~, Keizai no prism]. https://www.sangiin.go.jp/japanese/annai/chousa/keizai_prism/backnumber/h31pdf/201918201.pdf. (Accessed May 14, 2023).
- Yokomi, M., 2003. Minneikakuoku no gizyututekikourtsusei no hyouka [evaluation of technical efficiency at privatized airports]. *Transp. Policy Stud. Rev.* 6, 2–8. https://doi.org/10.24639/tpsr.TPSR_6R_08.

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