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Measuring Technical Efficiency of the Iranian Post Company Using Data Envelopment Analysis (DEA)

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Abstract

Given that improvement in efficiency is a major resource to economic development, this can be applied to each domestic sector of an economy. The objective of this paper is to measure technical efficiency of the Iranian Post Company across the country's provinces using data envelopment analysis (DEA). The ranking of technical efficiency has been calculated by using collected data on post offices across 32 Iranian provinces in 2011 based on assumption of constant return to scale imposed.

The study has specified two models of DEA to explore efficiency of post offices for all Iranian provinces. The first model has shown that provinces of Alborz, Semnan, Mazandaran, Isfahan, Tehran and Bushehr are technically efficient, while the second model has clarified the efficient units, which have been located in the 13th, 14th and 19th zones of Tehran province and the 16th zone of Bushehr province.

Keywords: Technical Efficiency, Data Envelopment Analysis, Post Company, Iranian Provinces

JEL Classification: C14, L87

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1. Introduction

Human beings have always been encountered with a problem called limitation of production resources and possibilities so that they are still limited to the existing possibilities even under the present conditions and ever-increasing development of sciences and techniques. Demand for goods and services have had an increasing process given to enhancement of humans' expectations from economic welfare. Now maximum application of the existing resources is one of the possible solutions to decrease the gap between supply and demand given to limitation of possibilities and increased consumption level of goods and services. Humans' economic attempts have always been focused on obtaining maximum output with the fewest available factors and possibilities. This intention is called achieving higher productivity and efficiency. Productivity is a comprehensive term and includes efficiency that its enhancement to improve standard of living, welfare and peacefulness of people that have continually been considered by economic and political authorities.

Generally, importance of productivity and its recognition has not been limited to capitalism schools and societies and socialism and the Islamic school and society emphasize it too. In other words, productivity has a historical origin more than 1400 years but its practical measurement and scientific evidences have been proposed in recent years (Emami Meibodi, 2006).

Communication is one of the basic needs of human societies either among individuals or various societies. Not only it contains the spiritual dimension and individuals' mental needs but also shows itself in physical relations and different exchanges among the individuals. Post is one of oldest institutions which has developed human's awareness and is regarded as the change factor and cultural, social and economic growth. Its development, vitality and long service have high flexibility and compatibility with the existing conditions and the time. Flexibility of postal systems is more necessary at present, as rate of change in current conditions and applications is more than any other time.

Therefore, efficiency level of this institution and representing strategies to improve inefficient units are regarded in the present study. Section 2 refers to principles of efficiency including its concept and methods of its measurement. Section 3 reviews the related literature. Section 4 discusses the empirical framework, and the experimental results are analyzed in Section 5. Section 6 concludes the relevant remarks.

2. Theoretical Principles

2.1. Concept of Efficiency

Generally efficiency is a relative concept for comparison between real performance and ideal performance. It could be stated that efficiency is focused on existing resources and shows useful application of resources. In other words, it is ratio of obtained real output to the standard and determined (expected) output or ratio of the accomplished work to the expected amount of work.

Debreu (1951) began to study subjects regarding efficiency systematically and Farrell (1957) continued this process. But the possibility to measure efficiency practically was provided in 1977 and 1978 using econometrics model and linear planning method respectively. According to Farrell definition technical efficiency is a firm's capability to achieve maximum product from a certain amount of inputs (Emami Meibodi, 2001).

Farrell studied three kinds of efficiency: technical efficiency, allocative efficiency and economic efficiency. In technical efficiency the relationship between inputs and outputs (products) and how inputs are converted into output are proposed. To consider it differently, it is related to technological structure and is a relative concept, since there is a comparison between the firms regarding the type and using the technology. Technical efficiency is not related to price of factors and thus it could be used when it is not possible to determine the price of factors properly. Allocative efficiency measures a firm's capability in using optimal combination of factors given to their prices. Economic efficiency that is obtained through multiplying technical efficiency by allocative efficiency is a firm's capability in obtaining maximum possible benefits given to the price and level of inputs.

The common method of measuring efficiency is constitution of production function or efficient cost (standard limit) for firms and comparing them with each other based on

efficiency frontier. This production function could be the reliable performance of the industry or the proper theoretical potential performance. Practically, methods like Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA) are used to form the efficiency frontier and calculate technical efficiency of manufacturing and service units.

