Effect of New Public Management: Data Envelopment Analysis[*]

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1. Introduction

The financial condition of local governments has continued to deteriorate in Japan since the 1990s. Drastic administrative and financial reform of such governments is needed, and so New Public Management (NPM) has drawn attention, and administrative evaluation and corporate accounting methods have been introduced into local governments across the country. However, some consider that local governments have given priority to early introduction without understanding the objective of NPM, i.e., what these techniques were introduced for, and that their introduction itself has became the objective, resulting only in "superficial formal reforms"[1]. NPM, which has become a major trend in administrative reforms worldwide, has been criticized for being less successful than is widely believed, because there is no data by which to measure the success of the reforms, and successful cases are presented mainly based on interviews with those in charge of NPM policies.

Whether the reforms by NPM really lead to improved services to residents or to higher efficiency of administrative and financial management, and what problems are involved in NPM, are economic issues and yet there have been no reports of empirical studies on the effects of introducing NPM. This paper sets out to elucidate empirically the effects of introducing NPM into local governments in Japan by means of economic approaches. Many institutions that restrict the activities of local governments in Japan are of course taken into consideration. This paper pays particular attention to the issue of "soft budget constraints" pointed out by Akai, et al. (2003), which refers to the fact that most local governments in Japan greatly depend upon fund transfers from the central government, such as the local allocation tax, which is a portion of the national tax revenue allocated to local governments, which softens their budget constraints and gives them a disincentive to improve efficiency[2]. If this indication is true, NPM reforms may have only resulted

1) For example, according to the results of a questionnaire survey conducted by NIRA (National Institute for Research Advancement) on the cities and the 23 wards in Tokyo in 2002, the largest percentage of responses concerning the purpose of introducing administrative evaluation was: "Improvement of efficiency of administrative management" (53.9%); on the other hand, concerning the actual effects, the largest percentage of responses was "Change of awareness of government staff" (35.3%), but only 16.7% of respondents indicated "Improved efficiency of administrative management". Such survey results imply that NPM has been, or is being, introduced into local governments across the country without considering "what will be reformed".
2) Regarding the issue of "soft budget constraints", if the central government has retroactive discretionary power, there would exist a system where it makes up for shortages of financial resources of local governments retroactively (i.e., soft budget constraints) to aid inefficient local governments retroactively for political reasons, or in view of fairness or efficiency. There would then be no incentive for local governments

in "superficial formal reforms" when implemented in situations where local governments have much less incentive to acquire financial resources or reduce costs themselves. This paper analyzes the effects of introducing NPM into local governments in Japan, considering the "soft budget constraints" problem.

The rest of this paper is organized as follows. In section 2, the productive efficiency of administrative management of local (prefectural) governments is measured by means of data envelopment analysis (DEA). In section 3, the effects of introducing NPM under the Japanese financial system are examined on the basis of the productive efficiency values obtained in section 2. In conclusion, section 4 identifies problems related to NPM that local governments are implementing based on the analysis results of the preceding sections.

2. Estimation of public sector efficiency by means of DEA

Data Envelopment Analysis (DEA) is a technique used for evaluating the efficiency of various organizations in the public and private sectors. In Japan and other countries, DEA is used as a powerful tool for analyzing the efficiency of the public sector[3]. This section attempts to estimate the productive efficiency of administrative managements of local governments, after the model of preceding studies[4].

2.1 Systematic categorization of administrative activities

This sub-section systematically categorizes the administrative activities of local governments to estimate the productive efficiency of those activities. Recognizing the administrative activities of the local government as a system consisting of policies, programs and projects as shown in Figure 1, this paper assumes that the local government consists of eight organizational divisions: Welfare; Health; Labor; Agriculture, Forestry and Fisheries; Commerce and Industry; Civil Engineering; Police; and Education, and each division implements various projects that correspond to the sub-categories of annual budgets in accordance with the classification of categories and sub-categories of budgets/expenditures provided in Article 216 of the Local Autonomy Law.

It is assumed, for example, that the Welfare division is responsible for policies on welfare, carrying out various projects to implement programs for social welfare, welfare of the aged, and welfare of children. However, the budget categories and sub-categories where the effects of expenses are difficult to measure (e.g., general affairs expenses) or only some governments spend (e.g., fire-fighting expenses) are excluded from this analysis.

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that expect aid from the central government to reduce costs, and so they would be discouraged from making cost-reduction efforts. For a detailed study of this issue, refer to Yamashita, Akai and Sato (2002).

3) In Japan, DEA has been used to measure the efficiency of public activities including public bus services, the police, fire-fighting services, water supply services, public hospitals, third-sector railway services, libraries, residential land development, and tax collection [Fukushige and Miyara (2002a, 2002b, 2003), Nakayama (2002, 2004a, 2004b), Nemoto (2004), Kinugasa (2005), and Umemura and Ogawa (2006)]. Besides the evaluation of the efficiency of such individual services, DEA has also been applied, assuming each local government as a single entity, to measure the efficiency of providing local public services [De Borger, et al., (1994), and De Borger and Kerstens (1996)].

