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# Measuring the Relative Efficiency of Education Organizations of Country: Data Envelopment Analysis Approach

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**Abstract:** The aim of this study was to calculate the efficiency of education organizations of country using DEA and determine efficient and inefficient units and ranking of them and determine performance changes in the years 2007 until 2010. Using the statistics and the values related to the three input variable (Performance credits, student density rate, teacher education level) and two output variables (pass rates and graduation rates) and by Deaos Software and to methods of profit maximization and cost minimization and with two assumptions of constant return to scale and variable return to scale the model has been provided and resolved and then using supper efficiency of units the ranking and in terms of efficiency of highest and lowest unit was determined and using Malmqueist index the efficiency changes during studied years has been also calculated.

**Key words:** Efficiency, data envelopment analysis, education, lowest unit, profit

## INTRODUCTION

Investing in education is the backbone of economic growth in the most developed countries and developed and in developing countries, in most cases, investment in education has been led to economic growth. Due to favorable long-term effects of education leaves oncountry economy, government itselfis the provider of educational service and always in the allocation of government resources devoted major figures to it, thus the allocation of resources should be fair and always tried to increase the efficiency of this infrastructure section.

To achieve this worthwhile goal, the components of education performance should be analyzed in details. In the present study, the components are education organizations classified by the Ministry of Education directive and considering three input variables including performance credits, student density rate and teacher education level and two output variables involving pass rates and graduation rates using data envelopment analysis their efficiency is evaluated to determine the units to what extent have been successful in achieving objectives.

So, this study tries to analyze the state of the country's education in provinces at all levels of school education, to be aware of the strengths and weaknesses of the educational system more than ever to propose appropriate solutions to obviate problems and issues and reinforce and strengths of plans and programs.

By building appropriate DEA models, resolve it through two methods of CCR, BCC by using the software Deaos, to determine the relative efficiency of each of DMUs and then the ranking the units and to examine efficiency changes using Malmquist index during the studied years, the efficiency of education organizations will be analyzed.

**Statement of the problem:** Although, large student population in our country has caused serious problems to the administration of the education system and has created many difficulties but it should be noted that effective investment in this area will enable country that in the not too distant future benefit its young expert and efficient staff and this in turn is considered as one of the biggest areas of change and achieve economic growth and development because the most important factor for economic growth and development is specialist human power.

So, to this end the performance of components of education must be scrupulously analyzed, it is noteworthy in this research the componentsare the organizations of education. For this purpose, using three input and two output variables and using data envelopment analysis, we assessed their efficiency to determine to what extent the aforementioned units have been successful in achieving their goals. Notably, input variables include performance credentials, student density rate, teacher education level of and output variables include pass rates and graduation rates. In other words, the analysis of aforementioned indices, clearly determine that education to what extent has been successful in achieving its objectives. In this regard, this study tries with analyzing the state of education in country provinces and at all levels of school to be aware of the strengths and weaknesses of the educational system more than ever to propose appropriate solutions to obviate problems issues reinforce and strengths of plans and programs.

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**Literature review:** Farrell and Fieldhouse (1962) for the first time, to estimate efficiency proposed non-parametric method. He rather than guessing production function observed the values of inputs and outputs of units and considered a frontier for these units and considered this frontier as efficiency criterion. In 1978, DEA approach as a nonparametric approach for estimation frontier functions for the first time was introduced by Charnes and Cooper for first time was used in Edvard Rhodes doctoral thesis by help Cooper entitled "Assessment of student achievement in national schools of America" in 1976 at Carnegie university. Farrel (1957) presented an article entitled "measurement of decisions making units". Because, this model was presented by Charnes as CCR was introduced with the assumption of constant returns to scale that is composed of the first letters of the names of mentioned people. Many economists have focused on the importance of investing in education and examples of which are as follows.

Adam Smith in his book entitled Wealth of Nations in 1776 addresses the importance of education on increasing efficiency and meeting the specialized needs of society. Stroomelin in 1924 reviewed the implementation of free and public education in the USSR and changes of various groupworkers income according to their education level. Schultz in terms of providing research ineducation economy, in the 1950s was awarded the Nobel Prize. Hikz in investigating income status of developing countries believe economic growth ratechanges affected by literate population. Also great economists such as Francis Bacon, James Stwart, David Hume, Malthus, Ricardo, John Stuart Mill, Karl Marx, Friedman, Alfred Marshal, Wheeler, Kuznets and in their research have addressed the importance of investing education in enhance the performance of communities.

