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Full Length Research Paper

An analysis on the economic effectiveness of municipalities in Turkey

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In the present study, efficiency of municipalities and the factors affecting it are evaluated theoretically and then empirical analysis about the efficiency made. In the application part, 27 municipalities, 7 of which are metropolitan municipality, are covered. Data related to the inputs and outputs that reflect the financial, fiscal, social and demographic situation of these municipalities are taken from surveys, centralized management units and statistical units. Efficiency analysis of municipalities are made by using data envelopment analysis (DEA) and Malmquist index technique. Efficiency scores were obtained and factors which affect efficiency and the interaction among the factors are determined. Under the lights of these result and the estimations of both DEA models and Malmquist Index, it can be stated that there was a decrease in the number of efficient municipalities and the level of their efficiencies from years 2006 to 2008.

Key words: Municipality efficiency, data envelopment analysis (DEA), malmquist index, tobit model.

INTRODUCTION

The term “administration efficiency” has been one of the important topics which public administration focuses on. In one of his articles, Wilson (1887), the creator of public administration theory, stated that the most important aim of administration is “first determining what it can do in a proper and successful way and then doing them with the lowest cost and energy but with the most effective method”. According to the theorists of public administration, efficiency of public organizations is not a problem related to individuals and their behaviors but related to the structure of an organization (Frederickson and Smith, 2003).

Although, performance measurement is not a new concept, it is renewed in the current context of public administration (Poister, 2003). However, the first attempts on performance measurement of public sectors were interrupted during World War II. Nyhan and Martin (1999) define performance measurement as “collecting and reporting data regularly about the efficiency, quality and productivity of the programme performed in any administrative activity”. In a more general sense, performance measurement in the public sector is the evaluation of the services provided by the public utilities constantly and systematically (Hatry, 1999). In performance measurement, there are some approaches like productivity, operating effectiveness, service quality, customer satisfaction and cost efficiency, although, the most common approach is to evaluate the performance with a “process-based” model which focuses on the input, production process, output and output process. Performance measurement can be grouped as input, output, efficiency and productivity measurements (Ammons, 1995). In these kinds of measurement approaches, while input measures the amount of resources used in the production of public services, output measures the amount of a job or an activity which was completed.

In the 1990’s, although there were remarkable developments about performance measurements for the local

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administrations, it could be said that empirical evidences obtained about the utility and feasibility of performance measurement is still limited and insufficient. Furthermore, in the performance measurements, the measurement of low level of input and workload, and the fact that the measurements do not cover every field of activity in the local administrations results in that measurements are not directly related to the decision-maker units and reporting power of it about in-company units is weak (Kopczynski and Lombardo, 1999).

In parallel with the developments in the modern administrative mentality, performance measurement started to become prevalent in the public sector. On this matter, firstly a method for performance measurement and evaluation called as Balanced Scorecard was developed. With this method which was applied on local administrations by Kloot and Martin (2000), the efficiency tried to be determined by using selected financial variables, and it was determined that administration efficiency was especially low with respect to the criteria of learning and development. As a result of most of the studies conducted on local administrations, it was concluded that the scope of application of this method is notably limited for local administrations (Chan and Ching, 2004). In addition to all these, lots of studies were conducted examining the effects of performance measurement in the local administrations on; the decisions of administrations (Poister and Streib 1999), the process and decision of budgeting and reporting (Melker-Willoughby, 2002), satisfaction of the citizens (Ryzin and Van, 2005), positive and supportive behaviors of central government and participation of the citizens to decision process, (Wang and Berman, 2000), political environment, stability of the central government, citizen centered and open to change behaviours (Tat and Ho, 2005).

In this study, efficiency analysis and the analysis aimed at determining the factors affecting the efficiency were made for 27 municipalities, 7 of which are metropolitan municipalities (since data of some municipilaties are missing, evaluation is made on 25 municipilaties). While efficiency analyses are made by using non-parametric methods like data envelopment analysis (DEA) and Malmquist index.

In this study, municipalities were analyzed in terms of their level of achieving economic efficiency and level of turning their economic and social facilities into goods and services. In this direction, factors that provides them achieving efficiency and the effects of these factors on efficiency were observed.

LITERATURE REVIEW

Data and variables used in efficiency measurement

The most important step in analysis and measurement of efficiency is choosing the factors that may be effective on efficiency and the indicators that are inputs and outputs. This is very crucial for the quality of analysis. Some of these variable and data are consisted of the data that were taken from local governments and some of them are the data that were taken from Turkish Statistical Institute. In the cases that suitable data is not collected from the local administrations, official data are used. These data is defined as values, numbers, amounts and monetary values. Especially for the cases in which analysis can be made like DEA, almost all of these variables are used together. In this part, inputs, outputs and variables that may be used in evaluations and analysis that are parametric and non-parametric intended to determine factors affecting economic efficiency of municipalities are given. These variables given in Table 1 are tested for the convenience for the analysis and researches made. In these researches, data envelopment analysis, free disposal hall, stochastic boundary analysis, Malmquist index anlysis and Tobit analysis are used.

In the Table 2, factors like qua input and output used in efficiency analysis with different methods are given. These factors are variables that can be defined as numerical size, proportional value, volume and length. In efficiency measurements, numerical approaches are used often later. The usage of these approaches takes three advantages for the researchers and decision units (Kalirajan and Shand, 1999). First of all, by making a comparison between similar economic decision units, relative efficiency can be analyzed. Secondly, direction and the size of efficiency variations that belongs to decision units can be determined. Finally, policies to increase the efficiency defined by the parameters may be developed.

Empirical practices

It is seen that in the studies which measure the efficiency in terms of technical, economical and appropriation, parametric and non-parametric methods are used. In this subject, DEA that is one of the most popular methods of todays is a very suitable nonparametric analysis method especially for determining the efficiency of health, education, finance, production and service units of the public sector.

Another method used for efficiency analyses is Malmquist Index. This index, which can be calculated by using parametric and linear programming methods, is based on the amount of input and output and determined by distinction functions representing multiple-inputs and multiple-outputs technologies. Malmquist index can be used as a tool that is appropriate for measuring the efficiency of public sector in which prices are not determined exactly. In addition to this, it is an efficiency method which is used often because of its ability to show production efficiency and technical efficiency separately.

Table 1. Used variables up to efficiency analysis researches (Efficiency measurement indicator).

Author	Sample	Method	Inputs	Outputs
Van den et al. (1993)	235 Belgium municipalities (Horizontal section)	DEA	Total current expenditures	Total population, proportion of people who are older than 65, number of people who live at the lowest life level, number of elementary school students, length of roads, number of guilts
De Borger et al.. (1994)	589 Belgium municipalities (Horizontal section)	FDH	Number of blue and white coloured workers m^2 of buildings	Length of roads, number of people who live at the lowest life level, number of elementary school students' unsettled population / log (total employment). Area of public service spaces
De Borger and Kersterns (1996)	589 Belgium municipalities (Horizontal section)	DEA, FDH Stochastic method	Total current expenditures	Total population, proportion of people who are older than 65, number of unemployed people, number of elementary school students, length of roads
Athanassopoulos and Triantis (1998)	172 Greece municipalities (Horizontal section)	DEA and stochastic method	Total current expenditures	Number of settled families, average area, length of spaces, length of tourism and industrial areas
Ramos and Sousa (1999)	701 Brazil municipalities (Horizontal section)	DEA, FDH	Total current expenditures	Settled population, number of houses that use clean water, number of houses that collect wastes, uneducated population, number of elementary school students
Wortinghton (2000)	166 Australia municipalities (Horizontal section)	DEA and stochastic method	Number of full time workers, financial expenditure	Total population, number of equipment used to collect clean water and etc., length of rural and urban roads (km)
Prieto and Zofio (2001)	209 Spain municipalities whose population is under 20.000 (Horizontal section)	DEA	Expected budget spending	Potable water, waste, length of roads, number of units that illuminate the roads, cultural and sport background
Balaguer-Cool et al. (2002)	258 Spain municipalities (Panel data)	DEA	Total current expenditures	Number of illumination points, total population, collected waste (tons), area of streets backgrounds, length of park areas, number of voters and the level of quality
Loikkanen and Susiluoto (2005)	353 Finland municipalities (Panel data)	DEA	Total current expenditures	Daily child care houses, child care houses, central tooth care, older people' home, handicapped home, school, number of libraries and their users
Afonso and Fernandes (2006)	51 Lisbon region municipalities	DEA	Spending per capita	General administration, educational, social and cultural services, performance of waste collectors

In efficiency studies, in order to determine the efficiency values of the units and the factors affecting the efficiency, parametric approaches are being used quite often, too. In a research intended to determine the efficiency, by using

Table 2. Relations between inputs and efficiency scores in DEA.