4) Basic models for data envelopment analysis are widely known and were presented by Tone (1994), Nemoto (2004), etc., so this paper omits the explanations of the model.
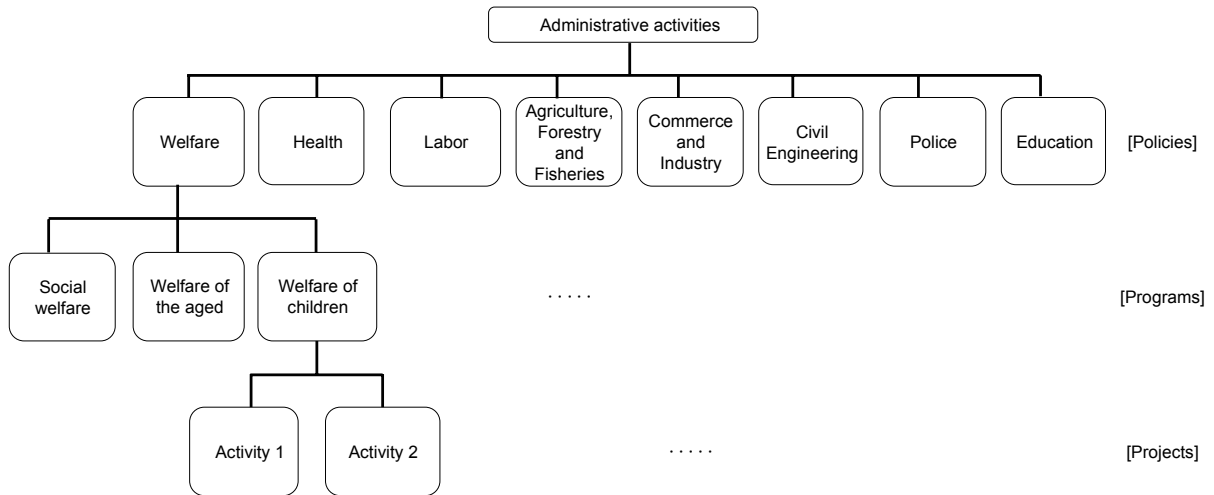
Figure 1   System of administrative activities

It is assumed that the local government allocates and inputs budgets and personnel (input indicators) as management resources to each division so that they can achieve their policy goals, and that each of the divisions performs various projects to improve indicators that symbolically indicate its achievements or results (output indicators). For example, in the production of welfare services for the aged by the Welfare division, its budget and personnel are considered to be inputs, and the capacity of nursing homes for the aged and the number of visiting care service workers for the aged are outputs (Figure 2). For activities whose achievements or results cannot be easily reflected, the number of direct beneficiaries of the public services provided in such an activity is used as an alternative indicator[5].
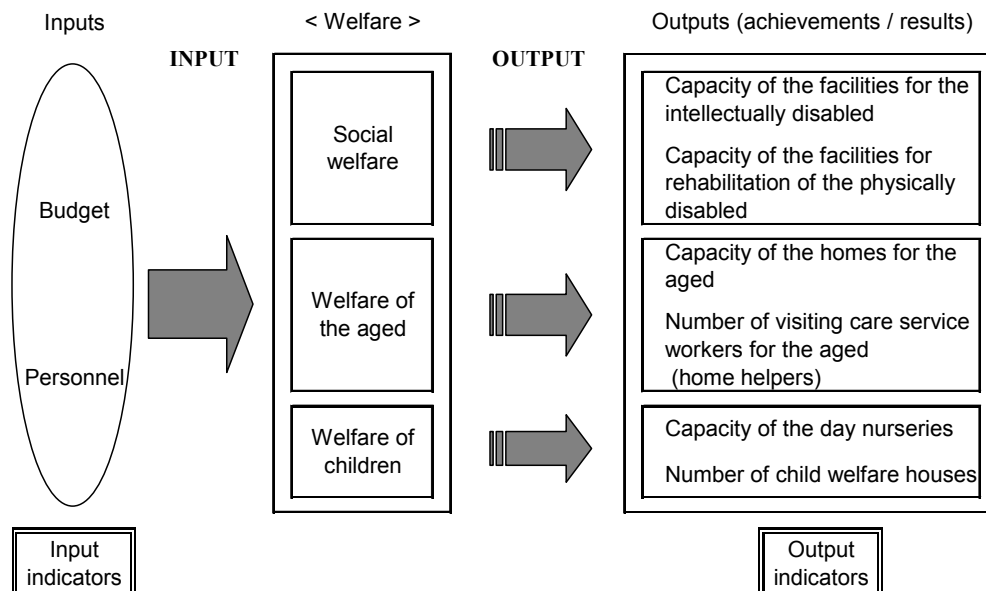

Figure 2   Process of production of administrative services

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5) For the input and output indicators used in this paper, refer to Attached Table 1.

2.2 Estimation of productive efficiency of local (prefectural) governments

Assuming the system of administrative activities and process of production described above, the efficiency of the divisions of each prefectural government was measured by means of DEA (CCR model). The Tokyo Metropolitan Government, however, was excluded from the analysis, because it is exceptional in that it carries out not only the same activities as other prefectural governments, but also those that cities, towns and villages carry out.

The results of measurement of productive efficiency of the divisions of each prefectural government in 2001 are shown in Table 1. The weighted average on the basis of the expenditure ratios of each local government is considered as the efficiency value of the entire administrative activities.