2.2. Methods to measure efficiency

Methods of measuring efficiency are totally divided into two classes of parametric and non-parametric methods.

A) Parametric Methods

Parametric methods are methods in which a special form is considered for production function (like Cobb-Doglas function). Then, coefficients (parameters) of the function are estimated by one of methods of estimating methods that are widely used in statistics and econometrics and efficiency is calculated using the estimated function. The most important parametric methods are as below:

1) Deterministic frontier production function-statistical deterministic frontier production function

2) Stochastic frontier production function-profit function

B) Non-parametric Method

Mathematical programming technique is one of the non-parametric method in which a method is used to calculate relative efficiency of firms and with no more to estimate a production function. If firms have several different outputs, this method would have no problem in estimating the efficiency. But it is notable that the obtained efficiency in this method is in comparison with other units and is relative. Data envelopment analysis could be called as a non-parametric method.

3. Literature Review

Pereira et al. (2002) analyzed technical progress and productivity growth in the agriculture sector in Brazil during the period 1970-1996. The applied methodology was based on Malmquist index and data envelopment analysis (DEA) method was applied. Results of this study show process of technical progress hasn't been similar and monotonous in all regions and states of Brazil and productivity growth has been completely positive and stable in some regions during the whole period while it has been negative for other regions.

Galagedera and Edirisurya (2002) used data envelopment analysis (DEA) method to measure efficiency of commercial banks in India in the period 1995-2002 and measured and analyzed productivity growth using Malmquist index too. The whole deposits and operating expenses (variable) were regarded as input and loans and other outstanding claims were regarded as output. Results reveal no growth has been observed in banks' productivity during the period under study. The increasing rate of technical efficiency is probably due to the scale efficiency that is compared with management efficiency even though it is low. Indeed smaller banks are less efficient and those with higher efficiency have more outstanding claims (assets).

Borenstein et al. (2004) studied technical efficiency using data envelopment analysis (DEA) method in post offices in Brazil. They selected seven inputs and eleven outputs and identified one pair for each office in terms of efficiency, so efficiency level of offices was evaluated. Consequently managers were able to create basic changes in performance manner of inefficient offices on the basis of efficiency level.

This study deals with following questions, that have been unanswered mostly in the Iranian economy:

1- How is the prioritization of postal branches in provinces in terms of efficiency?

2- How could an inefficient postal branch improve?

3- Which postal branches build the efficiency frontier?

4. Empirical Framework

Data envelopment analysis is the most widely used method to measure efficiency as a non-parametric method. History of this method dates back to 1957 when Farrell measured performance of units for the first time using non-parametric method. Since then this performance assessment method has been developed quickly due to its considerable priorities than the parametric method. It was used in many organizations such as banks, hospitals, universities, insurance companies and etc. The efficient frontier curve is determined in this method by a series of points that are determined through linear planning. Constant return to scale and variable return to scale could be used to determine these points. After optimization linear planning method specifies whether the intended decision-maker unit is on

the efficiency line or not; thus efficient and inefficient units are separated. It is notable that the target function (output) could be maximized based on certain inputs in this method or inputs could be minimized using certain outputs.

Return to scale shows production changes because of total change of inputs. Return would be increasing if amounts of all necessary inputs to produce a certain good are increased to the same degree and production is enhanced more. If it increases to the same degree, return to scale would be constant and it would be decreasing if it is lower. Constant return to scale could be usable if firms act in optimal scale. Firms don't act in optimal scale due to different issues such as competitive effects, limitations and etc. Data envelopment analysis represents technical efficiency which includes net technical efficiency (management efficiency) and economies of scale efficiency by assuming variable return to scale. Management efficiency means that hard working, attempt and management of managers as well as employees' attempt and proper combination of production factors increase productivity of an organization. Economies of scale efficiency means if average cost of manufacturers in an industry in large scale is less than average production cost for manufacturers in small scale, there would be economies of production scale in that industry.

Given to characteristics of post offices in the country, data envelopment analysis could be used to measure efficiency of these offices as a selected method.

4.1. Constant Return to Scale Model (CRS)

Three operations research specialists called Charnes, Cooper and Rhodes measured efficiency practically through linear planning in 1978 that was called DEA, while there was no need to specify a production function form. The basic assumption in this model is constant return to scale and could be implemented in two states of input-oriented or output-oriented.

