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Comparative Performance Assessment In EU Pre-Accession Funds

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1. Introduction

European Union accession process designates candidate countries to adopt EU policies and laws to achieve concerted economic integration and social cohesion with the European system. Pre-accession funds are offered as the main instruments of EU enlargement programs in the course of harmonization. Each pioneered in different policy areas in line with the priorities of the development schemes of the candidate country; those funds motivate regional development, enhance civil participation and most importantly facilitate the Europeanization of the candidate country. The major challenge of pre-accession fund schemes derives from the ability of the candidate country to utilize those financial assistance programs in order to attain the most beneficial outcomes for all of the interest groups in the society. This certainly needs the configuration of the institutional templates and administrative capacity in the context of the requirements of the EU policies as well as the right establishment of fund allocation architectures that fit with the dynamics of the candidate country.

This study aims at developing an analytical framework to assess the comparative performance and analyze the efficiency of the EU programs in the candidate countries, particularly in Turkey, in attaining the objectives of regional development policies. Such an analysis would contribute both to ascertain the absorption capacity of the regions for further EU funding and to identify the best practices in the three regional development grant schemes in Turkey, established and allocated under the pre-accession process. Comparative performance measurement approach can involve parametric or nonparametric methods. Major problem with a parametric approach is the requirement for a priori estimation of the type of method such as linear, non-linear etc. which may lead to a misspecified model. It might also get difficult to deal with multiple inputs and multiple outputs simultaneously. These problems can be overcome utilizing the non-parametric methods such as the Data Envelopment Analysis (DEA). DEA constructs an efficient boundary using the methods of linear programming and measures the distance of any unit from the boundary. It computes the relative efficiency of a unit and derives a variety of information about comparative

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performance assessment. Benchmark units that may be used as role models for other units are identified. Based on factor utilization levels of benchmark units, information is derived on the marginal rates of substitution between the factors of production of inefficient units. It thus becomes possible to know which mix of resources, scope of activities each inefficient unit may adopt to improve their performance.

The paper proceeds with a discussion of the absorption capacity analysis in the context of comparative performance analysis. The following section is about Data Envelopment Analysis with specific emphasis on the CCR Model. Section four presents the absorption capacity analysis of NUTS II regions in Turkey and discusses the results of the DEA model with respect to macroeconomic, administrative and financial dimensions of absorption capacity. The paper ends with the conclusion section.

The study contributes to the literature by introducing and implementing an analytical approach for comparative performance assessment of absorption capacities. The approach The approach may be utilized as a common pattern of efficiency analysis for the candidate countries. Implementing the adopted DEA model to the regional development grant schemes in Turkey, a coherent strategy can be proposed to improve the efficiency of the pre-accession funds for regional development in Turkey.

2. Absorption Capacity Analysis in the Context of Comparative Performance Assessment

Comparative performance assessment in the EU pre-accession process stands as one of the major areas of structural fund management. It provides decision-makers the required information about the consequences of projects, plans, policies and regulations with regard to the objectives designated to be achieved at the first hand. Therefore it could be noted that comparative performance assessment is more likely a strategic tool in the EU accession process. European Union proposes a unique system of funding for the management of the deepening of the economic integration and introduces specially designed funding schemes nearly for all of the policy areas to promote economic and social cohesion among the candidate countries. The current European system of funding is based on more rigorous systems of management, monitoring, control and evaluation. European Commission (2004), states that most of the effects of cohesion policy cannot be expressed in quantitative terms. Accordingly, beyond the net impact of policy on GDP or employment, its added value arises from other aspects like the contribution made to regional development by factors such as strategic planning, integrated development policies, partnership evaluation and the exchange of experience, know-how and the good practices between regions.

In the literature there are several studies focus on the efficiency assessment of the funds being allocated and their impact upon growth in the context of comparative performance assessment. Some econometric analyses state that funds have a negligible or even a negative impact on convergence, while others imply a significant positive impact. Related studies propose a number of different models and approaches to calculate the efficiency and the impact. The studies may be outlined under four titles; Europeanization studies, absorption capacity studies, added value studies and impact assessment studies. Even though they are categorized in accordance with their starting point whether to find out the level of Europeanization, the absorption capacity for further EU funding or to identify the added value resulting from the Community assistance, they all tend to explore the relation between the funds and their impacts on the region.