Table 1　Productive efficiency

Local government		Welfare	Health	Labor	Agriculture, Forestry and Fisheries	Commerce and Industry	Civil Engineering	Police	Education	Total
Hokkaido and Tohoku region	Hokkaido	1.000	0.549	1.000	1.000	0.363	1.000	0.710	0.719	0.805
	Aomori	0.862	0.635	0.619	0.566	0.368	0.759	0.634	0.804	0.679
	Iwate	0.759	0.746	0.787	0.731	0.597	0.992	0.825	0.784	0.793
	Miyagi	0.791	1.000	0.740	0.638	1.000	1.000	0.862	0.927	0.884
	Akita	0.971	0.909	0.640	0.609	0.499	0.852	0.826	0.887	0.778
	Yamagata	0.946	0.832	0.572	0.895	0.508	0.941	0.707	0.933	0.862
	Fukushima	0.717	0.820	0.673	0.684	0.632	1.000	0.889	0.891	0.840
	Regional average	0.864	0.785	0.719	0.732	0.567	0.935	0.779	0.849	0.806
Kanto region	Ibaraki	0.771	0.646	0.581	1.000	0.930	0.922	0.867	0.883	0.880
	Tochigi	0.759	0.790	0.713	1.000	0.763	0.751	1.000	0.944	0.855
	Gunma	0.877	0.962	0.924	0.912	0.876	0.945	0.978	0.942	0.928
	Saitama	0.729	0.620	0.942	1.000	0.929	0.739	0.816	0.996	0.866
	Chiba	1.000	0.806	1.000	1.000	0.708	0.862	0.775	0.970	0.899
	Kanagawa	1.000	1.000	0.745	1.000	1.000	0.951	0.880	1.000	0.969
	Regional average	0.856	0.804	0.817	0.985	0.868	0.862	0.886	0.956	0.899
Chubu region	Niigata	1.000	0.748	0.865	0.748	0.626	0.726	0.783	0.852	0.780
	Toyama	0.898	0.838	0.641	0.620	0.868	1.000	1.000	0.941	0.890
	Ishikawa	1.000	0.857	0.942	0.600	0.688	0.724	0.855	0.938	0.795
	Fukui	1.000	0.979	0.839	0.546	0.684	0.808	1.000	0.987	0.834
	Yamanashi	0.831	1.000	0.813	0.948	1.000	0.902	0.757	0.939	0.911
	Nagano	1.000	0.808	0.737	1.000	0.586	1.000	0.810	0.928	0.913
	Gifu	1.000	0.837	1.000	0.672	0.417	0.963	0.868	0.909	0.852
	Shizuoka	0.980	0.783	1.000	0.803	1.000	0.667	0.931	0.987	0.881
	Aichi	1.000	0.976	0.908	0.914	1.000	0.714	0.957	0.986	0.930
	Regional average	0.968	0.870	0.860	0.761	0.763	0.834	0.884	0.941	0.865
Kinki region	Mie	0.888	0.657	0.790	0.684	1.000	0.770	0.775	0.908	0.830
	Shiga	0.751	1.000	0.633	0.633	1.000	1.000	1.000	0.970	0.915
	Kyoto	1.000	0.983	0.702	1.000	0.531	1.000	0.983	1.000	0.938
	Osaka	0.999	0.881	0.671	1.000	1.000	0.514	0.753	1.000	0.852
	Hyogo	1.000	0.679	0.461	0.477	0.859	0.830	0.874	0.940	0.854
	Nara	0.895	0.836	0.948	1.000	1.000	0.842	1.000	0.960	0.921
	Wakayama	0.906	0.710	0.828	0.776	0.889	0.753	0.772	0.838	0.812
	Regional average	0.920	0.821	0.719	0.796	0.897	0.816	0.880	0.945	0.875
Chugoku and Shikoku region	Tottori	0.921	0.875	1.000	0.670	0.955	0.987	1.000	1.000	0.924
	Shimane	0.842	0.910	0.787	0.675	0.717	0.746	1.000	0.774	0.762
	Okayama	1.000	1.000	0.956	0.538	1.000	1.000	1.000	0.928	0.914
	Hiroshima	0.982	1.000	0.637	0.804	0.834	0.745	0.882	0.902	0.856
	Yamaguchi	0.874	0.841	0.357	0.588	1.000	0.890	0.840	0.865	0.837
	Tokushima	0.724	0.883	0.549	1.000	0.754	0.568	1.000	0.893	0.784
	Kagawa	0.810	0.938	1.000	1.000	1.000	0.808	0.901	1.000	0.920
	Ehime	0.871	0.750	0.782	0.584	0.909	0.826	0.865	0.955	0.837
	Kochi	0.989	1.000	0.619	0.889	0.695	0.883	1.000	0.723	0.852
	Regional average	0.890	0.911	0.743	0.750	0.874	0.828	0.943	0.894	0.854
Kyushu and Okinawa region	Fukuoka	1.000	1.000	0.410	0.662	0.748	0.789	0.848	1.000	0.878
	Saga	0.789	1.000	0.691	0.879	0.766	0.726	0.812	1.000	0.850
	Nagasaki	0.873	0.695	0.575	0.530	0.765	0.581	0.798	0.935	0.738
	Kumamoto	0.974	0.961	0.690	0.979	0.679	0.873	0.916	0.994	0.931
	Oita	1.000	0.833	0.833	0.700	1.000	0.945	0.869	0.887	0.881
	Miyazaki	0.918	0.790	0.874	1.000	0.558	0.948	0.807	1.000	0.919
	Kagoshima	0.960	0.796	0.806	0.778	0.671	0.807	0.850	0.845	0.824
	Okinawa	0.752	0.765	0.343	0.829	0.524	0.923	0.854	0.960	0.853
	Regional average	0.908	0.855	0.653	0.795	0.714	0.824	0.844	0.953	0.859
Average by division		0.905	0.846	0.753	0.795	0.780	0.847	0.872	0.922	0.859
Standard deviation		0.097	0.124	0.177	0.174	0.197	0.128	0.095	0.074	0.059

Of the divisions across the prefectures, the Education division shows the highest value of efficiency, with smaller differences among prefectures. On the other hand, the Labor, Agriculture, Forestry and Fisheries, and Commerce and Industry divisions show larger differences in efficiency among the prefectures. According to Table 1, the activities of the 46 prefectural governments produce an average of 14% loss of resources, i.e., an efficiency value of 0.859. For regional differences, the Kanto region shows the highest efficiency value, particularly higher in the Agriculture, Forestry and Fisheries, and Education divisions, than any other region. The Hokkaido and Tohoku region shows a low efficiency value, as a whole, even though it has a higher value than other regions for the Civil Engineering division. Regarding the other regions, the Chubu region shows higher efficiency values for the Welfare and Labor divisions; the Kinki region a higher value for the Commerce and Industry division; and the Chugoku and Shikoku region higher values for the Health and Police divisions.