## MATERIALS AND METHODS

### Theoretical framework of research

**Efficiency definition:** To date different definitions of efficiency have been offered. The efficiency concept in economics is the optimal allocation of resources. But for practical purposes, different definitions have been mentioned. Generally, the efficiency is reagent (indicator) of ratio of outputs to inputs compared to a certain standard. Therefore, recognizing the efficiency is subject to standard definition and compared to a desired level of standard. The efficiency is the criterion ofan organizational system performance that has been based on consumption of resources (data or inputs). In other words, the efficiency isthe amount of resource consumption to produce a certain product.

**Methods of measuring efficiency:** There are two main methods for measuring efficiency including:

- Rate analysis method
- Stochastic frontier analysis method

**Rate analysis method:** Rate analysis method is of one of the oldest methods to measure efficiency. In this method, a ratio between items related to the numerical data of management is calculated and calculated. Ratios in different financial areas, economic and industrial are used. Methods of ratio analysis include the procedure method, percentage method and comparison and index method.

**Stochastic frontier analysis method:** In stochastic frontier analysis method whichin academic research istoo much emphasized, firstly by estimating production functions create a frontier as efficiency frontier and companies that operate in the frontier are known as efficient units. In the Stochastic frontier analysis studies of the efficiency, there are at least four important methods with many applications:

- Parametric method of random stochastic
- The thick parametric frontier method
- The free distribution parametric method
- Linear nonparametric method as DEA

The nonparametric methods are parallel with parametric methods. Among the advantages of non-parametric methods is that these methods does not consider a concrete form for the production function and work directly with observed data.

**Data envelopment analysis:** This method is a non-parametric method based on linear programmingto determine the efficiency of decision making units or equal economic institutions based on similar data and profits (outputs). In this technique, the best performance isfound in the comparable category and performance of other units are compared to it.

**Benefits of DEA:** DEA is capable evaluate different inputs (costs) and outputs (profits). Meter, kilograms, percentage of defects, Rial and human resources, etc in this methodology can be combined together to assess the performance to be studied. In DEA method using mathematical models, proportionate weights for inputs (costs) and outputs (profits) are determined to maximize of value ratio of outputs (profits) to inputs (costs) to maximization of efficiency. Thus, determined weights are not arbitrary and have been obtained according to the

nature of mathematical programming problems. The resulting weights can be considered as the best attainable weight among decision-making units for unit under consideration as well.

In DEA models, unlike techniques such as regression, which there is a trend to the center of data, there is a tendency to use efficient units by efficiency frontier. With the image of the DMU decision making unit on the efficiency frontier in fact the best achievable performance of the unit is determined. This frontier represent the best performance status which has been established from study and consequent of studied decision-making units and therefore, the ideal situation in this method is meaningless because if a decision-making unit is not placed on the efficiency center, is not in the best condition of its performance and to achieve the state should adopts appropriate strategies for improvement.

The DEA has a high ability to provide complete ranking of studied decision-making units and models such as Andersen and Petersen (1993) can also rank the efficient enterprises and select the most efficient among efficient enterprises.

The capability of classification of units in this methodology resulted in the identification units that are functionally onthe highest possible level compared other. Aforementioned units are called pattern or sign (symbol) units. In fact, these units, with the amount of data to make decisions, produces more output (profit)than it or using less amount of its data produces the same output (profit).

**Malmquist index:** An index that uses distance function to measure changes in productivity, efficiency and technology during the years of the study (Kazemi *et al*., 2007). This index was not using until 1992. In this year, the first scientific estimation was done using this method. This method has advantages including:

- This index uses value information
- Has less is restrictive sell
- Doesn't need econometric estimation

Caves and coauthors introduced Malmquist productivity index based on distance production factors as following:

$$T_i^{t+1}\times E_i^{t+1}=\frac{D_i^t\left(y^t,x^t\right)}{D_i^{t+1}\left(y^{t+1},x^{t+1}\right)}\times\left(\frac{D_0^{t+1}\left(y^t,x^t\right)D_0^{t+1}\left(y^{t+1},x^{t+1}\right)}{D_0^t\left(y^t,x^t\right)D_0^t\left(y^{t+1},x^{t+1}\right)}\right)^{\frac{1}{2}}$$
$$M_i^{t+1}\left(y^{t+1},x^{t+1},y^t,x^t\right)$$

So, that $T^{t+1}{}_i$* $E^{t+1}{}_i$ technical efficiency changesand $T^{t+1}{}_i$ changes in technology performance in condition of cross-border transfer function between the two t, t+1periods t, t+1 is measured. Notably, x, y input and output and D is the distance function. According to this relationship, if there is productivity growth, this index would be greater than the unit and in the absence of productivity growth, would be less than unit.