OECD defines absorption capacity as the accumulation of adequate information dissemination, capacity building in local governance and civil society for the conception and implementation of development projects (OECD, 2006). Absorption capacity leads to a strong performance of the EU funds only if the economy, efficiency and effectiveness are taken fully into account (Sumpikova et.al, 2004). Sumpikova et.al. (2004), define absorption capacity as the extent to which a state is able to fully spend the allocated financial resources from the EU. The literature on absorption capacity of the EU funds in the Candidate Countries uses the absorption classification of the EU providing three main definitions (Zerbirati 2004; Sumpikova et. al. 2004; Oprescu et.al. 2005, Georgescu, 2008).

- Macroeconomic absorption capacity, which can be defined and measured in terms of the ratio of GDP levels to Structural Funds allocated. (the upper limit for the Structural and Cohesion Funds was generally set at 4 percent of the GDP of the respective Member State)
- Administrative absorption capacity, which can be defined as the ability and skills of central, regional and local authorities to prepare acceptable plans, programs, and projects in due time, to decide on programs and projects, to arrange co-ordination among the principal partners, to cope with the vast amount of administrative and reporting work required by the Commission, and to finance and supervise implementation properly, avoiding fraud as much as possible.
- Financial absorption capacity, which means the ability to co-finance the EU-supported programs and projects, to plan and guarantee these national contributions in multi-annual budgets, and to collect these contributions from several partners (public and private), interested in a program or project.

3. Data Envelopment Analysis

Data Envelopment Analysis (DEA) is a nonparametric, deterministic performance analysis tool. DEA is a "data oriented" approach for evaluating the performance of a set of peer units called Decision Making Units (DMUs) which convert multiple inputs into multiple outputs (Cooper et al., 2000). DEA is among the highly preferred methods of performance or efficiency analysis basically due to a number of advantages over parametric methods. Unlike most other approaches like regression analysis that need a priori assumptions, DEA requires very few assumptions. It does not attempt to explain the nature of the relations between the multiple inputs and multiple outputs that belong to the analysis units.

Within DEA context, the relative efficiency of any DMU is calculated as the weighted sum of outputs to weighted sum of inputs. The efficiency of a DMU is a scalar ranging between zero and one, which is evaluated through a linear programming model. By calculating the efficiency of each DMU, DEA forms a production possibility frontier from the most efficient DMUs. DEA connects the points of efficient DMUs with each other by interpolation to form the frontier. The new lines and points on this frontier are also relatively efficient. Inefficient production is also possible and inefficient DMUs are enveloped by the production possibility frontier (Thanassoulis, 2001). A DMU is to be rated as fully (100%) efficient on the basis of available evidence if and only if the performances of other DMUs do not show that some of its inputs or outputs can be improved without worsening some of its other

inputs or outputs (Cooper et al., 2004). In other words, a DMU is efficient if and only if it is not dominated by some other DMU(s) with which it can be compared. This definition deals with the "technical" aspects of efficiency. Properties such as, economies of scale, piecewise linearity, categorical variables, ordinal relationships can also be treated through DEA.
As pointed out in Cooper et al. (2000), DEA has also been used to supply new insights into entities that have previously been evaluated by other methods. Benchmarking with DEA has identified sources of inefficiency in some of the most profitable benchmark firms and this has made it possible to identify better benchmarks in many applied studies.
DEA is used not only to evaluate the efficiency scores of each DMU and then to rank them, but also to realize improvement opportunities for the relatively inefficient DMUs. For this purpose, DEA specifies one or more efficient peers for each inefficient DMU in order to emulate their operating practices to improve performance. It also estimates the target levels of the input-output variables which the DMU should attain to operate efficiently.
It is also possible to retain extra information related to efficient units. DEA identifies the reference frequencies and weights of efficient DMUs as being role models for inefficient units. If the reference frequency and weight of an efficient DMU is high, this generally implies that it is a well performing unit because it outperforms many other units. It is most probably a better role model for less efficient units to emulate because its operating practices match them more closely than a unit that is rarely an efficient peer (Thanassoulis, 2003)".
Identification of the above mentioned functions of DEA becomes possible by solving the primal linear programming problem as well as utilizing the primal-dual relationships of linear programming models.
DEA includes a number of alternative (but related) approaches for evaluating performance. In the following section, the basic model that is also used in this study is presented in detail.