3. Effects of NPM introduction

3.1 Characteristics of NPM

NPM aims to make the public sector more efficient and active by introducing management ideas, methods, and best practices of the private sector, wherever possible in the administrative activities. This trend has been prevalent mainly in Anglo-Saxon countries such as the United Kingdom, the United States, Canada, Australia, New Zealand, and Northern European countries such as Sweden, Finland and Norway, since the mid 80s, with the initiative being taken by administrative officials.

The term "NPM" includes diverse concepts, with significant variations in meaning by country, region and period. Nevertheless, NPM has four common characteristics: (1) market mechanism, (2) customer orientation, (3) performance-based management, and (4) the streamlining of hierarchical structures, namely the segmentation/decentralization of functions and authorities. These characteristics will be described below, based on the definition of Tamamura (1998).

(1) Market mechanism

This means to introduce the principle of competition into the public sector directly or in a pseudo manner to improve the efficiency. Methods for directly applying the principle of competition include: the "privatization" of public enterprises that provide goods and services on a financially independent basis; "outsourcing to the private sector" by which the public sector purchases goods/services provided by the private sector; a "voucher system" where grants are provided for consumers, and they can choose what to purchase with them; and "PFI," Private Financial Initiative. Measures for using the market in a pseudo manner include: the creation of "agencies" by which organizations that carry out specific activities in the public sector and can hardly be privatized are made independent; and "market testing" in which public organizations created as agencies are set in a contestable situation, in other words, made to potentially compete with private enterprises.

(2) Performance-based management

This means a shift in the standard for activities in the public sector from the traditional "democratic control of processes, i.e., control by laws/regulations" to "accountability for results" with increased freedom in processes. It also means a shift from control on inputs (amounts of input resources) to control on outputs (direct results of implementing policies) or outcomes (indirect results of implementing policies). Measures for this include introducing performance evaluation systems (performance control by numerical indicators).

(3) Customer orientation

Customer orientation is based on the idea that residents who are recipients of public services are considered as customers, and importance is given to their satisfaction. A typical example is Citizen's Charters (declarations to citizens) established in the United Kingdom, including specific charters made from the viewpoint of service beneficiaries such as the Taxpayer's Charter and the Traveller's Charter.

(4) The streamlining of hierarchical structures – segmentation/decentralization of functions and authorities

This means a shift from the centralized hierarchical structure, which is the traditional basic form of administrative organization, to the decentralized organizational structure, in order to materialize the above-mentioned "market mechanism," "performance-based management," and "customer orientation." More specifically, it means an organization made of smaller and flattened units that correspond to units of operation, as easily managed, or segregation between planning and implementation.

According to Muramatsu and Inatsugu (2003), in which they show the progress of introduction of NPM methods into local governments in Japan by indicators according to the above-mentioned categories, there are differences in the introduction of NPM among such governments. It is also characteristic of Japanese local governments that the evaluation of programs/projects and the preparation of balance sheets have become widespread. On the other hand, approaches using the market mechanism that have been actively taken in advanced countries in terms of NPM, such as the United Kingdom, have made little headway in Japan.

Muramatsu and Inatsugu (2003) have developed indicators for the level of implementation of NPM in each prefecture for each of the above-mentioned categories for 2000. For the purpose of this paper, those indicators are used to estimate the effects of introducing NPM[6].

3.2 Factors that affect productive efficiency of local governments

This sub-section examines the effects of introducing NPM in Japan on the basis of the indicators developed by Muramatsu and Inatsugu (2003) to indicate the level of implementation of NPM, and the productive efficiency values of the local governments estimated in section 2. The productive efficiency values estimated based on DEA in this paper do not take the effect of the size of local governments into consideration in their bases, so the effects of other related factors including the above-mentioned effect are also considered here. The factors considered in this sub-section are (1) to (3).

(1) Financial system

As described above, most local governments are largely dependent upon funds transferred from the state government, such as the local allocation tax, and it has been pointed out that such dependence softens local governments' budget constraints and gives them a disincentive to improve their efficiency. Since the national government decides policies and assures financial resources to the local governments that implement local policies, the financial system may have a great effect on the productive efficiency of local governments. This paper uses the ratio of revenue from the local government's own sources (Ratio of Financial Independence) as a variable for the financial factor. The Ratio of Financial Independence for the previous fiscal term is used as an explanatory variable because it is assumed that the local government's ex-ante moral hazard is due to its expectation for an ex-post fund transfer i.e., there occurs inefficiency because it behaves in expectation of funds to be transferred for the current term on the basis of the results in the previous fiscal term[7].

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6) For how such NPM indicators were obtained, refer to Muramatsu and Inatsugu (2003).
7) For an alternative variable for the financial factor, the index of financial potential or current balance is used in some studies including Yamashita (2001), besides the funds allocated from national tax revenue to the local governments as in Yamashita, Akai and Sato (2002).

(2) Introduction of NPM

NPM is the concept of incorporating managerial techniques of the private sector into the public sector to improve the efficiency of administrative and financial management. However, it involves factors that might cause inefficiency in local governments. For example, Tamamura (1998) pointed out that use of the market mechanism, such as by the privatization of public services or the creation of agencies, may involve a risk of opportunism or of expanded agency costs[8].

Performance-based management involves a risk of the whole public sector falling into opportunism. The performance evaluation system may appear to be objective, but it is conceivable that the public sector selects and discloses only favorable information or uses information as a means of justifying its policies, using its overwhelmingly advantageous position in gathering information. For "customer orientation," if the residents as customers do not have a proper understanding of the relationship between the benefits and burdens of public services, they may have unrealistic expectations for them, which may lead to increased expenditures by the public sector, i.e., a financial illusion may occur. Concerning the streamlining of a hierarchical structure, i.e., further division of functions and authorities and decentralization of powers, if there is not a strong requirement of accountability for results, it has a risk of creating new inefficiencies due to the expansion of discretionary power of the bureaucracy.