Author	Country	Empirical indicators (Factors affecting efficiency)	
		Positively	**Negatively**
Van den et al. (1993)	Belgium	-High tax rates -Education level of adults	- High income per person -Transfer spending per person
De Borger and Kersterns (1998)	Belgium	-Local tax rates - Education level	- Transfer spending per person -Income
Athanassopoulos and Triantis (1998)	Greece	-High proportion of free services in municipalities' revenues -High investment rate	-Population density -Scholarship and subsidy -Parties about central Government
Balaguer-Cool et al. (2002)	Spain	-Bigger population -Level of traditional activity	-High tax per person -High scholarship per person
Loikkanen and Susiluoto (2005)	Finland	-Number of workers between 35 and 49 is high -High education level -Rural density -Suburb settlement	-High income level -Large population -High unemployment -Different service buildings -Proportion of services from the other municipalities

a two phased non parametric method, firstly, DEA and free disposable hull techniques are used and then, fiscal and political variables are focused on and some critical variables related to efficiency are determined. To determine the factors that may affect efficiency, regression analysis done with the ordinary least square method, and Tobit model -an econometric model- are being used.

A similar study was conducted by Afonso and Fernandes (2007) for Portgual municipalities. In that study, firstly, relative efficiency of selected 278 municipalities in 5 different regions has been tried to be determined by using DEA. Also, a set of descriptive variables and their effects on inefficiency are determined by using Tobit analysis. As distinct from the other studies, the term "local expenditure efficiency" is examined and a new indicator named "local administration output indicator" is calculated. While this indicator is being calculated, a mixed output is used in nonparametric analysis. This study is an important guide for the similar studies in terms of the techniques being used because a wide variety of input-output set was used to assess the relative efficiency of a municipality with a nonparametric method. Adding to this, a lot of variables thought to be affecting on efficiency/ inefficiency with parametric analyses were covered and empirical evidences were presented.

In the study conducted by Benito et al. (2007), DEA was used by using the service and cost as inputs in terms of the service types of municipalities. After that, determinants of efficiency according to the different administration types like sub structures of municipalities, directly self-governance, autonomous public agency, 100% public company checked by self-governance, 51% public company, and private company are tried to be determined comparatively.

In the study of Moore et al. (2003), statistical methods are used in order to examine the effects of possible environmental factors and official preferences on efficiency according to service types and cities. In the same study in which it is determined that lots of urban services that apply suburbian type urban development methods have quite low efficiencies, a fact that an intensive urban development does not cause high efficiency is an important finding.

In the study in which cost efficiency of Australian local administrations is determined, analysis of mathematical programming and econometric approaches are made comparatively (Worthington, 2000). As a result of analysis, it is indicated that DEA and stochastic methods have to be thought as supplementary tools in the analysis of local public sector.

Borge et al. (2008), in the study they did, effects of efficiency of public services and budget and political settlement and fiscal capacity and democratic applications on efficiency tried to be determined by using an econometric analysis method. The study was carried out by benefiting from global efficiency measurement criterions in Norway local administrations. It was determined that high fiscal capacity and multi-party political settlements have negative effects on the efficiency of local administrations. In addition to this, central bureaucratic budgeting method also causes efficiency to be low.

Loikkanen and Susiluoto (2006), in their study, examined the cost efficiency of social aid service supply in Finland municipalities between 1994 and 2002. As a

method, DEA was used to calculate the efficiency. 6 of 10 inputs used in health, education and social services are evaluated and production costs of these services are used as outputs. As a result of the study, it has been determined that there are important differences between municipalities in cost efficiency. It is determined that small municipalities in South Finland are the most efficient municipalities; however, the efficiencies of the bigger municipalities in North are low.

In a study conducted by Kim and Brian (2004), efficiency of water services in Galler municipalities and Australian local administrations are tried to be measured by using DEA. Also, within the framework of efficiency measurement, qualitative indicators are also looked at. The reasons for the efficiency situations of municipalities' water services and the best applications are tried to be analyzed.

In the study made by Widsröm et al. (2004), the cost efficiency of public tooth health service (PTH) until 2000 is searched in Finland, in a study on 228 PTH that belongs to the municipalities, first with DEA by looking at inputs and outputs, and then by Tobit analysis, efficiency and the factors affect it were searched. In the study made by Isabel (2006), efficiency of water services in Spain municipalities was examined. In her study in which DEA is used, superiority of DEA over the other classical methods is shown. As a result of the study, population density has significant effects on efficiency.

In the article in which the efficiency of local administrations is measured by setting a local waste function in south Walles municipalities by Worthington and Dollery (2001), DEA was used, and the comparison of 103 municipalities was made in terms of some criterions. According to the results, in order to reach the best efficiency value, current administration inputs must be reduced by 65%. On the other hand, efficiency loses caused by scale inefficiency was counted as 15% of total inputs.

METHODOLOGY

Mathematical structure of DEA

DEA has been developed with the relative technical efficiency approach that Farrel had suggested in efficiency measurement and it is based on the usage of multiple inputs and outputs (Farrell, 1957). Farrel based on that result on production functions of economic decision units is measured whether by the best production technique or an efficient production function which represents the best input output relationship. Lets assume that from x_k, $k=1,2,\ldots,m$ inputs of a decision making unit (DMU) y_i, $i=1,2,\ldots,t$ outputs are produced. With the helps of the suitable weights ($v_i=1,2,\ldots,t$; $w_k=1,2,\ldots,m$) , the equation can be written as follows:

$$\frac{\sum_{i=1}^{t} v_i , y_i}{\sum_{k=1}^{m} w_k , x_k}$$

Fractional program benefits from the proportion of total factor efficiency. In one sense, it must be thought as a conceptual model of DEA. Linear model should be thought as a practical method for the efficiency measurements. For every input and output, DEA determines the weights of DMUs. Two constraints exist in determining the weights by linear programming. One of them is that weights have to be positive and the other one is that the ratio of the proportion of outputs to inputs should not be greater than 1 for the DMUs included in the model. In the literature, these weights are named as virtual input-output or virtual weights.

DEA takes the inputs and outputs of the previous equation as the data, and for these inputs and outputs it chooses the weights that maximize the p decision unit performance with respect to the other units' performances:

$$Max.v_i w_k \frac{\sum_{i=1}^{t} v_i , y_{ip}}{\sum_{k=1}^{m} w_k , x_{kp}}$$

Here, efficiency value belonging to decision unit is under <1 constraint:

$$0 \le \sum_{i=1}^{t} v_i y_{ic} / \sum_{k=1}^{m} w_k x_{kc} \le 1$$

$c = 1,2,\ldots,p,\ldots,Z$ and for all inputs and outputs v_i, $w_k > 0$

In the model, "v" and "w" constitutes the weight on the inputs and outputs, and variables in the equation. Solution of the model gives an efficiency value for "p" DMU and the set of weights which are necessary to reach the value for "p" DMU. Nonparametric efficiency measurement model in the form of fractional programming which was developed by Charnes, Cooper and Rhodes has been turned to linear programming model like in the above equation. (Charnes et al., 1978). This equation is calculated for every DMU and set of weights is obtained. The weights in the aimed function maximise the efficiency value of the unit under (≤ 1) constraint.

Malmquist index

Malmquist efficiency index one of the indexes that consider the change in the production (Malmquist, 1953). This index was used by Caves et al. (1982) in data envelopment analysis. This index consists of discrepancy functions which represent multiple inputs and outputs technologies based on the amounts of input and output. The reason why Malmquist index is superior to the other indexes is that in this index, prices and assumptions about the structure of the technology are not needed. Because of these properties, Malmquist index is an appropriate tool to measure the efficiency in public sector in which prices are not determined clearly. Unlike the other indexes, Malmquist index can determine production and cost limits of production technology.