3.1 The CCR Model of Data Envelopment Analysis

The basic DEA model form, CCR is developed by Charnes, Cooper, and Rhodes (1978). According to Charnes et al. (1978), the efficiency of any DMU is calculated as the maximum of a ratio of weighted outputs to weighted inputs. The weights of virtual inputs and virtual outputs are calculated for each decision making unit by using linear programming. The objective function for the DMU that is being evaluated includes maximization of its virtual output to virtual input ratio. The accompanying n constraints impose that the virtual output to virtual input ratio of every DMU, including the unit being evaluated, must be less than or equal to one. For modeling purposes, number of units to be evaluated is taken as n. Each unit utilizes varying amounts of m different inputs to produce s different outputs. Specifically, j^{th} unit consumes x_{ij} amount of input i and produces y_{rj} amount of output r. In this case, the input matrix and the output matrix can be defined as $X = (x_{ij}) \in R^{m\times n}$ and $Y = (y_{ij}) \in R^{s\times n}$ respectively. In the following formulations, λ is a non-negative vector in R^n; the vectors $s^- \in R^m$ and $s^+ \in R^s$ indicate the input excess and output shortfall respectively.
This nonlinear programming problem of Charnes et al. (1978) is formulated as

$$\max h_0(u,v) = \frac{\sum_r u_r y_{ro}}{\sum_i v_i x_{io}}$$

subject to:

$$\frac{\sum_r u_r y_{rj}}{\sum_i v_i x_{ij}} \le 1 \qquad j = 1,....,n$$

$$u_r, v_i \ge 0 \text{ for all i and r}$$

where
h_0: maximum efficiency ratio for DMU_o.
n: number of DMUs to be analyzed
v_i: weight of input i for DMU_o
u_r: weight of output r for DMU_o
x_{io}: input value of x_i for DMU_o
y_{ro}: output value of y_r for DMU_o

The v_i and u_r are the decision variables indicating the weights assigned to each related input or output in order to reach the maximum possible efficiency score; x_{io} and y_{ro} are the observed input and output variables for the rated unit o.
As explained by Cook and Zhu (2005), the non-linear model yields infinite number of solutions. This is due to the fact that if (u*, v*) is optimal, then (αu*, αv*) is also optimal for α > 0. The non-linear formula can be converted to the equivalent linear programming problem via the transformation developed by Charnes and Cooper (1962) for linear fractional programming, which selects the solution (u, v) for which $\sum_{i=1}^{m} v_i x_{io} = 1$.
The equivalent linear programming problem is presented below. (the output and input weights are indicated as (μ, v)).

$$\text{Max } z = \sum_{r=1}^{s} \mu_r y_{ro}$$

subject to

$$\sum_{r=1}^{s} \mu_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \le 0$$
$$\sum_{i=1}^{m} v_i x_{io} = 1$$
$$\mu_r, v_i \ge 0$$

The linear programming problem is run for each DMU to determine the optimal (μ*, v*) values and the relative efficiency scores of each DMU. The linear dual model of the basic CCR model is presented below.

$$\theta^* = \min \theta$$

subject to

$$\sum_{j=1}^{n} x_{ij} \lambda_j \le \theta x_{io} \qquad i = 1,2,....m;$$

$$\sum_{j=1}^{n} y_{rj}\lambda_j \geq y_{ro} \qquad r = 1,2,....s;$$
$$\lambda_j \geq 0 \qquad j = 1,2,....n;$$

The optimal solution θ^* yields the maximum efficiency score of the rated DMU. The process is repeated for each DMU *j*. If θ^* =1, then the current input level cannot be reduced, indicating that DMU_o is on the frontier and it's efficient. Otherwise, if θ^* < 1, then DMU_o is dominated by the frontier and is not efficient. Based on the dual theorem of linear programming z* = θ* , the optimal solutions of the dual and primal problems are equal. Hence either problem may be used to obtain an efficiency score.