(3) Other related factors

Other factors that may affect the productive efficiency of local governments include firstly, the economy of scale in providing public goods. Many studies, including Hayashi (2002), on the optimal scale (minimum efficient scale) of a local government point out that the population size has a great effect on the expenditure structure of the local government, i.e., the administrative cost per resident required to achieve a given level of public services. The proportion of the aged is used as a variable to control the quality of the population. As a local government has a higher ratio of the aged in the population, it has a greater handicap on financial management which results in a lower productive efficiency. Besides the population, the area is used as a variable to represent a local characteristics. It is considered that a local government with a larger area is less efficient in providing public services, which results in a lower productive efficiency. The ratio of habitable area to total area is used as a variable to control the quality of the area.

Discipline imposed by residents on the local government, i.e., monitoring, is indispensable to improve the efficiency of its activities. As pointed out by Kawasaki (2001), the voting rate is used as an indicator of the residents' indirect monitoring of the local government through elections. Kawasaki (2001) also pointed out that local governments possibly allocate the resource loss to the salaries and wages of their employees. The salaries of ordinary administrative officials are included as a variable to incorporate this matter.

3.3 Results and interpretation

To statistically examine the factors that affect the productive efficiency of local governments, the Tobit estimation was made with the productive efficiency values of the local governments estimated in the preceding section used as an explained variable. The sources of data and descriptive statistics used in the analysis are shown in Table 2.

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8) Assuming that planning and management divisions are principals and the executing divisions are agencies, it is likely that the agencies have more information related to contracts than the principals, so there would be asymmetry of information between them. Such agencies would thus have an incentive to take advantage of that asymmetry of information for their own benefit (opportunism) if they are to behave rationally. Such agencies would then convey to the principals only the kind of information that might be favorable for them, and hence the principals would behave as agencies, as if they had been captured. As a result, resources could not be allocated efficiently. If such problem is to be avoided, the costs for such agencies might increase.

Table 2   Descriptive statistics

	Average	Standard deviation	Minimum	Maximum
Productive efficiency value	0.859	0.06	0.679	0.969
Ratio of Financial Independence (note 1)	41.6	9.31	24.3	66.1
Implementation of NPM (note 2)	100	32.56	28.5	167.4
(I) Market mechanism	100	30.67	25.1	176
(II) Performance-based management	100	50.13	10.7	192.1
(III) Customer orientation	100	43.81	35.2	193.9
(IV) Streaming of hierarchical structures	100	42.24	0	172
In (total population)	14.5	0.7	13.3	16
Proportion of the aged	19.8	2.91	13.5	25.5
In (total area)	8.7	0.64	7.5	11.3
Ratio of habitable area	36.4	14.41	16.4	69.4
Voter turnout	58.6	4.12	50.2	68.6
In (salary of local government employees)	12.8	0.03	12.7	12.9

Note 1) Concerning the issue of soft budget constraint, the Ratio of Financial Independence for the previous fiscal term is used because it is assumed that the local government's ex-ante moral hazard is due to its expectation for an ex-post fund transfer, i.e., there occurs inefficiency because it behaves in expectation of funds to be transferred for the current term on the basis of the results in the previous fiscal term.

Note 2) Indicators are so set that the average of all the local governments except the Tokyo Metropolitan Government is 100, on the basis of the data in Table 1.

The estimation results are shown in Table 3, and each of the factors is discussed below[9].

Table 3   Estimation results[10]

Variable	Case 1			Case 2		
	Coefficient	t value		Coefficient	t value	
Constant term	-1.2005	-0.1307		1.5798	0.1759	
Ratio of Financial Independence	0.0047	2.6809	**	0.0041	2.8535	**
Implementation of NPM	-0.0006	-2.4783	**	-	-	
(I) Market mechanism	-	-		-0.0003	-0.6283	
(II) Performance-based management	-	-		-0.0001	-0.4447	
(III) Customer orientation	-	-		-0.0005	-2.5677	**
(IV) Streaming of hierarchical structures	-	-		0.0002	0.9527	
In (total population)	-0.4484	-1.0796		-0.2731	-0.6619	
Proportion of the aged	-0.0111	-2.3728	**	-0.0093	-2.0484	**
In (total area)	-0.0007	-0.0037		-0.4481	-0.2534	
Ratio of habitable area	-0.0001	-0.1105		-0.0005	-0.5955	
Voter turnout	0.0051	2.0945	**	0.0044	1.8883	*
In (salary of local government employees)	1.2074	0.3295		-0.0263	-0.0073	
Sigma	0.4572	9.5917	**	0.0433	9.5917	**
Log likelihood	76.6443			79.1066		

9) The value for efficiency is limited to the range between 0 and 1, so ordinary OLS estimation would produce biased estimates. This paper therefore uses the Tobit estimation to deal with it. The Logit estimation was also carried out. For case 1, both estimations produced qualitatively the same results, except that the coefficient for the ratio of the aged is not significant in the latter. For case 2, only the Ratio of Financial Independence is significantly positive, so the explanatory power of the model is lower.
10) In the table, * refers to a level of statistical significance of 5%, and ** refers to a level of statistical significance of 1%.

(1) Financial factor

It was revealed that the Ratio of Financial Independence (the ratio of revenue from the local government's own sources) has a positive significant effect on the productive efficiency of the local governments. The results show that local governments that are less dependent upon the funds transferred from the national government, and that are financially more independent, have higher productive efficiency values. This suggests that large amounts of funds transferred to local governments such as the local allocation tax may make those governments less conscious of costs and give them a disincentive to improve their efficiency, as pointed out by Yamashita, Akai and Sato (2002). Therefore, it will probably be necessary to raise the Ratio of Financial Independence of the local governments and hold them more accountable for their finances in order to make them more efficient.