Malmquist index can be calculated as both input oriented and output oriented. A production oriented Malmquist TFV change index M_h^{t+1} can be written as:

$$M_h^{t+1}(X_h^{t+1}, Y_h^{t+1}, X_h^{t}, Y_h^{t}) = \left[\frac{D_h^t(X^{t+1}, Y^{t+1})}{D_h^t(X^t, Y^t)} \frac{D_h^{t+1}(X^{t+1}, Y^{t+1})}{D_h^{t+1}(X^t, Y^t)} \right]^{1/2}$$

The equation aforementioned shows production element in D_h, t and t+1 period. Technology in t period is reference and t+1 is used. Reference category can be chosen arbitrarily. For the applications concerning the municipalities, inputs as (h =1, 2,…….n),

Here input vector is $x_h^t = (X_{1ht}, X_{2ht}....)'$ and output vector is $y_h^t = (Y_{1ht}, Y_{2ht}....)'$

Because properties of returns to scale of technology in total factor productivity is very important, for estimating the distance functions in Malmquist indexes, constant returns to scale assumtion (CRS) is based on. Otherwise, results obtained do not represent total factor productivity profits and losses caused by scale effects.

MUNICIPALITIES IN TURKEY

Structure and income sources of the municipalities in Turkey

During the Republican period, the first legal regulation was the municipality law numbered 1580 which was introduced in 1930. The first regularization concerning metropolitan municipalities was taken into consideration with Article 127 of 1982 Constitution, and it was stated that special administrative regimes can be brought for cities. With regard to this regularization, for the first time a metropolitan municipality was established in 1984 with the decree law numbered 195. Later, again in 1984, Metropolitan Municipalities Law numbered 3030 was introduced. Together with the ones established in different times, 16 metropolitan municipalities are İstanbul, Ankara, İzmir, Adana, Bursa, Gaziantep, Diyarbakır, Adapazarı, Antalya, Kayseri, Konya, Eskişehir, İzmit, Erzurum, Samsun and Mersin. This law has been changed by the law numbered 5216 which was introduced in 2004, and today, metropolitan municipalities are still being administrated with this law. After this law, conditions for establishing a metropolitan municipality were made difficult and the limit for being a metropolitan municipality has been defined again. In order to establish a metropolitan municipality, the population has to be at least 750.000 and the physical location and economic situation have to be taken into consideration. The border for a city to be a metropolitan municipality was determined as having a radius at least 20 km for the ones having population up to 1 million, 30 km for the population up to 1 to 2 million and 50 km. for the ones having population over 2 million.

There are two types of municipalities which are governed in two different ways in Turkey. First type is metropolis municipality and its provincial municipalities that are governed under Law no. 5216. The other type is the municipalities governed under law no. 5393; these are city municipalities, provincial municipalities and town municipalities. The number of each municipality type (http://www.mahalli-idareler.gov.tr) is given thus:

Metropolis municipalities 16
Metropolis provincial municipalities 143
City municipalities 65
County municipalities 749
Town municipalities 1.978
Total 2.951.

The municipalities have three organs; municipal council, municipal board and the mayor. Municipal council and mayor are elected and assigned through local elections held once in each five years. Some members of municipal board are selected from the members of municipal council, and some of them are selected by mayor from the municipal units' heads. Municipal council is decision-making organ, municipal board is executive and advisory organ, and the mayor is the top manager and executive organ of a municipality.

Some duties of the municipalities, governed under law no. 5393, in accordance with clause 14 are: public improvements, water and sewerage works, transportation services, environmental health services, cleaning works, public security services, fire brigade services, emergency helps, in-city traffic management, burial and cemetery services, forestation works, providing parks and green fields, house construction services, cultural and artistic activities, tourism and advertisement works, youth and sportive activities, social services and aids, marriage services, professional trainings. Some duties of the municipalities, governed under low no. 5216, in accordance with clause 7 are: planning and application of transportation services, planning of public transportation services, to determine locations for auto-park lots in bus stops, streets, roads, public areas, and similar locations, to construct public squares, boulevards, streets and main roads, maintenance and repair works of these roads, to determine locations for hanging advertisements and billboards, to provide protection for environment, agricultural areas and water basins in accordance with sustainable development principle.

Revenues of municipalities are their own revenues, shares from general budget taxes, government helps and the other revenues. Their own revenues which were determined by Municipality Revenues Law numbered 2464 are taxes, fees and the participation shares into the expenses. However, 80% of the aforementioned municipality shares are distributed to the population and 20% is distributed to the municipalities by İller Bankası (Provincial Bank) with respect to its index of development.

Like in the other municipalities, the most important part of the revenues of metropolitan municipalities consists of the shares transferred from general budget taxes. According to the law numbered 5779, 2.5% of general budget taxes are given to the district municipalities. 5% of the total revenue of general budget taxes collected in metropolitan municipality borders and 30% of the amount separated for metropolitan district municipalities out of

Table 3. Distribution of revenues and expenses of municipalities (2008).

Type of revenue	Amount (0,000 TL*)	Total revenue (%)
Tax revenue	4,07,274	16
Enterprise and ownership revenues	3,751,749	14
Donations, contributions and private revenues	496,871	2
Interests, private revenues and fines	15,709,413	61
Capital revenues	1,664,835	6.9
Collection of debts	35,870	0.1
Total	25,736,012	100
Type of expense (Cost)	**Amount (0,000 TL*)**	**Total expense (%)**
Personnel expenses	5,944,940	19
Social security premium expenses	831,219	3
Expenses for purchasing goods and services	10,565,757	34
Interest expenses	631,434	2
Current transfers	1,493,257	5
Capital expenses	11,000,982	35
Capital transfers	136,729	0.5
Loan	354,766	1.5
Total	30,959,084	100

*Turkish Lira. Source: http://www.muhasebat.gov.tr.

the sum of revenue of general budget taxes are taken as a contribution for metropolitan municipalities. The cabinet has the authority to double or decrease this amount up to its legal limit. The shares are calculated monthly by Ministry of Finance.

As it is seen in Table 3, while the percentage of tax revenues in the total revenues of municipalities was 16%, interests, private revenues and fines have 61% of that amount. When we look at the total expenses of municipalities, personnel expenses and expenses for purchasing goods and services are 19 and 34% respectively.

Scope of the study

The analysis about the municipalities cover the years 2006 to 2008. Some of the data are obtained from the municipalities via questionnaires and data forms, and the others are taken from the institutions such as Ministry of Internal Affairs, Local Administrations, General Directorate of Accounting and Revenues and from the statistics data bases of some institutions like TUİK (Turkish Statistical Institute) and DPT (State Planning Organization). Especially, all data in terms of expenditures and revenues consist of the data of Central Administration Budget Revenues and Expenditure. Although, 27 municipalities would be covered in this study, because the data for two of them (Mardin ve Şanlıurfa) are insufficient and inconsistent, these municipalities are taken out of the scope of the study.

Table 4 gives the demographic features of municipalities in 2008. In these municipalities, Istanbul is in the most populated metropolitan city with 12.5 million populations and then Ankara and İzmir come respectively. Mugla municipality is the least populated city with 56.619 populations. In terms of the income per person, Istanbul again takes the first place and Van is the last one. It is seen that population increase rate of 9 municipalities is negative. This situation shows that there is a great immigration from these cities.

In the municipalities covered in this study, the average population is 22.54 million people. This constitutes the 87% of all the population living in all municipalities. Covered municipalities contain nearly 26 million people. This amount is approximately 35% of Turkey's total population. The variables that are used while assessing the efficiency of the municipalities via Data Envelopment Analysis (DEA) and their results are presented in Table 5. In Data Envelopment Analysis, some of these variables are placed as inputs while some others as outputs. All the variables about the inputs are related to the various expenses of the municipalities. Outputs are presented variously depending on the type of utilization of the people benefiting from the municipality services. The ratio of the people who are 65 and over is accepted as the same for the three years. However, the other variables change greatly.

In Table 5, for the year of 2006, especially in the borders of municipalities, the fact that the number of beds concerning the tourism establishments is changing from 0 to 215.000 shows that the standard deviation of this variable is high. In the same way, capital transfer and

Table 4. Demographic features of municipalities (2008).