In DEA methodology, the efficient frontier can be estimated by using output-oriented or input-oriented models. Output-oriented models aim to increase the outputs proportionally given a certain amount of input. On the other hand, input-oriented models find out the amount that the inputs can be decreased proportionally given a certain level of output.

The DEA model presented below aims to minimize the amount of resources used for the given output level.

$$\text{Min } \; h_0(u,v) = \frac{\sum_i v_i x_{io}}{\sum_r u_r y_{ro}}$$

subject to

$$\frac{\sum_i v_i x_{io}}{\sum_r u_r y_{ro}} \leq 1\,; \quad j = 1,....,n,$$
$$u_r, v_i \geq \varepsilon > 0 \text{ for all i and r.}$$

Transformation of input oriented model to linear model along with its dual model is presented in the following pair (Cook and Zhu, 2005).

$$\min q = \sum_{i=1}^{m} v_i x_{io}$$

subject to

$$\sum_{i=1}^{m} v_i x_{ij} - \sum_{r=1}^{s} \mu_r y_{rj} \geq 0$$
$$\sum_{r=1}^{s} \mu_r y_{ro} = 1$$
$$\mu_r, v_i \geq \varepsilon > 0 \qquad \forall\, r, i$$

for which the linear dual model is defined below.

$$\max \phi + \varepsilon(\sum_{i=1}^{m} s_i^- + \sum_{r=1}^{s} s_i^+)$$

subject to

$$\sum_{j=1}^{n} x_{ij}\lambda_j + s_i^- = x_{io} \qquad i = 1,2,....,m;$$
$$\sum_{j=1}^{n} y_{ij}\lambda_j - s_i^+ = \phi y_{ro} \qquad r = 1,2,....,s;$$
$$\lambda_j \geq 0 \qquad j = 1,2,......,n.$$

4. Absorption Capacity Analysis of NUTS II Regions in Turkey

In 2002, Turkey adopted the NUTS-IBBS (The Nomenclature of territorial Units for Statistics), a system of regional statistical data collection that is used in the EU. This system provides a new regional mapping of three levels. NUTS I and NUTS II levels cover 12 regions and 26 regions respectively; whereas NUTS III level represents all of the 81 cities in Turkey.
Table 1 summarizes related information on the NUTS II regions that have already enjoyed specific regional development fund schemes. Those funds are established under the pre-accession assistance to harmonize regional development policy and practices with EU and activate local development potentials and initiatives at identified priority regions, through special regional development programs. (Pre-Accession Economic Program, 2007).
The three development fund calls cover eight regions and 27 cities in Turkey as classified in Table 1. These programs are supported by a joint monitoring system that is formed by the coordination of State Planning Organization and the Central Finance and Contracts Unit (CFCU). In this context, 1,200 projects in 8 NUTS II regions and 27 provinces are implemented (State Planning Organization, 2008). The Calls are designed under three broad priorities; improvement of infrastructure, increasing the competitiveness of SME's located in the periphery, fostering local development initiatives that serve to advance human resource and entrepreneurship. Being the first calls in Turkey along with the regional diversities resulted in varying levels of efficiencies. These first calls have turned into an experimental phase for most of the beneficiaries rather than generating direct influence on regional development. Furthermore, these calls provided the first actual data on the potential absorption capacity of the regions. With these developments, the evaluation of post call efficiencies emerged as a significant issue for analyzing the three dimensions of absorption capacity.