Data Envelopment Analysis (DEA) converts multi-product and multi-production factor states into simple one-factor and one-product states creatively. If there is data about K production factors and M products for each n firm or DMU (Decision-Making Unit), inputs and outputs are displayed by vectors X_i and Y_i for ith product. X (input matrix K×N) and Y (output matrix M×N) show data for N decision-making units (DMU).

Duality in linear planning could be used to measure efficiency which represents degree of technical efficiency for each firm separately:

$$Min_{\theta,\lambda}\theta$$
$$\text{S.t. } -y_i + Y\lambda \geq 0,\ j = 1, 2, \ldots, i. \ldots N \quad (1)$$

$$\Theta x_i - X\lambda \geq 0$$
$$\lambda \geq 0 \quad (2)$$

where λ is a N×1 vector includes constants which show weights of a reference set. The obtained scalar amounts for θ are efficiency of the firms that hold $\theta \leq 1$. The first term in the above equations illustrates whether real amounts of the product by ith firm using production factors could be more than this or not. The second restriction indicates production factors that are used by the ith firm should be at least equal to factors used by the reference firm. It is necessary to solve linear planning model for N times and each time for one firm. As a result, amount of efficiency (θ) for each firm is obtained. If $\theta=1$, it shows a point on production quantification curve or frontier production function and thus the firm has totally relative efficiency according to Farrell theory (Yousefi, 2004).

4.2. Outputs and Inputs of the Model

As it has been mentioned earlier, data envelopment analysis technique is used to similar decision-making units. This similarity means decision-making units have similar inputs and outputs and use a similar process to convert inputs into outputs. Therefore, all input and output variables were identified given to objectives of evaluation, expected tasks and performances of Iranian Post branches and the working process in executive units. Among all inputs and outputs the followings are considered as performance indexes in postal branches.

Inputs are defined as follows:

- Number of personnel in the branch: it includes a number of employees working in each branch such as management and operational employees.
- Area of post office buildings: by area we mean buildings of each post branch across the country.
- Expenditures: expenditures of each post branch are divided into current and development

expenditures in the post company. Total expenditure in each branch could be obtained by adding the current and development expenditures.

- Cost of Development plans: costs that are allocated to development and organization plans of post services, developing technology in post operations, up-to-dating of the 10-digit postal code, buildings, human capital education and development, providing the required equipments and enhancing quality of post activities are called costs of development plans.
- National expenditures: generally costs of development plans are divided into two sections: provincial plans and national plans. Funds in costs of provincial plans are provided through the province and the governorship while in national development plans such funds are provided through the headquarters.
- Number of vehicles: it includes total number of vehicles such as automobile, truck, bus, mini-bus, crane and cash machine in all postal branches.
- Human force training hours: it includes in-service training hours to the personnel of postal branches.

Outputs are defined as follows:

- Number of post units: number of required post units in each region is determined based on its population.
- Income per capita: it includes income level of each post branch that is studied based on three indexes of population, employee and postal unit. For instance, net income of each branch is divided by the population that branch covers in order to calculate income per capita based on each person.
- Traffic per capita: by traffic we mean whole number of parcels in each post branch across the country that is calculated based on three indexes of employee, postal unit and population. For example, traffic per capita regarding each employee is the number of letters in each branch divided by the number of the personnel.

One of the most important features and capabilities of DEA method is that predetermined weights are not needed for each input and output. Weight of inputs and outputs of each decision-making unit in this method is obtained in interacting with other units and it could be stated that weights have a dynamic condition. Hence, weighting is used for personnel number index of each postal branch that is studied based on literacy level.

The allocated coefficients based on education level are as below:

Elementary=0.5; below diploma= 0.8; diploma=1; associates=1.2; B.A= 1.5; M.A= 1.8 and PhD= 2.

5. Empirical Results: Model simulation

Constant Return to Scale (CRS) is used to measure technical efficiency by assuming product orientation (output-oriented efficiency). In measuring output-oriented efficiency, this question is raised whether to what degree output amounts could be increased proportionally without a change in the inputs.

Therefore, output - oriented technical efficiency is measured using the following ratio:

$$TE_o = \frac{OA}{OB} \quad (3)$$

Index o shows measuring efficiency is on the basis of output orientation.