Municipality	Population (number)	Income per capita	Unemployment	Order of progressive	Percentage population
Istanbul*	12,569,041	2,750	11	1	10
Ankara*	4,194,939	2,588	12	2	18
Izmir*	3,206,958	2,696	12	3	15
Antalya*	911,497	1,813	10	10	38
Erzurum*	359,752	914	6	60	-13
Diyarbakır*	799,447	1,056	14	65	22
Samsun*	498,365	1,452	8	32	4
Ş.Urfa	468,993	805	13	68	33
Malatya	411,181	1,163	14	30	16
K.Maraş	385,672	1,215	15	46	25
Van	342,139	695	14	70	25
Batman	298,342	949	17	71	27
Sivas	288,693	1,098	11	39	-11
Manisa	278,967	2,062	8	12	-2
Trabzon	220,860	1,208	6	38	11
Hatay	188,310	1,509	18	29	19
Isparta	175,815	1,318	8	28	-30
Afyon	163,207	1,081	8	35	-6
Tekirdağ	137,962	2,134	11	15	57
Tokat	124,496	1,107	7	59	-7
Zonguldak	105,979	2,380	7	21	5
Çanakkale	90,653	2,172	7	7	-3
Erzincan	86,051	956	6	58	-14
Nevşehir	81,899	1,823	10	50	6
Mardin	81,269	718	17	72	7
Yozgat	71,768	781	11	64	-16
Muğla	56,619	2,750	10	13	32

*Metropolitan municipalities.

the total number of beds in the hospitals show a similar contradiction. In the other 2 years (2007 and 2008), there is a big difference between the maximum and minimum values of the capital transfer, number of beds in the tourism establishments and in the hospitals.

EMPIRICAL STUDY

In this direction, population of the study consists of all city and metropolitan city municipalities in Turkey. However, statistically because it is a more rational approach in terms of time and usage of resources that studying by creating sample population that is able to represent the population, a group of municipalities were chosen and analysis were made according to the data belonging to these municipalities (Table 4). Data obtained from the municipalities chosen are collected via questionnaires and statistics, and statistical evaluations and parametric and nonparametric analyses were made by making the data suitable for a cross-section work. A total 27 municipalities- 7 of which are metropolitan and 20 of which are city municipalities- which are selected according to their political party, geographical location, population density, level of development and their contribution to GDP were covered in the study with the permission of Turkish Republic Ministry of Internal Affairs General Directorate of Local Governments (TC MİGM).

Data envelopment analysis and findings: Central administration data and efficiencies of municipalities with CCR model

Efficiency analyses related to 25 municipalities considered between years 2006 to 2008 were made with DEA and a non-parametric method by using central administration budget expenditure data. As it was indicated in lots of researches, in DEA analysis, two different analyses as input-oriented or output-oriented are

Table 5. Descriptive statistics of municipalities (2006 to 2008).

Year	N	Minimum	Maximum	Mean	Std. deviation
2006					
Personnel expenses	25	140962	4025479	771576.72	1021484.879
Social security expenses	25	19054	560212	105712.60	142989.985
Expense for purchase of goods and services	25	32712	3374947	354818.68	701795.892
Current transfer expenses	25	2799	1775911	85298.80	352523.906
Capital expenses	25	6258	1113303	154627.92	249195.759
Capital transfers	25	92	393951	18132.32	78508.739
Total expenses	25	202094	11038191	1490167.04	2412274.241
Total population	25	60029	12351299	1015557.92	2543006.953
Population of 65+	25	3	12	7.08	2.120
Number of pupils	25	3334	2499806	250966.52	526859.901
Number of beds in tourism establishments	25	0	215484	13734.36	43685.076
Number of hospital beds	25	495	31681	4223.40	6634.543
Number of visitors	25	6800	11498593	1001643.04	2451439.474
2007					
Personnel expenses	25	165221	4675656	883819.20	1150067.587
Social security expenses	25	22199	644962	120359.20	161086.389
Expense for purchase goods and services	25	44778	3729835	425722.84	786797.353
Current transfers	25	4776	2084775	107411.04	412785.645
Capital expenses	25	10606	1226519	168502.04	264905.749
Capital transfers	25	90	611361	26709.04	121853.100
Total expenses	25	253446	13520790	1778087.44	2915191.782
Total population	25	58324	12460170	1028751.20	2568392.521
Population of 65+	25	3	12	7.08	2.120
Number of pupils	25	3585	2509999	250792.76	527857.257
Number of beds in tourism establishments	25	186	235382	17890.04	49103.502
Number of hospital beds	25	507	32412	4329.08	6767.383
Number of visitors	25	8545	11272841	1031818.24	2379100.677
2008					
Personnel expenses	25	192466	5232294	987861.24	1279411.090
Social security expenses	25	25423	707627	132223.52	175521.115
Expenses for purchasing goods and services	25	51250	3592563	449632.76	783725.729
Current transfer	25	6038	2523992	128487.40	499689.602
Capital expenses	25	14463	1282349	216821.96	301213.136
Capital transfers	25	39	827870	35000.80	165226.974
Total expenses	25	298354	14707240	1957274.60	3200273.047
Total population	25	56619	12569041	1041944.48	2593844.416
Population of 65+	25	3	12	7.08	2.120
Number of pupils	25	2545	141709	19685.44	31682.099
Number of beds in tourism establishments	25	186	255280	22045.72	58460.300
Total number of hospital beds	25	370	33143	4434.76	6903.403
Number of visitors	25	6170	11047089	1065008.48	2350138.009

made. While, in the input oriented models it is calculated how to get an output with the lowest cost, in the output oriented model, it is calculated how to get the highest output with an amount of input. In this study, analysis are made with CCR model which is constant returns to the scale and BCC model which is variable returns to the scale, and the results are evaluated.

Table 6 gives the whole representation of inputs and

Table 6. Input and output variables with central administration data.

Inputs (X)	Type
X_1: Personal expenses (Pers. costs)	Controllable
X_2 : Social security expenses (SOS. sec expenses)	Not controllable
X_3 : Goods and services expenses (Goods services expenses)	Controllable
X_4 : Current transfer expenses (Capital transfer expenses)	Controllable
X_5 : Capital expenses (Capital expenses)	Controllable
X_6 : Capital transfer (Capital transfer)	Controllable
X_7*: Total expenses (Total costs)	Controllable
Outputs (Y)	
Y_1*: Total population (Total population)	
Y_2: Proportion of 65+population (65+/city population %)	
Y_3: Number of pupils (Number of pupils	
Y_4: Number of beds in tourism establishments (Number of beds in tourism establishments)	
Y_5*: Total number of beds in hospitals (Total number of beds in hospitals)	
Y_6: Number of visitors (Number of visitors)	

outputs used in DEA models. In some models, only one input and less output is considered but in fundamental models six inputs (X_1, X_2, X_3, X_4, X_5, X_6) and six outputs (Y_1, Y_2, Y_3, Y_4, Y_5, Y_6) are used. While five of these inputs are accepted as controllable, one of them (X_2) is accepted as not controllable. Because, social security expenditures related to working personnels (X_2), is not a variable that may be controlled by the municipality administration.

Efficiencies of municipalities with input oriented CCR model (2006 to 2008)

In the DEA analysis that is under this title, CCR model that is input oriented and constant returns to scale is used. Each municipality is accepted as a Decision Making Unit (DMU). In the analysis, efficiency scores of municipalities are sorted of and no discrimination is made among them. Although metropolitan municipalities are different from the others in terms of administration, it was decided that it would be suitable to determine the success or the efficiency of these municipalities among all the other municipalities.

As it is seen in Table 7, in the efficiency analyses made for the year 2006, 17 of 25 municipalities are totally efficient according to CCR_{06} value. This number decreases down to 14 in 2007 according to CCR_{07} and decreases down to 13 in 2008 according to CCR_{08} value. It means that, when we go from 2006 to 2008, efficiency of municipalities decreases. In 2006, the most efficient municipality is Yozgat municipality and Diyarbakır metropolitan municipality is at the bottom with 44.46%. 4 of 8 inefficient municipalities are metropolitan municipalities. It is a notable fact that Ankara and İzmir, which are the second and third biggest municipalities, are in this list. Especially in both 2006 and 2007, Diyarbakır and Van are the municipalities that are the most inefficient. In these two years, the lower limit for productivity is 44% and in 2008, it increases to 54%. Antakya municipality that was totally efficient in the first two years decreases down to the lowest efficiency level placing itself under Van and Diyarbakır. While Ankara municipality has low efficiency in the first two years, it increases its efficiency in 2008. Sivas, İzmir, Kahramanmaraş, Erzurum, Van and Diyarbakır municipalities are not efficient through the three years. It is seen that, 17 municipalities are totally efficient, two municipalities were between 41 and 50% and two municipalities were between 51 and 60%. The other four municipalities were between 61 and 99% efficiency interval.