4.1 Discussion of DEA Model Results

Application of the DEA model requires defining the related input output variables. Literature review and data availability are the major determinants in the choice of the variables. Availability of detailed and standardized data has been a major issue since the regional development calls analyzed in this study, are among the first in Turkey. Based on the previous studies (Helvacioglu Kuyucu and Tektas, 2008), output variable is taken as the annual percentage change in the level of tax for city i, where percentage change is the percentage difference between the pre and post project periods. The variable can be justified by the fact that the development projects result in an increase in infrastructure, increase in new business opportunities, decrease in costs, and an increase in income as well as the level of tax. Input variables are the total budget allocated to the projects, number of projects, average duration of the projects and a weighted indicator of project types. Including a project-type related variable seems meaningful due to the significant structural differences among the infrastructure and development projects. The indicator reflects the strength of the project type in creating an impact on factors such as the number of potential beneficiaries, duration of the impact, geographical coverage. In this aspect, the weight of infrastructure projects is ten times the weight of development projects. The related knowledge is gathered by interviewing project coordinators and by reviewing project reports (Helvacioglu Kuyucu and Tektas, 2008)

Region/City	Population	Area (km^2)	Budget	No. of Projects	No. of Development Projects	No. of SME Projects	No. Infrastructure Projects	Average Duration	% Tax Change	Calculated DEA Efficiency Scores
TRA2										E_{avr}=0.95
Ağrı	530.879	11.499	4131913	16	3	9	3	1,00	40,07	1
Ardahan	112.721	4.968	3214088	14	5	5	4	8,50	34,44	1
Iğdır	181.866	3.588	5142957	9	1	6	4	9,82	30,29	1
Kars	312.205	10.139	4188614	17	6	5	6	10	33,77	0.81
TR72										E_{avr}=0.77
Sivas	638.464	28.567	6282743	49	22	22	5	10,04	41,89	0.82
Kayseri	1.165.088	17.109	12606459	86	40	43	4	10,19	34,63	0.65
Yozgat	492.127	14.074	4413498	20	10	8	2	10,00	33,16	0.85
TR52										E_{avr}=0.62
Karaman	226.049	8.869	7714239	39	13	21	5	9,59	19,75	0.42
Konya	1.959.082	40.813	16692522	166	28	131	7	8,83	38,42	0.81
TRB1										E_{avr}=0.78
Bingöl	251.552	8.254	5355701	23	10	7	6	8,43	45,52	1
Elazığ	541.258	9.281	6984615	33	11	17	5	9,97	29,87	0.62
Malatya	722.065	12.103	6657161	38	16	12	10	10,13	28,80	0.53
Tunceli	804.022	7.686	3198211	14	9	1	4	9,21	33,69	0.98
TRB2										E_{avr}=0.73
Bitlis	327.886	7.094	4099691	55	30	20	5	9,91	35,15	0.82
Hakkari	246.469	7.179	2714611	30	17	8	5	10,83	25,73	0.67
Muş	405.509	8.067	4580464	38	19	8	11	10,87	34,26	0.72
Van	979.671	22.984	13394514	142	82	32	28	10,92	41,51	0.70
TR82										E_{avr}=0.91
Çankırı	174.012	7.492	4713213	19	6	11	2	10,00	37,63	1
Kastamonu	360.366	13.158	6815135	47	18	21	8	9,51	38,29	0.75
Sinop	198.412	28.567	1950060	19	9	8	2	9,32	29,16	1
TR83										E_{avr}=0.79
Amasya	328.674	5.731	1170425	26	6	18	2	8,35	24,84	1
Çorum	549.828	12.796	5852773	44	9	30	5	9,62	31,28	0.67
Samsun	1.228.959	9.364	7796566	82	27	47	8	9,51	40,22	0.78
Tokat	620.722	10.073	7245120	42	17	21	4	9,93	33,90	0.72
TRA1										E_{avr}=0.87
Bayburt	76.609	3.739	4266303	26	15	3	8	9,42	38,04	0.90
Erzincan	213.538	11.728	3606552	30	10	14	6	10,13	35,83	0.88
Erzurum	784.941	25.330	3972528	62	31	31	0	9,71	33,10	0.86

Data are compiled using statistics of TUIK (Turkish Statistics Institute) and reports of regional development fund calls for pre and post call years.