Two general models are considered for analyzing. In the first model Tehran province is regarded as a general set including eight postal zones and analysis and trading unit that totally efficiency of 31 units (DMU) is measured. In the second model Tehran province is in the form of separated zones (11 to 19) and technical efficiency of 38 postal units is measured.

Inputs in both models are considered unchanged and contain the followings:

IK: number of personnel
IS: area of buildings (in terms of square meter)
IC: current expenditures (Rial; the Iranian currency)
IN: costs of development plans (Million Rials)
IV: number of vehicles
IA: training times to educate labor force

Outputs are considered as below given to product orientation assumption for both models:

A-Op population, OIp income per capita regarding per person in a population (in terms of Rial), OTp traffic per capita regarding per person in a population (in terms of parcel),

B-Op population, OIv income per capita regarding per person in a population (in terms of Million Rial), OTv traffic per capita related to per person in a population (in terms of thousand parcels),

C-Op population, *OIk* income per capita in lieu of each employee (in terms of Million Rial),

OTk traffic per capita related to each employee (in terms of thousand parcels).

Six models are created as below given to the selected stages for outputs:

Model {1-A , 1-B , 1-C }
Model {2-A , 2-B , 2-C }

Technical efficiency in each of the above models has been measured using EMS software and correlation degree of these six models has been calculated by the SPSS software in order to obtain the optimal model.

Table 1: Calculating correlation coefficient of Model A

Pearson Correlation	Model 1-A	Model 1-B	Model 1-C
Model 1-A	1	0.846	0.942
Prob.		0.001	0.001
Number	31	31	31
Model 1-B	0.846	1	0.811
Prob.	0.001		0.001
Number	31	31	31
Model 1-C	0.942	0.811	1
Prob.	0.001	0.001	
Number	31	31	31

***Source*:** Authors

According to Table 1, it is revealed that model A-1 has the highest correlation coefficient; it also has higher average efficiency and determines more inefficient units. As a result, it is selected as the suggested model and is called model A.

Table 2: calculating correlation coefficient of Model B

Pearson Correlation	Model 2-A	Model 2-B	Model 2-C
Model 2-A	1	0.895	0.875
Prob.		0.001	0.001
Number	38	38	38
Model 2-B	0.895	1	0.763
Prob.	0.001		0.001
Number	38	38	38
Model 2-C	0.875	0.763	1
Prob.	0.001	0.001	
Number	38	38	38

***Source*:** Authors

Table 2 also reveals the fact that model B-2 has the highest correlation coefficient. It also has higher average efficiency and determines more inefficient units. As a result, it is selected as the second suggested model and is called Model B.

Efficiency assessment model is conducted according to constant return to scale model and assuming output-orientation by collected data about amounts of inputs and outputs of each decision-making unit, then the efficiency score is obtained for every unit. Efficiency status of decision-making units is analyzed according to results obtained from solving the model. It is notable that the EMS software has been used to measure efficiency.

Hence technical efficiency in the first suggested model (Model A) is calculated given to Table 3.

Table 3: Technical efficiency of Iranian postal branches by output-oriented attitude in 2011 (Model A)

Number	Province	output-oriented Technical Efficiency	postal branches
1	East Azarbayejan	32.537 %	6(1.87)
2	West Azarbayejan	66/221%	31(0.00) 6(0.95)
3	Ardebil	205.5%	31(0.01) 6(0.63)
4	Isfahan	72.65%	1
5	Ilam	%146.14	6(0.64)
6	Bushehr	%35.92	24
7	Bakhtiary	%199.69	31(0.01) 6(0.52)
8	North Khorasan	%130.36	6(0.52)
9	Razavi Khorasan	%150.57	31(0.05) 4(036)
10	South Khorasan	%101.55	6(0.38)
11	Khuzestan	%115.36	31(0.05) 6(0.07)
12	Zanjan	%145.42	13(015) 6(0.63)
13	Semnan	%85.26	9
14	Systan & Baluchestan	%166.76	31(0.04) 6(0.49)
15	Fars	%302.68	31(0.07) 13(0.54)
16	Ghom	%104.69	6(0.35) 6(0.88)
17	Ghazvin	%145.39	31(0.00) 13(0.01) 6(0.57)
18	Koedestan	%167.57	31(0.00) 6(0.60)
19	Kerman	%278.22	31(0.05) 6(0.62)
20	Kermanshah	%209.93	6(0.81)
21	Kohkiluye & Bovirahmad	%154.73	6(0.63)
22	Mazandaran	%81.19	0
23	Golestan	%204.08	13(0.07) 6(0.51)
24	Gilan	%280.39	13(0.08) 6(0.84)
25	Lorestan	%213.83	31(0.01) 13(0.28) 6(0.47)
26	Markazy	%226.76	13(0.22) 6(0.86)
27	Hormozgan	%357.37	31(0.04) 6(0.75)
28	Hamedan	%128.01	13(0.54) 6(0.61)
29	Yazd	%176.73	31(0.01) 13(0.04) 6(1.62)
30	Alborz	%97.58	0
31	Tehran Province	%58.1	13