As it is shown in Table 7, there is an increase (3 pieces) in the number of inefficient municipalities in 2007. In the efficiency scores belonging to this year, Van is in the last place with a score of 44%. It is seen that 14 municipalities are efficient, two municipalities are between 41 and 50%, three municipalities are between 61 and 70%, two municipalities are between 71 and 80% and three municipalities are between 81 and 90%.

In 2008, number of municipalities whose total efficiency decreases increased as compared to the first two years. However, instead of Diyarbakır and Van municipalities that are in the lowest order, Antakya municipality becomes the lowest. What is interesting is that this municipality was totally efficient in the first two years. For the year 2008, while number of efficient municipalities decrease in the DEA analysis made with CCR model, efficiency scores of the municipalities increases. This situation can be seen as a contradiction. Number of efficient municipalities decreases to 13 and number of

Table 7. CCR model and DEA estimation with central administration data (2006 to 2008).

Municipality	CCR_{06}	Municipality	CCR_{07}	Municipality	CCR_{08}
Yozgat	100	Yozgat	100	K. Maraş	100
Malatya	100	Tekirdağ	100	Tekirdağ	100
Tokat	100	Çanakkale	100	Tokat	100
Nevşehir	100	Nevşehir	100	Yozgat	100
Samsun*	100	Erzincan	100	Manisa	100
Tekirdağ	100	Afyon	100	Batman	100
Muğla	100	Antakya	100	Nevşehir	100
Erzincan	100	Manisa	100	Çanakkale	100
Antakya	100	Zonguldak	100	Zonguldak	100
Batman	100	Muğla	100	Erzincan	100
Afyon	100	Isparta	100	Afyon	100
Manisa	100	Trabzon	100	Isparta	100
Zonguldak	100	Antalya	100	Antalya	100
Isparta	100	Istanbul	100	Muğla	100
Trabzon	100	Malatya	87.08	Istanbul	100
Antalya*	100	Tokat	86.52	Sivas	94.26
Istanbul*	100	Sivas	84.34	Samsun	88.13
Çanakkale	99.63	Samsun	75.16	Izmir	78.12
Sivas	88.8	Izmir	71.22	Malatya	77.48
Izmir*	76.31	Batman	69.82	Erzurum	76.24
K. Maraş	64.94	Erzurum	66.42	Trabzon	75.31
Erzurum*	60.84	K. Maraş	62.05	Antakya	66.8
Ankara*	51.41	Ankara	53.02	Ankara	54.08
Van	45.76	Diyarbakir	45.13	Diyarbakir	48.95
Diyarbakir*	44.76	Van	43.87	Van	46.95

*****Metropolitan municipalities.

municipalities whose efficiency scores are between 51 and 60% is four. In addition, there is no municipality under this proportion. There are 6 municipalities whose efficiency scores are between 71 and 90%. For this year, the lowest efficiency belongs to Antakya municipality.

Efficiencies of municipalities with BCC model (2006-2008)

Under this title, instead of a function that is constant returns to scale, BCC model which is variable returns to scale is used. In the BCC model estimations (Table 8), it is seen that in 2006, 18 municipalities are efficient, in 2007 this number decreases to 15 and in 2008 it decreases to 13. It is observed that at the top of inefficient municipalities, Diyarbakır, Van, Kahramanmaraş, Sivas and Erzurum exist. Diyarbakır was at the lowest order but in 2008, Van takes its position.

In the analysis made with this model, efficiency score of the most inefficient municipality is about 50%. As for CCR model, this value is lower and about 40%. In addition, except for Diyarbakır and Van, municipalities whose efficiencies are low, have a scale that has increasing returns. Diyarbakır and Van have decreasing returns to scale. Especially Diyarbakır and Van municipalities are in the last two places for three years. In the efficiency analysis made with this model, at least half of metropolitan municipalities are in the list of inefficient municipalities.

According to these results, it can be said that metropolitan municipalities are less efficient than city municipalities. In addition to this, it was observed that big amount of population has negative effect on the efficiency of municipalities. Optimal size of a city can be another study topic because population of metropolitan municipalities is bigger than the other municipalities except for Erzurum. Especially the fact that Ankara (first two years) and İzmir (first three years) are inefficient municipalities is a notable situation. Some other municipalities are dramatically losing their efficiencies. For example, Tokat, Samsun and Malatya municipalities were efficient in the first two years but started to lose their efficiencies for the last two years. When we look at the efficiency distribution of municipalities whose efficiencies are measured by BCC model for 2006, it is seen that number of efficient municipalities are high and even less efficient municipalities are in high efficiency range. 20 of these municipalities are between 91 and 100% and the other 5

Table 8. BCC model and DEA estimations with central administration data (2006 to 2008).

Municipalites BCC 2006			Municipalites BCC 2007			Municipalites BCC 2008		
Unit	**Score**	**Scale**	**Unit**	**Score**	**Scale**	**Unit**	**Score**	**Scale**
Malatya	100	Const.	Manisa	100	Const.	K. Maraş	100	Const.
Tokat	100	Const.	Zonguldak	100	Const.	Yozgat	100	Const.
SAMSUN	100	Const.	Batman	100	Const.	Tokat	100	Const.
Tekirdağ	100	Const.	Yozgat	100	Const.	Tekirdağ	100	Const.
Erzincan	100	Const.	Muğla	100	Const.	Nevşehir	100	Const.
Yozgat	100	Const.	Erzincan	100	Const.	Batman	100	Const.
Muğla	100	Const.	Tekirdağ	100	Const.	Zonguldak	100	Const.
Zonguldak	100	Const.	Isparta	100	Const.	Muğla	100	Const.
Batman	100	Const.	Afyon	100	Const.	Isparta	100	Const.
Afyon	100	Const.	Çanakkale	100	Const.	Afyon	100	Const.
Manisa	100	Const.	Antakya	100	Const.	Manisa	100	Const.
Isparta	100	Const.	Trabzon	100	Const.	ANTALYA	100	Const.
ANTALYA	100	Const.	İSTANBUL	100	Const.	Erzincan	100	Const.
Trabzon	100	Const.	Nevşehir	100	Const.	Çanakkale	100	Const.
Antakya	100	Const.	ANTALYA	100	Const.	İSTANBUL	100	Const.
Nevşehir	100	Const.	Tokat	99.74	Incre.	SAMSUN	99.96	Incre.
Çanakkale	100	Const.	Sivas	93.62	Incre.	İZMİR	99.27	Incre.
ISTANBUL	100	Const.	İZMİR	89.99	Incre.	Sivas	98.18	Incre.
IZMİR	96.77	Incre.	Malatya	87.77	Incre.	Trabzon	92.02	Incre.
Sivas	92.66	Incre.	SAMSUN	83.34	Incre.	Malatya	87.85	Incre.
ANKARA	78.4	Incre.	ANKARA	78.23	Incre.	ERZURUM	82.47	Incre.
K.Maraş	67.23	Incre.	ERZURUM	71.83	Incre.	Antakya	81.55	Incre.
ERZURUM	63.96	Incre.	K.Maraş	70.57	Incre.	ANKARA	79.31	Incre.
Van	53.46	Decre.	Van	52.02	Incre.	D. BAKIR	53.74	Incre.
D. BAKIR	49.07	Decre.	D. BAKIR	50.68	Incre.	Van	52.82	Incre.

municipalities are between 41 and 80%. It is seen that in 2007, efficiency of some municipalities decreased and the number of efficient municipalities decreased from 18 to 15. It means that the number of low efficient municipallities decreased and efficiency levels increased. In other words, while the number of totally efficient municipalities decreases, number of low efficient municipalities decreases.

Efficiency scores for the year 2008, scores are higher with BCC model as compared to CCR model. According to this model, Van municipality again has the lowest performance. In the given year, number of efficient municipalities decreases and number of low efficient municipalities also decreases. As a matter of fact, in the graph, there is no municipality whose efficiency is under 50% and there are two municipalities whose efficiencies between 51 and 60%. On the other hand, there are 7 municipalities whose efficiencies are between 81 and 99.9%, and 15 municipalities are totally efficient.