Table 1. Regional Efficiency Ratings

Macroeconomic absorption capacity is analyzed in three dimensions. In the Candidate Countries, it is measured as the ratio of GDP levels to Structural Funds allocated. In general, the EU system foresees the upper limit for the Structural and Cohesion Funds as 4 percent of the GDP of the respective Member State. This principle is also being applied to Candidate Countries even though the funds allocated to the Candidate Countries usually remain significantly limited compared to the volume of the funds provided to the Member States. In order to evaluate the macroeconomic absorption capacity in Turkey, one of the two regional development funding mechanisms of the EU might be considered. The first alternative is to use the total value of the EU funds distributed under the regional development fund schemes for the period 2005-2007, which amounts to € 263 million. Applying this approach, it is seen that the regional development fund schemes reach only 0.06 % of the GDP of Turkey as of 2007. The second alternative is to use the IPA (Instrument for Pre-Accession) financial assistance program's annual strand for regional development which is € 167.5 million as the absorption capacity in 2007. This would only equal to 0.04 % of GDP. Both of the approaches, clearly show that the macroeconomic absorption capacity in Turkey bears great potential as the available funds are very limited, even negligible when compared to the EU average. The two major reasons for this may be explained as the novelty and the limited amount of the funds allocated to the regional development in Turkey. On the other hand, operating structures have been designated for the Regional Development of IPA in 2008. This would mean that the structural and cohesion funds are expected to have greater budgets in the near future.

Administrative absorption capacity includes management, planning and coordination ability and skills of central, regional and local authorities. The cities with higher administrative capability can successfully manage the information flow, training programs and local networking of potential partners which in turn lead to formation of more functional and effective project teams with higher project management skills.
In analysis of the DEA model results in terms of the administrative capacities of cities, the emphasis should be given to efficient cities. Within DEA context, efficient cities which form benchmarks (references) to remaining inefficient ones deserve special attention. Table 2 presents the efficient cities along with their reference frequencies and their average weights on the suggested improvements of the inefficient cities that take them as reference.

City	Reference frequency to other cities	Average impact on the efficiency score
Bingol	17	0.556
Agrı	9	0.302
Amasya	7	0.353
Ardahan	4	0.431
Cankırı	2	0.278
Sinop	1	0.006
Igdır	0	0.000

Table 2. Reference frequencies and weights of efficient cities

Bingol emerges as the city with the highest reference frequency as well as weight, followed by Agri and Amasya. Bingol and Agri benefit from the highest annual percentage change in tax which may be a crucial factor in their high efficiency score and their selection as reference cities. On the other hand, Amasya is a noteworthy reference city despite its relatively low percentage change in tax value. Amasya is the only efficient city in its region while others have lower than average efficiency scores. Amasya is actually a high level benchmark within the region which makes the remaining cities relatively less efficient. Amasya owns the first development office in Turkey which is established in compliance with the Yeşilırmak Development Plan; the first regional development strategy paper ever designed parallel to the EU schemes. This scheme foresees higher allocation of government funds to the regional actors such as municipalities, NGOs and related institutions. The technical assistance provided by an English technical consultant group has also increased the regional development agency's level of expertise on project development and management. Furthermore, Yeşilırmak Project has a significant impact on the objectives of this region's call which create a perfect balance between the Call's and Amasya's objectives. This fact emerges as another reason for Amasya's efficiency level.

Financial absorption capacity. The average budget allocation and the contribution of the partners to the budget under the additionality principle present a general outlook for the financial absorption capacity. Table 3 presents the contribution of budget and other variables to the efficiency scores. The DEA analysis shows that total budget allocated to the regional development projects at each city emerges as a significant variable in determining the efficiency scores. In 14 of the 27 cities, the average weight of budget on the efficiency score is found as 49%. Analyses further depict that in 5 of the 7 efficient cities, budget stands as the most significant variable affecting the efficiency scores. In those 5 cities with the highest efficiency scores, the average weight of budget on the efficiency score attained is quite significant with 42%. This may be due to the high importance of the budget in the achievement of efficient regional development programs. In most of the cities classified under the grant schemes, budget is considered as the lacking element of novel and tailor-made regional development projects. Once the budget is guaranteed the local administrations have become much more capable of undertaking projects that serve to regional priorities. Parallel to this finding, in the cities where the budget does not have a weight on the efficiency score, the weight is replaced by the variable that shows average project duration at each city. This shift can be explained under the scope of administrative absorption capacity. The cities with higher administrative capability have better managed the information flow, training programs and formed a local network of potential partners which lead to the establishment of more functional and effective project teams with higher project management skills. It is observed that annual percentage change in tax level influences the average weight of total budget allocated to the regional development projects at each city on the efficiency score. The annual percentage change in tax level varies between 42% and 20% for the cities in the sample set. In the three cities with the highest percentage increase (>40%); Sivas, Bingol and Van, the budget has no weight on the efficiency score. Among the eight cities which have an increase greater than 37.5%, efficiency scores of only two cities are influenced by the budget. These results support the fact that the cities with higher tax revenues are less dependent on the project budget and rely on administrative absorption capacity rather than financial absorption capacity.