**Research purposes:** The current study on the assessment of the relative efficiency of education organizations of provinces of country, so the purposes are as follows:

- The assessment of relative efficiency of education of different provinces
- He ranking of country educational institutions in terms of their efficiency
- Etermination of inefficient units and offering necessary suggestions in order to making them efficient

**Analytical model of research:** The study is among descriptive-analytic study which evaluate the efficiency of organizations of education of country and analyze it using three inputs and two outputs, making appropriate models of DEA, resolve it through two methods of CCR, BCC, determining the relative efficiency of each DMUs and then rankings units using super efficiency and examining efficiency changes using Malmquist index during the study years.

**Efficiency in data envelopment analysis:** Efficiency evaluation of a unit is required to compare the outputs with the inputs. This comparison is done in different ways, including: efficiency of a decision making unit in the condition in which there is only one input and one output can be represented as follows:

$$\text{Efficiency}=\frac{\text{Ouput value}}{\text{Input value}} \quad (1)$$

For example, the efficiency of a mill can be compared by dividing the output value (flour) of it into the input (wheat). But, usually decision-making units have multiple inputs and outputs. In this case, efficiency is defined as follows:

$$\text{Efficiency}=\frac{\text{Totalweghit of outputs}}{\text{Totalweghit of input}} \quad (2)$$

Ant in this definition the main problem is determination of weight. Another method of determining the efficiency of efficient and inefficient units are defined as follows: one unit is efficient compared other units,once any unit or linear combination of some units couldn't

produce the output value of that unit (self-evaluation) with less input value of that or couldn't with the same input value of evaluated unit give greater output andan unit that is not efficient are called inefficient.

**DEA models:** One of the features of DEA models is the structure returns to scale. Returns to scale variable can be constant or variable. Constant returns to scalemeans increasing the amount of inputs lead to increase in output compared to the same rate.In the variable returns, output increase is more or less than the increase in output. Notably, CCR models including constant returns to scale models and BCC models are among models of variable returns to scale.

Each of the above models can be examined from two procedures. These two procedures are known input-oriented and output-oriented procedures. In input-oriented model a unit would be inefficient ifthe of reduction in each of inputs without increase other inputsor decrease each of the outputs is possible. In an output-oriented model, a unit would be inefficient if the of increase in each of inputs without increase other inputs or decrease each of the outputs is possible. A unit would be efficient if the above two cases are not achieved.

**CCR models:** This model for first time was proposed by Charnes, Cooper and Rhodes in 1978, its name comes from the initials of the names of the bidders and mostly is known as CCR. In this model, the efficiency of each unit of n DMU by a linear programming model is calculated for each DMU. After obtaining the optimum answer, the efficiency of each DMU is determined according to the following conditions. If 1 = *θ and there is at least one (V *, U *) optimization with V *> 0 and U *> 0 the DMUp is related to efficiency of CCR. Otherwise DMUp is inefficient of CCR. This means that CCR inefficiency is or 1> *θ, or if 1 = * θ and at least one factor of (V *, U *) for optimal answer is zero.

**BCC model:** This model in 1984 was developed by Banker *et al.* (1984) and its name comes from the initials of the names of the bidders which known as the BCC. CCR is similar to BCC model but at the basic shape of the model, the limit of 1λ = 1 has been added to other restrictions of CCR model and its linear programming model is as follows:

- Minθ
- S.t:
- Xp
- Yλ≥YP
- λΣ
- λ = 1Σ
- λ ≥ 0

Added condition in the above model causes the efficient frontier model has convexity condition. If a DMU is efficient in CCR model certainly is efficient in BCC model but the reverse is not true, so generallyefficiency of CCR at any time is not more than the efficiency of BCC.

**Inputs and outputs variables**

**Input variables:** Performance credits shows the amount of spend credits.

**Student density rate (density):** This index showing the number of students in anestablished class and planners by comparing this index by related standard can become aware form the situation of studied classes.

**Teacher education level (Education):** To calculate this index to diploma coefficient of 1, to associate, coefficient of 2, to bachelor, coefficient of 3 and to master's degree and higher coefficient of 4 has been assigned, for example, in the academic year 2005-2006 the assigned value to the Markazi province is 21522 which has been calculated as follows: Total teaching staff with a diploma degree in three sections *1 (804)+total teaching staff with associate degrees in three sections *2(2×2810)+total teaching staff with a bachelor degree in three sections *3 (3×4486)+total teaching staff withmaster degree or higher in 3 sections 4 (4×410) which is equal to the 21522.