(2) NPM factor

The progress in implementing NPM has a negative significant coefficient. The results show that local governments with higher levels of implementation of NPM have lower productive efficiency values. Nowadays, local governments across the country have rapidly implemented reforms with NPM; however, this has not necessarily improved productive efficiency as there is much less incentive to make such improvements, as discussed above, and so it is suggested that the current reforms may actually have been "superficial formal reforms".

In this paper, the level of implementation of NPM is presented as an explanatory variable, and the productive efficiency as an explained variable. Whether such causal relationship is valid may need further consideration. In other words, it could be inferred not that the introduction of NPM has lowered the productive efficiency of local governments, but that local governments with lower productive efficiency have introduced NPM more than others. However, it is difficult to support that inference with a study by NIRA (National Institute for Research Advancement) (2002). As shown by Akai, Sato and Yamashita (2004), etc., local governments that are more dependent upon the local allocation tax probably manage their finances less efficiently; on the other hand, a study by NIRA (2002) revealed that there is no causal relationship between the level of dependence upon the local allocation tax and the level of implementation of NPM[11]. In other words, it is not the case that local governments that manage their finances inefficiently with higher dependence upon the local allocation tax have introduced NPM more than others[12].

In case 2 where regression analysis was conducted for each of the break-down items of NPM, the results show that "customer orientation" has a negative significant effect on the efficiency. It is shown that, under the conditions that there are gaps between the benefits and burden of public services and that local residents are less conscious of administrative costs because of the large amounts of funds transferred from the national government, the pursuit of customer orientation involves a risk of inducing inefficiency.

(3) Other related factors

It was revealed that the proportion of the aged has a negative significant effect on the productive efficiency of local governments, indicating that population aging will probably place a heavy handicap on local governments' financial management and lower their productive efficiency in Japan. The voting behavior (voting rate) has a positive significant effect on their productive efficiency. As Kawasaki (2001) pointed out, voting serves to monitor local governments. This shows that, to induce local governments to manage their finances more efficiently, discipline imposed by the residents, or external management, is

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11) With the indicator to measure the level of implementation of NPM used in this paper, there appears to be no causal relationship between the dependence upon the local allocation tax and the level of implementation of NPM.

12) It is generally believed that local governments in poor financial condition should introduce NPM techniques more than other local governments; however, there is no clear relationship between such financial situation and the introduction of NPM. Concerning the reasons for it, Shirakawa and Ono (2002) pointed out that, based on the results of a questionnaire survey by NIRA (2002), local governments are making reform efforts not because of their consciousness of critical financial conditions but because of the national government's instructions such as Administrative Reform Guidelines. In other words, the heads of local governments fail to recognize the current situation exactly, and lack a policy commitment to overcoming financial crises.

probably more important than internal management such as NPM. For other factors, no significant effect is recognized.

4. Conclusion

In this paper, the productive efficiency in each prefecture was estimated based on DEA. The results show that there is an average 14% loss of resources on aggregate and that there are differences among regions or among divisions of administrative activities. A statistical analysis of the causes of such differences in productive efficiency revealed that large amounts of funds transferred from the national government to local governments make the latter much less conscious of costs and gives them a disincentive to improve efficiency.

The study on the effects of NPM has revealed that local governments with higher levels of implementation of NPM show lower efficiencies of production, suggesting that the current NPM-type reforms implemented in the presence of the above-mentioned disincentive to improve efficiency have probably resulted in only "superficial formal reforms." Furthermore, the results also show that pursuing a "customer orientation" policy, which is a characteristics of NPM, while large fund transfers create a gap between the benefits and burden of public services, probably encourages inefficiency because of an illusionary fiscal recognition.

These results suggest that it is naive to consider that introducing managerial techniques of the private sector into the public sector will immediately improve efficiency, although local governments across the country have introduced NPM-type reform techniques one after another. The local governments in Japan are restricted in their activities by the Local Autonomy Law, and they also largely depend upon the national government for their financial resources. The current administrative and financial systems mentioned above may make managerial techniques of the private sector much less useful and limit the effect of reforms by NPM. In order to make NPM an effective tool for improving efficiency, it is necessary to change the administrative and financial systems such that there exists an incentive to improve efficiency that actually works. In other words, to make NPM as "reforms in expenditure" successful, it is necessary to combine it with "reforms in revenue" such as an expansion of local governments' own financial resources.

The results of the present analysis also clearly show that, to encourage efficient financial management by local governments, external management, i.e., discipline imposed by residents, is more important than internal management by means of NPM. It is the oversight over the administration through elections, etc. that disciplines the local government and encourages it to be efficient. To reinforce the residents' oversight, local governments must improve public disclosure of information. Residents' external management, however, has limitations, and so external monitoring of the administration by independent organizations will become an increasingly important form of external management.

Finally, the analysis in the paper involves some remaining issues. First, it used DEA for estimating the productive efficiency of local governments. Productive efficiency statistically estimated by DEA largely depends upon the dataset. In this analysis, administrative activities were divided into eight categories, with 16 input indicators and 50 output indicators. What indicators are used in estimation, or what levels of indicators are used, quantitatively affect the efficiency values. For example, this analysis used annual merchandise sales and manufacturing shipment amount as output indicators of the Commerce and Industry division; however, those indicators depend largely upon the general economic situation and other factors, and it may not be valid to assume that they result from inputs such as government personnel or budgets. Because the local governments' administrative activities have diverse aspects, it is necessary to consider the selection of input items from various points of view to reflect the exact state of those activities. In DEA, when the number of indicators is larger than the number of entities covered in the analysis, the degree of freedom in the combination of weights is higher, and as a result, the average of efficiency values tends to be higher; on the other hand, when the number of indicators is smaller than the number of such

entities, the degree of freedom in the combination of weights is lower, and as a result, the average of efficiency values tends to be lower. This point should be taken into consideration when deciding the number of indicators to be used in the estimation.