Region/City	Efficiency	Contribution of each input variable to the efficiency score			
CALL 1		Budget	Number	Duration	TI Impact
TRA2	**E_{avg} = 0.95**				
Agrı	1	0.48	0.52		
Ardahan	1	0.68	0.32		
Igdır	1	0.07	0.93		
Kars	0.81	0.28	0.24	0.48	
TR72	**E_{avg} = 0.88**				
Sivas	0.82			0.63	0.37
Kayseri	0.65			0.61	0.39
Yozgat	0.85	0.39		0.11	0.50
TR52	**E_{avg} = 0.62**				
Karaman	0.42			0.65	0.35
Konya	0.81			1	
TRB1	**E_{avg} = 0.78**				
Bingoöl	1		0.55	0.45	0
Elazıgğ	0.62			0.67	0.33
Malatya	0.53			1	
Tunceli	0.98	0.67	0.33		
CALL 2					
TRB2	**E_{avg} = 0.73**				
Bitlis	0.82	0.47		0.53	
Hakkari	0.67	0.35	0.06	0.59	
Muş	0.72	0.47		0.53	
Van	0.70			1	
CALL 3					
TR82	**E_{avg} = 0.91**				
Cankırı	1			0.69	0.31
Kastamonu	0.75			1	
Sinop	1	0.67	0.33		
TR83	**E_{avg} = 0.79**				
Amasya	1	1			
Corum	0.67			0.67	0.33
Samsun	0.78			1	
Tokat	0.72			0.68	0.32
TRA1	**E_{avg} = 0.86**				
Bayburt	0.90	0.50	0.04	0.46	
Erzincan	0.88	0.43		0.57	
Erzurum	0.86	0.35		0.11	0.54

Table 3. Contribution of each input variable to the efficiency score (vi * xi)

5. Conclusion

The study focuses on the comparative performance evaluation of EU pre-accession funds from the point of absorption capacity. The absorption capacity concept is undertaken in three major dimensions; namely, macroeconomic, administrative and financial. Relating to this objective, an analytical approach is proposed utilizing the data envelopment analysis. The method is implemented on the NUTS II regions in Turkey that have already enjoyed specific regional development fund schemes. The analysis covers 1,200 projects in 8 NUTS II regions and 27 provinces in Turkey.

Research results depict that the macroeconomic absorption capacity in Turkey bears great potential due to the fact that the available funds are very limited, even negligible when compared to the EU average. The analysis results pertaining to the administrative capacities of cities cite significant differences. The administrations that have provided strategies to integrate with the EU funding mechanisms and that have created special networks for partnership and knowledge flow achieved a critical competitive edge and benefited more form the EU harmonization process. The DEA results show that total budget allocated to the regional development projects at each city emerges as a significant variable in determining the performance levels and financial absorption capacity remains as the key factor for the cities where the administrative absorption capacity is weak. It is noteworthy that all these funding schemes are very new in Turkey and the regional development programs used in this study form the very first examples of EU model funding.

The study contributes to the literature by introducing and implementing an analytical approach for comparing the performance of EU pre-accession funds in terms of the absorption capacities. The approach may be utilized as a common pattern of efficiency analysis for the candidate countries. Implementing the adopted DEA model to the regional development grant schemes, a coherent strategy can be proposed to improve the efficiency of the pre-accession funds for regional development in Turkey. Further research could be possible by integrating the EU-originated cohesion funds which would be available in Turkey in the near future along with the recently approved national regional development state aid system.

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