**Output variables:**

**Pass rate (transition):** This index shows how much of the final grade students of the school in each academic course have been able to register in the next period

**Graduation rate (graduation):** With this rate, student's position in the study will be determined and demographic representation of it will make we can predict students population in the future.

## RESULTS AND DISCUSSION

As seen in the attached tables at the level oneand for input oriented CCR model in years of 2005, 2007 and 2008 of East Azerbaijan Province and in 2006 the directorate of total cities of Tehran Province are efficient and Khorasan Razavi province has the least amount of efficiency which according to data table it seems the reason is the use of higher inputs values than is than other provinces at the same level. Notably, the opposite is raised on the East Azerbaijan province.

In the output-oriented model in studied yearsthe East Azerbaijan province has been efficient,as well as in 2005, Khorasan Razavi Province in 2006 the directorate general of Tehran province and in 2008 the Fars province have also acted efficiently, which represent aforementioned provinces access to a high percentage of academic success.

Notably, for input-oriented BCC model in 2005, the Directorate General of Tehran Province, in 2006, Tehran, Esfahan and Tehran cities, in years 2007 and 2008 the Tehran isadded to efficient total Directorate General. Also in input-oriented situation, the least amount of efficiency has been related to Tehran cities in years of 2005, 2007, 2008 and in 2006 has been related to Khuzestan Province. It should be noted that in this model the efficiency of the provinces is over 80%.

In the extraordinary efficiency also, East Azerbaijan province with efficiency higher than 120% in the study period has achieved first place among the other agencies at the same level. In level two for CCR input-oriented model in 200, the provinces of Ardebil, Kerman, Guilan, Mazandaran, Markazi, Hamedan and Hormozgan have been efficient and in 2006, Kurdistan has added to the list and Kerman province deleted from the list. In 2007, provinces of Kurdistan and Hamedan were removed and in 2008, Kurdistan and Kerman again removed from efficient provinces list, also in 2008, provinces of Hormozgan and Mazandaran were removed from efficient provinces and Sistan-Baluchestan provinces was added. In the output-oriented model of CCR difference is that in 2005, Sistan-Baluchestan and Kurdistan provinceswere added and Kerman was removed from the list and in 2007, the Hamedan province was removed from efficient provinces and in 2008, Sistan-Baluchestan was added to efficient provinces list.

Since, each province which isefficient in the constant return to scale is certainly efficient in the model of variable return to scale. So, the difference in the input-oriented BCC model compared the CCR is that in years of 2005 and 2008, Kurdistan and in the 2008, Sistan-Baluchistan Province are added to efficient provinces and in the output-oriented BCC model, in 2005, Kerman province, in 2007,Kurdistan provinceand Hamadan and in 2008,Kurdistan are added to efficient provinces. Notably, in this level, Golestan and Lorestan provinces in 2008 and in the output-oriented BCC model, have the least efficiencyand in the other cases, the West Azerbaijan province has allocated the least efficiency to itself.

Notably, in the extraordinary efficiencythe first rankis related to Markazi provincethat has a significant difference with other provincesat the same level on calculated efficiency rate. In level three and in the CCR model, provinces of Ilam, South Khorasan, Semnan, Kohkiloye and Yazd acted efficiently and in 2006, provinces of South Khorasan, Semnan and Kohgiluyeh-Boyerahmad and in 2007, provinces of South Khorasan and Semnan and in 2008, provinces of Ilam and Kohgiluyeh and Boyerahmdnyz were added to this collection.It is noteworthy that in 2005, Qom, in 2006, Qazvin province, in 2007, provinces of Qom and Qazvin and in 2008, Qazvin had the least efficiency rate with over 70% in this collection.

In the input-oriented BCC modelthe difference with CCR is that in 2005,Qom province and in every four years Kohgiluyeh and Boyer-Ahmad Province are also efficient and output-oriented BCC model has differences withinput-oriented model as following: In 2005, the province of Qom is efficient, in 2006, Ilam province is efficient. In the extraordinary efficiency, highest rank is related to Semnan province.