CCR model with one input and two outputs

Under this title, efficiencies of municipalities are estimated with one input and two outputs in CCR model (Table 9), by using again central administration data. As input, total expenses are considered and as output total population and number of beds in the hospitals are considered.

In the Table 10, results of estimations made with this model are given for the years. For the three years, it is seen that only two municipalities (Isparta and İstanbul) are totally efficient and the other municipalities are not. Score of Ankara metropolitan municipality that is the lowest is below 30%.

In the lowest order of inefficient municipalities, Ankara is placed in 2006 and 2007 but for 2008, Erzincan is in that place. As it was the case in the other models, Diyarbakır and Van are in the last place. With estimations made with this approach, Diyarbakır became more efficient in 2008 but the efficiency of Erzincan municipality always decreased. When we look at the efficiency scores of municipalities in 2006, efficiency of 1 municipality is below 30%, efficiencies of 8 municipalities are between 41 and 50%, and efficiencies of 6 municipalities are between 51 and 60%. In other words, productivity of approximately 50% of municipalities is between 41 and 60%. According to one input two outputs

Table 9. Variables in one input and two outputs DEA.

Input (X)	Type
X1 *: Total expenses (Total expenses)	Controllable
Outputs (Y)	
Y1: Total population (Total population)	
Y2: Total number of beds in the hospitals (tot. num. of beds in hospitals)	

Table 10. Efficiency scores of municipalities.

Unit	CCR 2006	Unit	CCR 2007	Unit	CCR 2008
Isparta	100	Isparta	100	Isparta	100
ISTANBUL	100	İSTANBUL	100	İSTANBUL	100
Afyon	85.2	Afyon	84.68	Zonguldak	90.79
Manisa	82.97	Zonguldak	82.96	Afyon	89.16
Zonguldak	79.23	Manisa	79.75	Manisa	83.79
Sivas	71.27	Sivas	69.35	DİYARBAKIR	77.5
IZMİR	66.56	ANTALYA	65.77	ANTALYA	74.27
ANTALYA	60.92	İZMİR	65.14	Sivas	72.93
SAMSUN	60.1	SAMSUN	62.99	İZMİR	67.99
Tekirdağ	60.01	Tekirdağ	60.75	Tekirdağ	66.56
Yozgat	56.4	Tokat	56.7	SAMSUN	66.01
Tokat	55.33	Trabzon	54.63	Tokat	61.04
Malatya	53.06	Malatya	54.21	ERZURUM	59.48
Trabzon	50.54	Yozgat	51.93	Trabzon	59.36
Nevşehir	46.15	Muğla	48.98	Batman	58.5
Erzincan	45.62	ERZURUM	48.08	Malatya	57.07
Muğla	45	Çanakkale	44.4	Muğla	54.7
Batman	44.82	Nevşehir	43.97	Yozgat	50.86
Antakya	43.49	Batman	43.26	Çanakkale	47.07
ERZURUM	41.55	Antakya	42.05	Nevşehir	44.74
Çanakkale	41.52	K.Maraş	41.16	Antakya	43.64
K.Maraş	40.72	DİYARBAKIR	37.81	K.Maraş	41.82
DİYARBAKIR	37.71	Erzincan	35.23	ANKARA	29.3
Van	35.22	Van	33.86	Van	28.73
ANKARA	28.58	ANKARA	27.39	Erzincan	25.54

model, half of the municipalities have 50% efficiency and the other half is above 50% efficiency.

In the following Figure 1, output efficiency limit for 2006 with one input two outputs CCR model is shown. Efficiency size is inversely proportional with distance to origin. According to this graph, there are only two municipalities that is on the efficiency limit. One of them is İstanbul and the other one is Isparta. These two municipalities are placed in the efficient municipalities with all DEA models. The fact that Isparta municipality being placed in the left on efficiency limit means that it is efficient in terms of hospital bedroom/ total expenditures. In other words, in terms of the number of beds in hospitals, Isparta is more efficient. On the other hand, İstanbul is close to horizontal coordinate means that İstanbul is more efficient in terms of total population/ total expenditures. The other municipalities are placed within the efficiency limit. In order for these municipalities to be more efficient, output amount should be increased with the same amount of input.

As it is seen in the graph, the municipalities that are closer to the origin are the least efficint municipalities. As a matter of fact, Ankara, Van, Muğla and Çanakkale are the closest to the origin, so they are the least efficient municipalities. All municipalities being placed on the left side means that they are efficient in terms of the

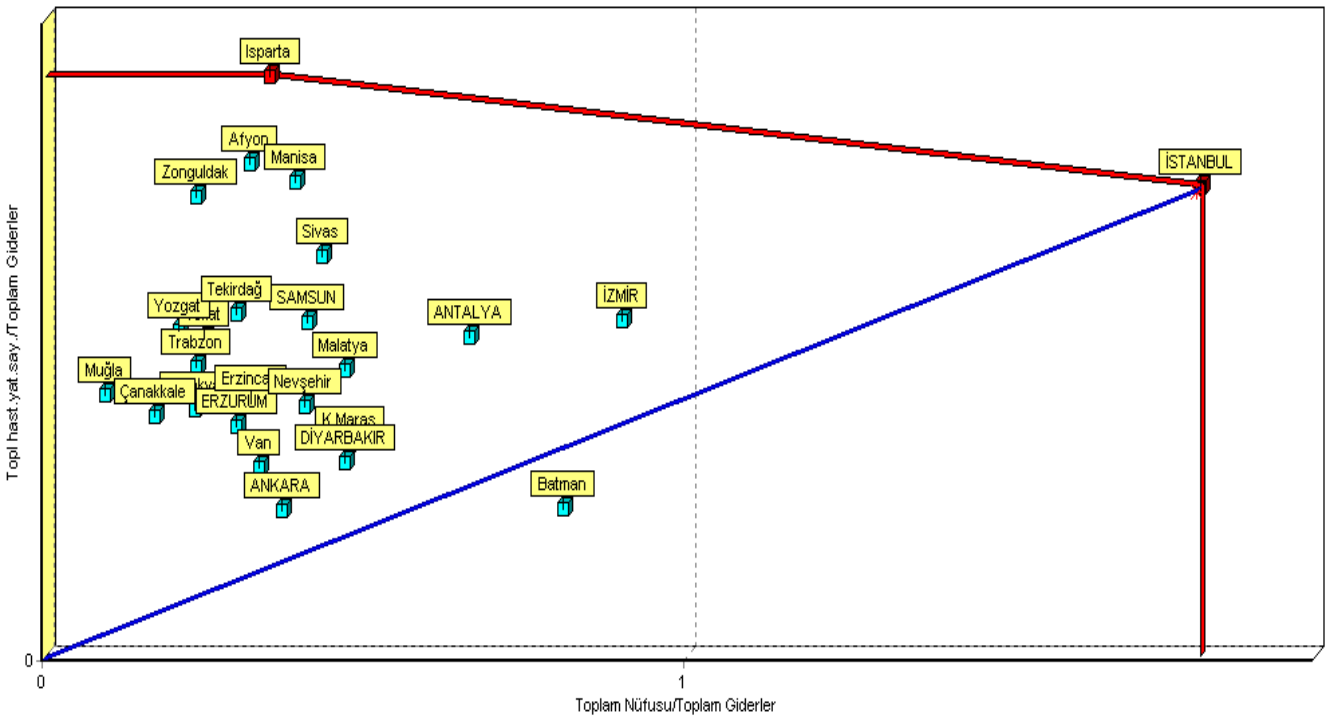

Figure 1. Output efficiency limit for 2006.

number of beds in the hospitals. Here, Batman is an exception. Only Batman seems more efficient in terms of total population/ total expenditures. The line drawn from origin to efficiency limit means that the municipalities on this line can reach the efficiency limit by increasing their outputs without changing their inputs.

According to 2007 efficiency scores, it is shown that only two municipalities are efficient. In 2007, as it is the case in 2006, İstanbul and Isparta are the most efficient municipalities and Ankara, Van and Erzincan are the least efficient municipalities. In the estimations made with one input two outputs CCR model, the efficiencies of 80% of municipalities in 2007 are between 21 and 80%. Here, it can be said that the average efficiencies of all municipalities are about 50%. As a matter of fact, efficiencies of almost half of the municipalities are between 41 and 60%.