Second, some issues generally pointed out as being involved in DEA are: that estimated efficiency values refer to relative values, not absolute values; that DEA can not test efficiency values obtained on the assumption that no stochastic factors are involved; and that efficiency values based on DEA are obtained on the assumption that observational errors are not involved, but such errors are taken into consideration in a factor analysis by means of econometric techniques. The analysis presented in this paper also cannot avoid those issues. In the measurement of efficiency, it is necessary to analyze the efficiency by means of econometric techniques such as a stochastic frontier approach, and then to compare the results by such an approach with those by DEA to test the robustness of the conclusion, or it is necessary to expand DEA analysis so that it can take stochastic factors into consideration, based on the studies of Charnes, et al. (1985), Sengupta (1990), and Land, et al. (1993), in future studies.

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Attached Table 1   List of indicators used for measurement of efficiency values

			Indicators	Source	Time of Survey (Y/M/D)
Welfare	Input	Budget	Welfare expenditures (excluding expenses for public livelihood assistance and for disaster relief)	Annual Report of Local Finance Statistics by Institute of Local Finance	01/4/1 – 02/3/31
		Personnel	Number of public employees in welfare division	Status of Salaries/Wages of Local Public Employees by Ministry of Internal Affairs and Communications (MIC)	01/4/1
	Output	Social welfare	Capacity of facilities for the intellectually disabled	Survey Report of Social Welfare Facilities by Ministry of Health, Labor and Welfare (MHLW)	01/10/1
			Capacity of facilities for the physically disabled	Survey Report of Social Welfare Facilities by MHLW	01/10/1
		Welfare of the aged	Capacity of homes for the aged	Survey Report of Social Welfare Facilities by MHLW	01/10/1
			Number of visiting care service workers for the aged (home helpers)	Survey Report of Social Welfare Facilities by MHLW	02/3/31
		Welfare of children	Capacity of day nurseries	Survey Report of Social Welfare Facilities by MHLW	01/10/1
			Number of child welfare houses	Survey Report of Social Welfare Facilities by MHLW	01/10/1
Health	Input	Budget	Health expenditures (excluding cleaning expenses)	Annual Report of Local Finance Statistics by Institute of Local Finance	01/4/1 – 02/3/31
		Personnel	Number of employees in the Health division	Status of Salaries/Wages of Local Public Employees by MIC	01/4/1
	Output	Public hygiene, measures against tuberculosis, and public health centers	Number of deaths due to lifestyle diseases (per 100,000 population)	Demographic Survey by MHLW	01/1/1– 12/31
			Number of people who have had basic medical check-up	Report of Local Health Programs and Health Programs for the Aged by MHLW	01/1/1– 12/31
		Mental health	Average number of days of stay in mental hospitals (*)	Report of Hospitals by MHLW	01/1/1– 12/31
		Environmental sanitation	Annual per capita quantity of garbage discharged and disposed of (*)	Survey of Status of Public Facilities by Institute of Local Finance	01/4/1 – 02/3/31
		Medicine	Number of medical professionals and workers (doctors, nurses and assistant nurses)	- Survey of Doctors, Dentists and Pharmacists by MHLW - Report of Health Administration by MHLW	02/12/31 02/12/31
			Number of ordinary hospital beds (per 100,000 population)	Survey of Medical Facilities by MHLW	01/10/1
Labor	Input	Budget	Labor expenses	Annual Report of Local Finance Statistics by Institute of Local Finance	01/4/1 – 02/3/31
		Personnel	Number of employees in the Labor division	Status of Salaries/Wages of Local Public Employees by MIC	01/4/1
	Output	Labor policies, vocational training, measures for unemployment, and labor committees	Effective number of job openings	Annual Report of Labor Market by MHLW	01/4/1 – 02/3/31
			Effective ratio of job seekers to job openings	Annual Report of Labor Market by MHLW	01/4/1 – 02/3/31
			Number in employment by prefecture	Annual Report of Labor Market by MHLW	01/4/1 – 02/3/31
			Proportion of the middle aged and older (i.e., 45 years old and above) to the total employed	Annual Report of Labor Market by MHLW	01/4/1 – 02/3/31
			Proportion of the physically handicapped to the total employed	Annual Report of Labor Market by MHLW	01/4/1 – 02/3/31