With observing the items that were raised this season, it is characterized that highest and lowest rates of efficiency in second and third degrees organizations are a higher level of this rate compared first degree offices. As well as you can see, the efficiency of provinces is not equal and the provinces that are efficient in CCR model are efficient in BCC model as well. According to the results of the tables contained in appendix of chapter 4, the first hypothesis of study entitled "educational organizations in the country have relative efficiency" based on the description in this chapter only about the number of provinces is true and at three levels of presented models, inefficient provinces are also exist that the aforementioned hypothesis about them is rejected. Also, Markazi province according to data from the Peterson-Anderson model whichwas presented in appendix of chapter, at the country level, has achieved better efficiency results, thus, based on obtained information, second hypothesis of study entitled in the ranking of the educational organizations of country,in terms of relative efficiency of them, Tehran province ranked first, is rejected.

Using Malmquist index, it is also observed that in the level one, Isfahan and Fars in the comparison between the data of 2005 and 2008, changes in the rate of productivity of them is positive, in the aforementioned provinces, the efficiency changes have been effective to improve productivity changes and in the East Azarbaijan province shows the efficiency and technical changes of number1and its reason is acting efficiently of above province in studied years of index (Table 1-12).

Table 1: Input and output data at level of 1 in the year of 2005

| DMU | Credits | Density | Education | Transition | Graduation |
|---|---|---|---|---|---|
| Type | Input | Input | Input | Output | Output |
| Azarbigan Sharghi | 3136589000 | 21.24 | 60363 | 86.73 | 66.02 |
| Esfahan | 4002650647 | 24.56 | 77909 | 88.28 | 68.04 |
| Khorasane Razavi | 5722616984 | 22.03 | 113392 | 90.06 | 65.68 |
| Khoozestan | 3787707490 | 24.09 | 65277 | 80.24 | 63.13 |
| Tehran | 4896212845 | 29.46 | 101406 | 93.44 | 69.84 |
| Shahrestanhaye Tehran | 3718661349 | 28.41 | 83318 | 88.2 | 65.31 |
| Farse | 4564490336 | 23.04 | 88263 | 86.03 | 64.37 |

Period:2005

Table 2: Input and output data at level of 1 in the year of 2007

| DMU | Credits | Density | Education | Transition | Graduation |
|---|---|---|---|---|---|
| Type | Input | Input | Input | Output | Output |
| Azarbigan sharghi | 3602185054 | 21.15 | 74964 | 86.8 | 65.78 |
| Esfahan | 4537487401 | 23.94 | 96508 | 90.25 | 68.52 |
| Khorasane Razavi | 6347576400 | 21.91 | 139964 | 86.23 | 65.28 |
| Khoozestan | 4311844010 | 23.28 | 86492 | 81.7 | 62.09 |
| Tehran | 5669069000 | 28.77 | 127762 | 92.7 | 70.5 |
| Shahrestanhaye Tehran | 4536835798 | 27.86 | 103959 | 88.9 | 86.67 |
| Farse | 5485546780 | 22.2 | 104185 | 84.86 | 64.97 |

Period:2006

Table 3: Input and output data at level of 1 in the year of 2007

| DMU | Credits | Density | Education | Transition | Graduation |
|---|---|---|---|---|---|
| Type | Input | Input | Input | Output | Output |
| Azarbigan sharghi | 4745625000 | 21.5 | 73476 | 88.09 | 65.01 |
| Esfahan | 5589248510 | 23.6 | 95325 | 91.79 | 68.61 |
| Khorasane Razavi | 8315835025 | 21.89 | 133309 | 85.5 | 65.59 |
| Khoozestan | 6106377000 | 23.24 | 84908 | 80.34 | 62.97 |
| Tehran | 6709811000 | 28.62 | 126522 | 93.9 | 70.11 |
| Shahrestanhaye Tehran | 5967759000 | 27.92 | 101573 | 91.61 | 65.64 |
| Farse | 6171620050 | 22.02 | 102258 | 87.33 | 65.52 |

Period:2007

Table 4: Input and output data at level of 1 in the year of 2008

| DMU | Credits | Density | Education | Transition | Graduation |
|---|---|---|---|---|---|
| Type | Input | Input | Input | Output | Output |
| Azarbigan sharghi | 4179803724 | 21.82 | 69827 | 89.95 | 62.26 |
| Esfahan | 5067227577 | 23.75 | 89206 | 92.9 | 63.78 |
| Khorasane Razavi | 7376443966 | 22.32 | 128816 | 89.17 | 61.54 |
| Khoozestan | 5316199282 | 23.57 | 81027 | 82.09 | 56.7 |
| Tehran | 7531555268 | 29.41 | 118998 | 95.11 | 68.01 |
| Shahrestanhaye Tehran | 4972866037 | 28.28 | 91492 | 93.67 | 58.84 |
| Farse | 6206750111 | 22.35 | 94679 | 92.07 | 61.56 |