Figure 2 that shows the efficiency limit for 2007 is very similar to the previous year's efficiency limit graph. The facts said for 2006 is also the same for 2007. Isparta municipality is again efficient in terms of the number of beds in hospitals/ total expenditures, and İstanbul metropolitan municipality is the most efficient in terms of total population/ total expenditures. All municipalities are on the left of the line drawn from origin to efficiency limit means that they are more efficient in terms of the number of beds in hospitals.

In 2008 analysis, there is no change in the number and names of municipalities compared to the other years. However, in 2008, Erzincan municipality is in the last place. In the efficiency scores, efficiencies of more than half of the municipalities are between 41 and 70%. It is clearly seen in the Figure 3 that almost more than 90% of the municipalities have the efficiency of more than 40%. As it was in the previous graphs, similar comments can be made for the year 2008. Isparta municipalty is again efficient in terms of the number of beds in hospitals/ total expenditures and İstanbul metropolitan municipality is the most efficient in terms of total population/ total expenditures. That all municipalities are on the left side means that they are more efficient in terms of the number of beds in the hospitals. Erzincan, Van and Ankara municipalities are the closest to origin and their efficiency scores are between 21 and 30%.

Total factor productivity analyses and findings via Malmquist index

While Malmquist index analyses were being made, DEAP version 2.1 program was used. Output oriented Malmquist index total factor productivity and the efficiency scores and averages are considered separately. In this analysis, efficiency values of the municipalities that are estimated are listed as followings:

1. Total factor productivity (TFP) (tfpch)
2. Technical change (techch)

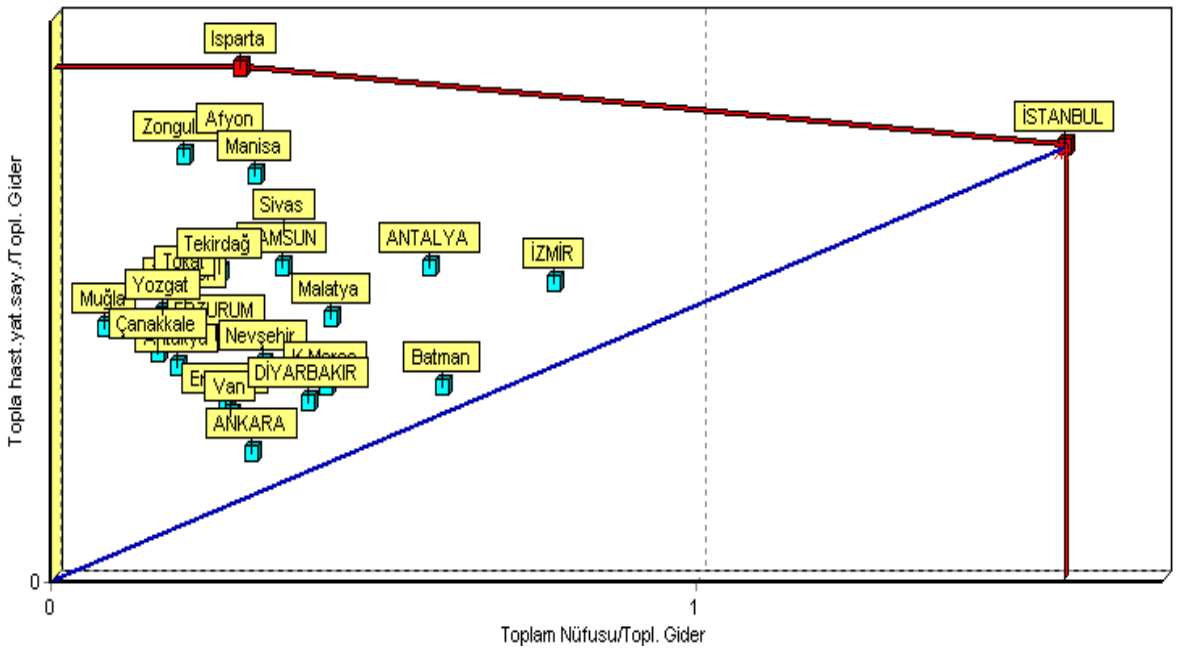

Figure 2. Output efficiency limit for 2007.

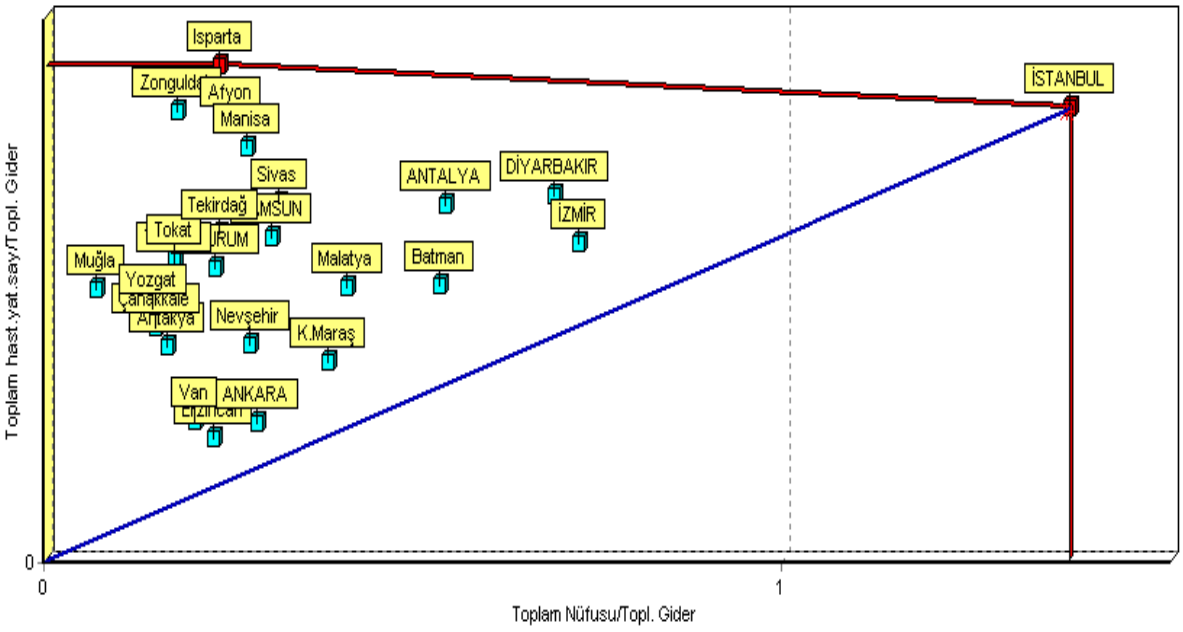

Figure 3. Output efficiency limit for 2008.

3. Efficiency change (effch)
4. Pure efficiency change (pech)
5. Scale change (sech)

Total factor productivities of municipalities (all variables)

In Table 11, efficiencies of municipalities with all variables between 2006 and 2008 are taken into consideration. First part of the table shows the efficiency values of all municipalities in the given years. In period 2006/2007, efficiency values of all municipalities are below 1. If estimated efficiency value is 1, it means that there is no change in efficiency, and if estimated efficiency is below 1, it means that efficiency decreased, and if estimated efficiency is above 1, it means that efficiency increased.

Table 11. Municipalities Malmquist index averages: All variables.