Source: Author

Table 4: prioritization of efficient units in Model A

Province	Technical Efficiency
Alborz	%97.58
Semnan	%85.26
Mazandaran	%81.19
Isfahan	%72.65
Tehran	%58.19
Bushehr	%35.92

***Source*:** Authors

Tables 3 and 4 have shown provinces of lborz and Bushehr as the highest and lowest efficient units in 2011, respectively. The numbers displayed in brackets in Table 3 rely on how many inefficient units have considered to provinces as specified by the model. For example, Tehran province has been introduced as a model for other 13 provinces in terms of efficiency. Other provinces have inefficient postal branches. For instance, Fars province is an inefficient branch that has 0.35, 0.54 and 0.07 differences with efficient units of Bushehr, Semnan and Tehran provinces respectively in terms of efficiency. It means that Fars province is very close to Tehran province regarding technical efficiency and it could achieve efficiency frontier of Tehran province by 7% improvement in its products. Generally, whatever the difference and the stated number for inefficient units in comparison with efficient units is smaller, that inefficient unit could act very close to the efficient unit in terms of efficiency but whatever the number is larger the amount of difference of inefficient unit from efficiency frontier of efficient units is rather more.

According to Table 3, the following results could be concluded for efficient units: 1) Isfahan province is on the efficiency frontier in comparison with Khorasan Razavi province. Its difference with Isfahan province is equal to 0.36 in terms of technical efficiency which means that 36% improvement in the process of service offering (saving in inputs or increasing of outputs) could make this province closer to the efficiency frontier technically. 2) Mazandaran and Alborz provinces have not been introduced as efficient units and models for other inefficient units.

Technical output-oriented efficiency in Model B has been calculated in Table 5.

Table 5: Technical Efficiency of postal branches by output-oriented attitude in 2011 (Model B)

Number	Province	Technical Efficiency	postal branches
1	East Azarbayejan	%1291.64	38(1.20) 35(0.46)
2	West Azarbayejan	%536.70	38(0.74) 35(0.20)
3	Ardebil	%406.49	38(0.30) 35(0.25)
4	Isfahan	%405.95	35(0.57)
5	Ilam	%315.08	38(0.06) 35(0.26)
6	Bushehr	%43.73	10
7	Bakhtiary	%316.00	35(0.29)
8	North Khorasan	%302.21	38(0.22) 35(0.22)
9	Razavi Khorasan	%661.92	38(0.32) 35(0. 81)
10	South Khorasan	%266.12	38(0.21) 35(0.08)
11	Khuzestan	%452.50	38(0.72) 35(0.41)
12	Zanjan	%453.22	38(0.19) 35(0.17) 6(0.13)
13	Semnan	%422.11	38(0.06) 35(0.18) 33(0.05) 6(0.40)
14	Systan & Baluchestan	%334.77	38(0.20) 35(0.45)