Period:2008

Table 5: Input and output data at level of 2 in the year of 2005

| DMU | Credits | Density | Education | Transition | Graduation |
|---|---|---|---|---|---|
| Type | Input | Input | Input | Output | Output |
| Azarbijan Gharbi | 2277556678 | 24.82 | 42988 | 77.62 | 64.18 |
| Ardebil | 1383073053 | 21.68 | 23835 | 83.77 | 66.03 |
| Sistan Bloochestan | 1773264335 | 23.38 | 22871 | 79.66 | 60.21 |
| Kordestan | 1438704421 | 21.06 | 25575 | 81.35 | 63.28 |
| Kerman | 2802966489 | 20.76 | 49742 | 87.48 | 64.36 |
| Kermanshah | 1871538498 | 23.5 | 35935 | 82.15 | 65.48 |
| Golestan | 1605914201 | 23.71 | 30882 | 80.56 | 65.27 |
| Gilan | 2542714187 | 19.85 | 48756 | 83.15 | 67.03 |
| Lorestan | 1744906500 | 22.15 | 34395 | 84.33 | 65.94 |
| Mazandaran | 2945434071 | 20.47 | 69887 | 87.88 | 69.64 |
| Markazi | 1133081794 | 25.39 | 21522 | 86.48 | 64.49 |
| Hormozgan | 1569693360 | 23.76 | 20307 | 86.55 | 62.7 |
| Hamedan | 1705163075 | 21.44 | 34026 | 84.81 | 66.56 |

Period:2005

Table 6: Input and output data at level of 2 in the year of 2006

| DMU | Credits | Density | Education | Transition | Graduation |
|---|---|---|---|---|---|
| Azarbijan Gharbi | 2972297601 | 24.84 | 52344 | 80.35 | 64.22 |
| Ardebil | 1560684981 | 21.56 | 27997 | 82.91 | 66.99 |
| Sistan Bloochestan | 2148863180 | 23.05 | 33064 | 75.78 | 60.26 |
| Kordestan | 1746279953 | 20.89 | 31749 | 86.4 | 62.41 |
| Kerman | 3396258571 | 20.22 | 61319 | 85.33 | 64.69 |
| Kermanshah | 2208876000 | 22.68 | 45031 | 85.2 | 65.27 |
| Golestan | 2078425976 | 23.23 | 36977 | 83 | 65.28 |
| Gilan | 2944807000 | 19.41 | 54554 | 83.86 | 66.93 |
| Lorestan | 2170787000 | 21.35 | 41319 | 83.55 | 65.45 |
| Mazandaran | 3618668378 | 20.25 | 79071 | 88.4 | 70.2 |
| Markazi | 1383756266 | 24.84 | 25980 | 85.98 | 64.99 |
| Hormozgan | 1723864000 | 23.17 | 24359 | 87.89 | 62.34 |
| Hamedan | 2009195791 | 21.09 | 40123 | 85.06 | 66.23 |

Period:2006

Table 7: Input and output data at level of 2 in the year of 2007

| DMU | Credits | Density | Education | Transition | Graduation |
|---|---|---|---|---|---|
| Type | Input | Input | Input | Output | Output |
| Azarbijan Gharbi | 3785851000 | 24.88 | 51163 | 79.97 | 63.08 |
| Ardebil | 2041803000 | 21.42 | 27115 | 84.3 | 66.27 |
| Sistan Bloochestan | 2799678000 | 23.35 | 35071 | 79.07 | 60.55 |
| Kordestan | 2295534000 | 21.04 | 31670 | 86.1 | 59.8 |
| Kerman | 4536506100 | 20.35 | 59689 | 89.99 | 66.55 |
| Kermanshah | 3231406000 | 22.45 | 43717 | 85.67 | 65.94 |
| Golestan | 2150538998 | 23.09 | 35462 | 85.41 | 66.55 |
| Gilan | 3944248232 | 19.44 | 51733 | 87.86 | 65.71 |
| Lorestan | 2993786000 | 20.88 | 40435 | 86.18 | 65.85 |
| Mazandaran | 4697129000 | 20.28 | 75874 | 92.6 | 70.29 |
| Markazi | 1234085000 | 24.53 | 25075 | 87.92 | 66.09 |
| Hormozgan | 3223643279 | 22.83 | 24082 | 86.75 | 62.28 |
| Hamedan | 2821926942 | 22 | 38560 | 8698 | 68.11 |