Years	*effch*	*techch*	*pech*	*sech*	*tfpch*
2006/2007	0.971	0.856	0.992	0.979	0.831
2007/2008	1.023	0.637	1.025	0.998	0.652
Average	0.997	0.739	1.008	0.989	0.736
Municipal	***effch***	***techch***	***pech***	***sech***	***tfpch***
Istanbul	1	0.374	1	1	0.374
Antakya	0.826	0.567	0.903	0.915	0.468
Erzurum	1.125	0.548	1.136	0.991	0.617
Antalya	1	0.729	1	1	0.729
Samsun	0.939	0.665	1	0.939	0.624
Trabzon	0.868	0.616	0.959	0.905	0.535
Isparta	1	0.677	1	1	0.677
Muğla	1	1.117	1	1	1.117
Izmir	1.012	0.426	1.013	0.999	0.43
Erzincan	1	0.691	1	1	0.691
Ankara	1.023	0.741	1.006	1.017	0.757
Zonguldak	1	0.498	1	1	0.498
Nevşehir	1	1.241	1	1	1.241
Çanakkale	1.002	0.796	1	1.002	0.798
Tokat	1	0.832	1	1	0.832
K.Maraş	1.228	0.788	1.22	1.007	0.968
Yozgat	1	0.796	1	1	0.796
Van	0.994	0.88	0.994	1	0.875
Batman	1	0.834	1	1	0.834
Afyon	1	0.929	1	1	0.929
Manisa	1	0.824	1	1	0.824
Tekirdağ	1	0.932	1	1	0.93
Malatya	0.893	0.89	0.937	0.952	0.794
Sivas	1.029	0.851	1.029	0.999	0.876
Diyarbakır	1.045	0.882	1.046	0.998	0.921
Average	0.997	0.739	1.008	0.989	0.736

Malmquist index as geometric mean.

When we look at the average of two years in the table, we see that efficiency change value decreases by 0.3% unit and efficiency caused by technical changes increase by 0.8% unit. Despite this, it is observed that total factor productivity is so low. Efficiency change is 2.3% only in 2007/2008.

Before looking at the averages of all municipalities, efficiency scores on the basis of municipalities are considered separately. When we look at the second part values in the table, efficiency values of the most of the municipalities-except for technical efficiency and total factor productivity- are about 1. This shows that total efficiency, scale efficiency and efficiency change indexes change slightly. If it is given as comparison, it is seen that there is a decrease in the efficiencies of all metropolitan municipalities. One of the interesting results is that İstanbul municipality has very low total factor productivity, and efficiency change, total efficiency and scale efficiency do not change. On the other hand, it is observed that technical efficiency change is so low that the decrease in total factor productivity is caused because of that. Technical efficiency change value is below 1 for municipalities except for Muğla and Nevşehir.

Total factor productivity for metropolitan municipalities: All variables

For the 7 metropolitan municipalities whose total factor productivities are considered, estimations are given in Table 12. When we look at the total productivity values, 3.2% increase in efficiency change value exists but technical efficiency decreases by 54.1% and total factor productivity decreases by 52.6%. Productivity change in

Table 12. Metropolitan municipalities Malmquist index averages: all variables.

Years	*effch*	*techch*	*pech*	*sech*	*tfpch*
2006/2007	1.017	0.717	0.977	1.042	0.729
2007/2008	1.048	0.295	1.007	1.04	0.309
Average	1.032	0.459	0.992	1.041	0.474
Municipalities					
Istanbul	1	0.359	1	1	0.359
Erzurum	1.047	0.525	1	1.047	0.549
Antalya	1	0.389	1	1	0.389
Samsun	1	0.425	1	1	0.425
Izmir	1	0.411	1	1	0.411
Ankara	1.053	0.423	0.996	1.057	0.445
Diyarbakır	1.134	0.799	0.948	1.196	0.906
Average	1.032	0.459	0.992	1.041	0.474

Malmquist index as geometric mean.

which metropolitan municipalities are the least efficient is technical efficiency change. The common point which municipalities are the weakest in efficiency is technical efficiency change.

Total factor productivity for city municipalities (three variables)

In the output oriented Malmquist index estimations made in this part, total factor productivity analysis is made by using total expenditures, number of beds in hospitals and population. In Malmquist index analysis made for city municipalities (except for metropolitan municipalities), efficiency change and scale efficiency change values are about 1 as it is seen in Table 13. Unlike the previous total factor productivity values, no value is above 1 in both 2006 to 2007 and 2007 to 2008 periods. When we look at the average productivities, we see that value of scale efficiency change is higher than the others

It is seen that this change values do not change too much in 3 years. On the other hand, all of the average values are below 1. It s seen that, these results reflect consistent results with models considering all municipalities. When we consider the municipalities separately, total factor productivity values of Nevşehir, Muğla and Kahramanmaraş municipalities are above 1. The common weakness point for all municipalities is that technical efficiency change values are so low. Decrease in total factor productivity values are caused by technical efficiency values.

Conclusion

In this study in which efficiency of municipalities and factors that affect this efficiency are considered, efficiency analysis of 27 municipalities, 7 of which are metropolitan municipalities are made. In the study, 34% of total municipalities and 35% of total population is covered.

According to central administration data, in the efficiency analysis of 25 municipalities between 2006 and 2008, input oriented and output oriented methods are used. In input oriented models, it is calculated how to get the output with the lowest cost and in output oriented model, it is calculated how to get the most output with a certain input.

For these two approaches, CCR and BCC models are used. In this study, CCR model which has constant returns to scale and BCC model which has variable returns to scale are considered. In these models lots of inputs and outputs can be used. In some models, only one input and less output are considered but in fundamental models, 6 inputs and 6 outputs are used. Within the framework of these data, according to CCR_{06} values, 17 of 25 municipalities are totally efficient in 2006. It decreases down to 14 in 2007 and decreases down to 13 in 2008 with CCR_{07} and CCR_{08} respectively. It means that, from 2006 to 2008, efficiencies of municipalities decreases. In 2006, the most efficient municipality is Yozgat and the least efficient municipality is Diyarbakır metropolitan municipality.

In BCC model estimations, 18 municipalities are efficient in 2006. It decreases to 15 in 2007 and it decreases to 13 in 2008. Diyarbakır, Van, Kahramanmaraş, Sivas and Erzurum are in the list of inefficient municipalities. Diyarbakır was at the bottom of the list but in 2008, Van took its position. Referring to these results it can be said that from 2006 to 2008, efficiencies decrease and the number of efficient municipalities decreases. By using Malmquist index, in t and t+1 period, efficiencies of

Table 13. Malmquist index averages of municipalities: three variables.

Years	*effich*	*techch*	*pech*	*sech*	*tfpch*
2006/2007	0.998	0.83	0.995	1.003	0.828
2007/2008	0.961	0.794	0.988	0.973	0.763
Average	0.979	0.811	0.991	0.988	0.795
Municipalities					
Antakya	0.829	0.541	0.912	0.909	0.448
Trabzon	0.876	0.597	1	0.876	0.522
Isparta	1	0.694	1	1	0.694
Muğla	1	1.286	1	1	1.286
Erzincan	1	0.691	1	1	0.691
Zonguldak	1	0.508	1	1	0.508
Nevşehir	1	1.309	1	1	1.309
Çanakkale	1	0.799	1	1	0.799
Tokat	1	0.83	1	1	0.83
K. Maraş	1	1.036	1	1	1.036
Yozgat	1	0.796	1	1	0.796
Van	0.945	0.827	0.939	1.006	0.781
Batman	1	0.749	1	1	0.749
Afyon	1	0.931	1	1	0.931
Manisa	1	0.862	1	1	0.862
Tekirdağ	1	0.988	1	1	0.988
Malatya	1	0.763	1	1	0.763
Sivas	1	0.858	1	1	0.858
Average	0.979	0.811	0.991	0.988	0.795

Malmquist Index as geometric mean.

municipalities between 2006 and 2008 are considered with all variables. In 2006/2007 period, efficiency values of all municipalities are below 1. When we look at the average of two years from the estimation results, we see that efficiency change value decreases by 0.3% units, and efficiency caused by technical change increases by 0.8%. On the other hand, it is observed that total factor productivity is so low. Efficiency change is 2.3% only between 2007 and 2008.

In the estimations made for 7 metropolitan municipalities, efficiency change value increases by 3.2%, but technical efficiency decreases by 54.1% and total factor productivity decreases by 52.6%. In metropolitan municipalities, efficiency change in which efficiency is the lowest is especially technical efficiency change. The common point which municipalities are the weakest in efficiency is technical efficiency change. Under the lights of these result and the estimations of both CCR and BCC models, it can be stated that there was a decrease in the number of efficient municipalities and the level of their efficiencies from years 2006 to 2008. Four of the seven municipalities, with tle low efficiency during the entire period of analysis are metropolitan municipalities. It is a quite remarkable result that Ankara and Izmir, which are the second and the third biggest municipalities, are among these less efficient municipalities In addition, when we look at the years 2006 and 2008 as a whole, there exists a decrease in the efficiency levels of municipalities.

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