Agriculture, Forestry and Fisheries	Input	Budget	Expenses for agriculture, forestry and fisheries	Annual Report of Local Statistics by Institute of Local Finance	01/4/1 – 02/3/31
		Personnel	Number of public employees in the Agriculture, Forestry and Fisheries division	Status of Salaries/Wages of Local Public Employees by MIC	01/4/1
	Output	Agriculture and livestock industries and agricultural land	Agricultural production amount	Statistics on Agricultural Income by Ministry of Agriculture, Forestry and Fisheries (MAFF)	01/4/1 – 02/3/31
			Gross product of agriculture per farmer	World Agriculture and Forestry Census by MAFF	01/2/1
			Land productivity (per hectare of cultivated land)	Statistics of Cultivated Land and Planted Land by MAFF	01/8/1
		Forestry	Forestry output	Summary of Forestry Statistics by Forestry Agency	01/4/1 – 02/3/31
			Afforested area	Summary of Forestry Statistics by Forestry Agency	01/4/1 – 02/3/31
		Fisheries	Fishing catches and production of the fish-farming industry (total of fisheries in the sea and inland waters)	Annual Report of Statistics of Fishing and Fish-farming Production by Fisheries Agency	01/1/1 – 12/31
Commerce and Industry	Input	Budget	Expenses for commerce and industry	Annual Report of Local Statistics by Institute of Local Finance	01/4/1 – 02/3/31
		Personnel	Number of employees in the Commerce and Industry division	Status of Salaries/Wages of Local Public Employees by MIC	01/4/1
	Output	Commerce	Annual merchandise sales (wholesale + retail)	Statistics of Commerce by Ministry of Economy, Trade and Industry (METI)	01/7/1 – 02/6/30
			Merchandise sales per person working in commerce (wholesale + retail)	Statistics of Commerce by METI	01/7/1 – 02/6/30
		Manufacturing and mining	Manufacturing shipment value	Industrial Statistics by METI	01/1/1 – 12/31
			Manufacturing shipment value per person working in manufacturing	Industrial Statistics by METI	01/1/1 – 12/31
			Amount of value added	Industrial Statistics by METI	01/1/1 – 12/31
		Travel	Number of hotels and inns	Report of Health Administration by MHLW	01/12/31
Civil Engineering	Input	Budget	Expenses for civil engineering (excluding those for ports / harbors, and airports)	Annual Report of Local Statistics by Institute of Local Finance	01/4/1 – 02/3/31
		Personnel	Number of employees in the Civil Engineering division	Status of Salaries/Wages of Local Public Employees by MIC	01/4/1
	Output	Roads and bridges	Total length of prefectural roads improved	Survey of Status of Public Facilities by Institute of Local Finance	01/4/1
		Rivers and coasts	Total length of rivers (under control of prefecture)	Materials from Water Administration Division, Ministry of Land, Infrastructure and Transport (MLIT)	01/4/30
		Urban planning	Length of street construction / improvement completed	Survey of Status of Public Facilities by Institute of Local Finance	02/3/31
			Area of parks in urban areas	Survey of Parks Constructed / Improved in Urban Areas by MLIT	02/3/31
			Rate of spread of sewage services	Statistics of Sewage (Administration) by Japan Sewage Works Association	02/3/31
			Area of land adjusted in land rezoning projects	Annual Report of Land Rezoning by Organization for Promoting Land Rezoning Projects	02/3/31
		Housing	Number of public housing units	Survey of Status of Public Facilities by Institute of Local Finance	02/3/31

Police	Input	Budget	Expenses for the police	Annual Report of Local Statistics by Institute of Local Finance	01/4/1 – 02/3/31
		Personnel	Number of police personnel	Status of Salaries/Wages of Local Public Employees by MIC	01/4/1
	Output	Police activities	Number of traffic accidents (per 100,000 population) (*)	Annual Report of Traffic Statistics and Traffic Accident Statistics by the National Police Agency	01/1/1 – 12/31
			Number of traffic deaths (per 100,000 population)	Annual Report of Traffic Statistics and Traffic Accident Statistics by the National Police Agency	01/1/1 – 12/31
			Number of traffic offenses charged	Annual Report of Traffic Statistics and Traffic Accident Statistics by the National Police Agency	01/1/1 – 12/31
			Number of arrests due to criminal offenses	Criminal Statistics by the National Police Agency	01/1/1 – 12/31
			Ratio of criminal arrests to total criminal cases	Criminal Statistics by the National Police Agency	01/1/1 – 12/31
Education	Input	Budget	Expenses for education (excluding those for kindergartens and universities / colleges)	Annual Report of Local Statistics by Institute of Local Finance	01/4/1 – 02/3/31
		Personnel	Number of employees in the Education division (excluding those for kindergartens and universities / colleges)	Status of Salaries/Wages of Local Public Employees by MIC	01/4/1
	Output	Primary school	Number of students	Report of Basic Survey of Schools by Ministry of Education, Culture, Sports, Science and Technology (MECSST)	01/5/1
			Ratio of long-term truant students (per 1,000 students) (*)	Report of Basic Survey of Schools by MECSST	01/4/1 – 02/3/31
		Junior-high school	Number of students	Report of Basic Survey of Schools by MECSST	01/5/1
			Ratio of long-term truant students (per 1,000 students) (*)	Report of Basic Survey of Schools by MECSST	01/4/1 – 02/3/31
		Senior-high school	Number of students	Report of Basic Survey of Schools by MECSST	01/5/1
			Ratio of senior-high-school graduates who go on to universities / colleges	Report of Basic Survey of Schools by MECSST	01/4/1 – 02/3/31
		Special school for the handicapped	Number of students of schools for the blind, deaf and other disabled	Report of Basic Survey of Schools by MECSST	01/5/1
		Social education	Number of those who have taken social education classes / courses	Report of Social Education Survey by MECSST	01/4/1 – 02/3/31
		Health and physical education	Ratio of those who play sports	Report of Basic Survey of Social Life by MIC	01/10/1

(*) For the output indicators that are better when smaller, the average of the maximum and the minimum is referred to as μ, and (2μ minus output value) is considered as the evaluation result. Thus, the evaluation results are on a reversed scale.

Attached Table 2   Sources of data

Variable		Source	Time of survey (Y/M/D)
Ratio of Financial Independence	Amount of own financial resources / amount of total expenditures in closing accounts	Statistical Indicators on Social Life by Statistic Bureau, MIC	00/4/1 – 01/3/31
Level of introduction / implementation of NPM		Muramatsu and Inatsugu (2003)	00/10/31
Total population		Estimated population in 2001 in Statistical Indicators on Social Life by Statistic Bureau, MIC	01/10/1
Ratio of the aged	Population of 65 years old or more / total population	Estimated population in 2001 in Statistical Indicators on Social Life by Statistic Bureau, MIC	01/10/1
Total land area		Survey of Land Areas of Prefectures, Cities, Towns and Villages by the Geological Survey Institute	01/10/1
Ratio of habitable area	Habitable area / total area	Statistical Indicators on Social Life by Statistic Bureau, MIC	01/10/1
Voter turnout		Survey of Results of General Elections of the House of Representatives by MIC	01/7/29
Salaries / wages of public employees	Average monthly salary / wages of general administrative posts	Status of Salaries / Wages of Local Public Employees	01/4/1