Period:2007

Table 8: Input and output data at level of 2 in the year of 2008

| DMU | Credits | Density | Education | Transition | Graduation |
|---|---|---|---|---|---|
| Type | Input | Input | Input | Output | Output |
| Azarbijan Gharbi | 2997433261 | 25.36 | 49571 | 84.95 | 64.81 |
| Ardebil | 1778303331 | 21.96 | 26740 | 85.75 | 61.41 |
| Sistan Bloochestan | 2754444228 | 24.09 | 38471 | 79.65 | 57.34 |
| Kordestan | 2018173788 | 20.78 | 31060 | 89.22 | 56.2 |
| Kerman | 3852663996 | 20.32 | 59466 | 93.22 | 62.73 |
| Kermanshah | 2580853300 | 22.98 | 42166 | 89.15 | 64.2 |
| Golestan | 2076408027 | 23.58 | 33810 | 87.09 | 62.12 |
| Gilan | 3304840072 | 19.72 | 47672 | 90.45 | 63.25 |
| Lorestan | 2499387404 | 20.9 | 39545 | 89.96 | 59.48 |
| Mazandaran | 4357316910 | 20.88 | 69180 | 94.99 | 64.95 |
| Markazi | 1419259709 | 24.57 | 23511 | 90.93 | 60.62 |
| Hormozgan | 2049279981 | 22.71 | 24799 | 92.83 | 56.97 |
| Hamedan | 2309724432 | 22.71 | 36471 | 87.77 | 65.75 |

Period:2008

Table 9: Input and output data at level of 3 in the year of 2005

| Credits | Density | Education | Transition | Graduation |
|---|---|---|---|---|
| Input | Input | Input | Output | Output |
| 767119969 | 20.94 | 13807 | 91.01 | 66.39 |
| 994175000 | 21.45 | 16204 | 87.99 | 64.83 |
| 1058229977 | 20.24 | 21682 | 88.16 | 62.98 |
| 695319983 | 18.78 | 12911 | 70.37 | 63.8 |
| 885596368 | 20.61 | 17886 | 63.9 | 63.64 |
| 960313028 | 21.28 | 18740 | 85.34 | 64.01 |
| 583538153 | 22.49 | 11162 | 89.65 | 67.75 |
| 977602191 | 24.46 | 19196 | 83.39 | 66.94 |
| 749101037 | 28.19 | 18326 | 91.46 | 68.01 |
| 899272718 | 18.68 | 16263 | 86.85 | 60.19 |
| 1176266350 | 20.37 | 21370 | 90.08 | 71.04 |

Period:2005

Table 10: Input and output data at level of 3 in the year of 2006

| DMU | Credits | Density | Education | Transition | Graduation |
|---|---|---|---|---|---|
| Type | Input | Input | Input | Output | Output |
| Eelam | 966405000 | 19.82 | 17530 | 96.36 | 65.88 |
| Booshehr | 1325257588 | 20.97 | 20601 | 88.51 | 63.48 |
| Chaharmahal Bakhtiyari | 1225783840 | 19.4 | 25891 | 86.51 | 63.45 |
| Khorasan Jonoobi | 823106000 | 18.55 | 15339 | 89.34 | 66.93 |
| Khorasan Shomali | 1005555001 | 19.91 | 21590 | 83.62 | 64.4 |
| Zanjan | 1125455612 | 20.93 | 23119 | 84.61 | 64.11 |
| Semnan | 689398557 | 22.22 | 13521 | 90.43 | 67.27 |
| Ghazvin | 1157688570 | 24.15 | 24166 | 85.43 | 66.59 |
| Ghom | 891087950 | 27.35 | 25121 | 87.94 | 67.85 |
| Kohkilooye va Boyerahmad | 1128445933 | 18.02 | 19062 | 92.21 | 59.24 |
| Yazd | 1354318582 | 20.07 | 27312 | 93.57 | 71.82 |

Period:2006

Table 11: Input and output data at level of 3 in the year of 2007

| DMU | Credits | Density | Education | Transition | Graduation |
|---|---|---|---|---|---|
| Type | Input | Input | Input | Output | Output |
| Eelam | 1284895661 | 20.09 | 17034 | 90.72 | 65.06 |
| Booshehr | 1650470610 | 20.75 | 20163 | 84.55 | 64.18 |
| Chaharmahal Bakhtiyari | 1552977263 | 19.47 | 25178 | 89.02 | 64.94 |
| Khorasan Jonoobi | 1199748484 | 18.85 | 18539 | 102.34 | 70.61 |
| Khorasan Shomali | 1326286499 | 19.72 | 21464 | 87.6 | 63.81 |
| Zanjan | 1498576000 | 20.86 | 23300 | 88.31 | 64.25 |
| Semnan | 879493210 | 22.08 | 13092 | 91.58 | 67 |
| Ghazvin | 1532788000 | 24.39 | 23430 | 85.74 | 65.09 |
| Ghom | 1510660000 | 26.96 | 24925 | 91.64 | 67.89 |
| Kohkilooye va Boyerahmad | 1802315816 | 17.5 | 18730 | 90.19 | 61.99 |
| Yazd | 1813160000 | 20.36 | 26304 | 94.65 | 69.92 |