15	Fars	%1049.92	38(0.31) 35(1.18)
16	Ghom	%166.68	38(0.26) 35(0.10) 6(0.40)
17	Ghazvin	%325.07	38(0.35) 35(0.12) 6(0.09)
18	Koedestan	%431.68	38(0.48) 35(0.14)
19	Kerman	%494.55	35(0.44) 6(0.87)
20	Kermanshah	%565.80	35(0.62)
21	Kohkiluye & Bovirahmad	%311.33	38(0.20) 35(0.15)
22	Mazandaran	%508.90	35(0.47) 33(0.22)
23	Golestan	%600.44	38(0.63) 35(0.01)
24	Gilan	%750.54	38(0.03) 35(0.64)
25	Lorestan	%708.68	38(0.48) 35(0.29)
26	Markazy	%452.85	38(0.19) 35(0.40)
27	Hormozgan	%719.24	35(0.57)
28	Hamedan	%712.46	38(0.52) 35(0.12) 33(0.07) 6(0.30)
29	Yazd	%411.06	38(0.11) 35(0.23) 6(0.65)
30	Alborz province	%553.94	35(0.57) 38(0.15)
31	th Zone in Tehran 11	%131.72	35(0.28) 33(0.19) 6(0.26)
32	th Zone in Tehran 13	%72.7	1
33	th Zone in Tehran 14	%53.51	5
34	th Zone in Tehran 15	%204.96	35(0.49) 33(0.20) 6(0.01)
35	th Zone in Tehran 16	%47.49	33
36	th Zone in Tehran 17	%139.14	35(0.47)
37	th Zone in Tehran 18	%117.00	35(0.40) 32(0.19) 6(0.54)
38	th Zone in Tehran 19	%14.66	23

***Source*:** Authors

Table 6: Prioritization of efficient units in Model B

Unit	Technical efficiency
13th Zone in Tehran	%72.77
14th Zone in Tehran	%53.51
16th Zone in Tehran	%47.59
Bushehr province	%43.73
19th Zone in Tehran	%14.66

***Source*:** Authors

Given to Table 5, postal branches which have the highest amount of technical efficiency and have been proposed as model for inefficient units are shown in Table 6. As it is observed Bushehr province in model B is regarded as a model for ten inefficient postal units and 19th zone of Tehran is proposed as the efficient branch for 23 inefficient units. The efficient unit

of 13th zone of Tehran has been determined as model for the inefficient unit of 18th zone and efficient unit of 16th zone is determined as model for 33 inefficient units. All inefficient branches are identified in Table 5 as Model A and their difference with efficient branches is evaluated. For example, Isfahan province in Model B is inefficient and its difference with efficient unit of 16th zone of Tehran is 57%. Semnan province is inefficient too in Model B and has 40% difference with Bushehr province in terms of degree of efficiency and 18% difference with 16th zone of Tehran and is far further than efficiency frontier of efficient branches. This is while its difference with 14th and 19th zones of Tehran is equal to 5% and 6% respectively and could achieve efficiency frontier of these two branches by improving its products up to 5% and 6%.

5. Conclusion

Technical efficiency of the Iran's Post Company has been measured by this study using DEA method. According to the empirical results obtained, Alborz, Mazandaran, Isfahan, Tehran, Semnan and Bushehr branches in Model A and branches in 13th, 19th, 16th and 14th zones in Tehran province and Bushehr province were at the efficiency frontier in Model B given to constant return to scale and product orientation assumptions. Also it was revealed that some postal units were inefficient in Models A and B but it is not possible to express definitely these units have been inefficient because of inappropriate application of financial resources.

As a result, it could be suggested if inputs are adjusted or productivity of outputs is increased in proportion with conditions of each inefficient unit, inefficient units would improve at the efficiency frontier by modeling efficient units and considering the difference among efficient and inefficient postal units.

The following policy implications could be represented given to the results in Tables 3 and 5 and efficient and inefficient units.

- Iran's Post Company should conduct the essential planning in number and quality of human capital and adjust costs about branches which have a lower efficiency by considering factors like population level of the region, social culture level and etc.
- Comprehensive systems of administrative automation plan should be used optimally and desirably. Fortunately the essential substructures have been provided in this organization, thus more serious steps should be taken in the field of e-government.
- The Post Company should consider postal centers in Isfahan, Alborz, Semnan, Mazandaran and Tehran provinces as a basis to obtain technical efficiency in other provinces and branches and represents policy recommendations for other provinces by studying effective factors on their technical efficiency.
- The obtained efficiency for each post office could be regarded as one of the standards of resource allocation in postal units.
- Post offices in Tehran province should be compared with efficient provinces. Moreover, technical efficiency of other provinces should be compared with branches of 13th, 14th, 16th and 19th zones of Tehran.
- Given that low level of outputs (traffic and income) is one of the major reasons of inefficiency, it is recommended to conduct more studies in this regard.

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