Period:2007

Table 12: Input and output data at level of 3 in the year of 2008

| DMU | Credits | Density | Education | Transition | Graduation |
|---|---|---|---|---|---|
| Type | Input | Input | Input | Output | Output |
| Eelam | 1197986649 | 19.61 | 16865 | 96.87 | 65.21 |
| Booshehr | 1482272216 | 21.12 | 20196 | 92.41 | 61.25 |
| Chaharmahal Bakhtiyari | 1577398182 | 20.07 | 24326 | 92.95 | 62.9 |
| Khorasan Jonoobi | 1120503313 | 19.26 | 18960 | 93.03 | 65.6 |
| Khorasan Shomali | 1240907153 | 20.84 | 20573 | 91.88 | 57.05 |
| Zanjan | 1345063413 | 21.41 | 23131 | 91.03 | 64.65 |
| Semnan | 881168868 | 22.65 | 12436 | 93.48 | 61.8 |
| Ghazvin | 1426628953 | 24.47 | 22242 | 90.15 | 64.09 |
| Ghom | 1169185489 | 27.37 | 23328 | 93.21 | 66.24 |
| Kohkilooye va Boyerahmad | 1486566960 | 18.68 | 18091 | 95.56 | 58.43 |
| Yazd | 1555241988 | 20.65 | 24839 | 95.04 | 69.18 |

Period:2008

In the level of two provinces of Sistan-Baluchesta and Kermanshah the changes have positive productivity and that is why positive efficiency changes of the aforementioned provinces. Notably, Ardebil, Guilan and Markazi because of acting efficiently in the studied years, their rate of productivity change display number 1. Notably, the provinces that their rate of technology changes is >1, represents superior technique and technology to deploy for better output with the same resources and inputs or the amount of previous outputs in situations which raw materials and used inputs become less and this issue has objectivity in the provinces of Khorasan Razavi, Kurdistan, Kerman, Lorestan, Mazandaran, Hormozgan, Chahar Mahal Bakhtyari and Yazd.

Also in Isfahan, Tehran and other cities of Tehran, Fars, West Azarbaijan, Kermanshah, Golestan, North Khorasan and Qom changes in efficiency exist that reflects the scale efficiency and management. It is noteworthy management efficiency confirms the hard work, effort, creativity of management and staff and the right combination of production factors to increase productivity. In the circumstances, the average cost of production for large-scale producers is less than the average cost of production for small-scale producers, save (economies) caused by scale in the production (scale efficiency) will be exist. Since, one of methods to examine the efficiency is measuring theefficiency and the improvement of current methods, it is recommended the

aforementioned method in this research is used to study the performance of government and non-governmental agencies and so this, an effective step in identifying problems, advancement of efficiency level and improvement of methods is taken.

## CONCLUSION

The importance of this study is to identify efficient and inefficient units and examine their performance that after implementation of the filed case, the necessary solutions to improve inefficient units has been proposed.

## REFERENCES

Andersen, P. and N.C. Petersen, 1993. A procedure for ranking efficient units in data envelopment analysis. Manag. Sci., 39: 1261-1264.

Banker, R.D., A. Charnes and W.W. Cooper, 1984. Some models for estimating technical and scale Inefficiencies in data envelopment analysis. Manage. Sci., 30: 1078-1092.

Charnes, A., W.W. Cooper and E. Rhodes, 1978. Measuring the efficiency of decision making units. Eur. J. Oper. Res., 2: 429-444.

Farrell, M.J. and M. Fieldhouse, 1962. Estimating efficient production functions under increasing returns to scale. J. Royal Stat. Society Ser. A General, 125: 252-267.

Farrell, M.J., 1957. The measurement of productive efficiency. J. Royal Stat. Society Ser. A General, 120: 253-290.

Kazemi, P., M. Hossein and S.H. Ali, 2007. Evaluating the efficiency of railway of Islamic Republic of Iran Railways compared to Asian countries and the Middle East. Econ. Res. J., 78: 104-198.