Municipal Efficiency and Economies of Scale in Bosnia and Herzegovina

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Abstract This study estimates municipal efficiency and economies of scale of municipalities in Bosnia and Herzegovina by employing data envelopment analysis (DEA) with variable (VRS) and constant (CRS) returns to scale. The results indicate low overall municipal efficiency, with economies of scale reached in very few municipalities. The average municipal efficiency score is 0.7115 under DEA VRS assumption, where only 16% of municipalities are found efficient. The average scale efficiency is 0.7458 with full scale efficiency reached by only 11% of municipalities in Bosnia and Herzegovina. Furthermore, the analysis shows strong positive impact of number of inhabitants on overall municipal efficiency. Politically motivated fragmentation of municipalities, aiming to bring peace and stability to the country, did not go hand in hand with improved economic efficiency.

Keywords: • municipal efficiency • economies of scale • data envelopment analysis • Bosnia and Herzegovina

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1   Introduction

Moving provision of public services as close as possible to the citizens' becomes imperative of modern government. Subsidiarity principle i.e. moving government as close as possible to citizens, has been embedded in administrative and political system of the European Union countries. Finding the right balance between decentralisation benefits and expenditures becomes a major challenge for national governments. Globalisation effects and open borders require discipline of national governments in ensuring attractive business environment, sustainable economy and wellbeing for their citizens. While centralisation represents a concept where public decision making is concentrated at national level, decentralisation refers to transfer of powers and responsibility for public services provision, from central to sub-national government(s) or other entities. While different authors recognize a number of decentralization types, the wide agreement is reached about three major types of decentralization: political, administrative and fiscal. Political decentralization aims to increase democratization and participation of citizens in public decision making process, administrative decentralisation is the way of redistributing responsibility and power between different tiers of government, while fiscal decentralisation refers to granting sub-national government authority and power to allocate the expenditures and/or revenues.

The motives for decentralization are different and include democratization, improving quality of public services, increasing cost efficiency, securing stability etc. Besides classical theory of decentralisation which assumes symmetry, there are also forms of asymmetric decentralization. Although asymmetric decentralisation concept is strongly criticized for inefficiency, in some cases it is the only solution to preserve stability and/or integrity of the country.

The major challenge in reaching efficiency of decentralisation is resolving relations between national and subnational government units. Ideally, efficiency framework should keep separate regulation, policy making and service delivery. Mixing these three functions results in blurred responsibility and decreased accountability on both sides: national and subnational government. Decentralisation system shall result in clear separation of powers between tiers of government (jurisdictional decentralisation) as well as separation of powers between government and service provider (functional decentralisation). Such process is complex by itself and if we add the asymmetric solutions it becomes even more complex, but if carefully designed it may be very effective and efficient.

Well-designed decentralization system may result in a number of advantages over centralized system, but at the other end may have adverse effects if not customized to specific country needs. Some of the most common unwanted results of decentralisation are: new charges by local communities, fragmentation of internal

markets, increased corruption, cross subsidizing through central government allocation formulas, increased complexity of tax reforms, conflict of decentralisation and macroeconomic policy, and increased public employment.

There are no specific guidelines or benchmarks for decentralisation design, but certain patterns may be observed in terms of finding the right balance of costs and benefits of chosen territorial and administrative set up. Tolerance towards scale inefficiencies due to the non-economic requirements is not unknown in decentralisation processes worldwide, but the balance between cost inefficiencies and non-economic benefits has to be established.

The ability of municipalities to reach efficiency is constrained by the number of factors which are beyond their control and this has to be taken into consideration when interpreting results and estimating the efficiency in Bosnia and Herzegovina (BiH). Dayton Peace Agreement (DPA) introduced a State level, two entities, namely Federation of Bosnia and Herzegovina (FBiH) and Republika Srpska (RS), and one district – District Brčko. Furthermore, FBiH is consisted of 10 Cantons and these Cantons have in total 79 municipalities, while RS has no Cantons, but is consisted of 64 municipalities. State, Entity, district and Cantonal level have their own Governments and bi-cameral Parliaments (House of Representatives and House of People), which results in 14 Governments in total. At municipality level, by DPA the number of municipalities increased by 33 (from 106 to 141), majority of them being very small by the number of inhabitants and the size of territory. Therefore, municipal efficiency estimation in BiH shall be analysed by taking into consideration constraints related to the small size of BiH municipalities and fragmented services provision. In principle, small jurisdictions are lacking funds, institutional and managerial competence to perform assigned duties and therefore the quality of public services provided is rather low with a tendency of deepening economic development gap between municipalities.

Efficiency of municipalities is a subject of many research studies which have examined impact of different determinants such as social, economic, political, demographic, geographic, ethnic etc. But basic constraint to efficiency is related to population size in municipality, which was further fragmented by DPA. Current political distribution of power does not provide optimism that a consensus on country restructuring will be reached and concepts of establishing economic, cross-entity regions, even strongly pushed by the EU projects have failed. Also, there are very few studies in this field for transition countries, which is a disadvantage in terms of using previous experiences, but on the other side, it provides significant added value for this study, which is one of the very few studies in transition countries and to our best knowledge the first in BiH.

The objective of this paper is to estimate municipal efficiency of 141 municipalities from both BiH entities, FBiH and RS, in order to evaluate potential for savings in budgetary expenditures. In addition to static efficiency, scale efficiency is established, which implies saving potential that could be attained in BiH municipalities by moving closer to the optimal size. Based on the results valuable policy implications and recommendations can be derived.

The paper is organised as follows. Section 2 provides literature review on municipal efficiency. Section 3 presents model specification and the methodology, including data selection and description. Section 4 presents results of the efficiency analysis and finally Section 5 summarizes the main findings.

2   Literature review on municipal efficiency

There is a number of studies which have empirically confirmed that decentralisation had a positive effect on efficiency (Barankay and Lockwood, 2007; Balaguer-Coll et al. 2007). The reasons are found within increased electoral control, yardstick competition and lower vulnerability to corruption (Seabright, 1996; Hindriks and Lockwood, 2009; Fan et al, 2009). At the other side local governments are not more efficient than central government if they lack managerial capability, if public services provision requires economy to scale, if local governments are highly influenced by local interest groups and if local governments are highly dependent on central government transfers (Prud'homme, 1995; Rodden, 2003).

To address disparity problems associated to decentralisation, a number of authors suggest asymmetric decentralisation (Ahmad et al., 2005; Litvack et al, 1998). Such concept would assume different levels of decentralisation by different sub-national units, depending on effective demand and needs of local community, as well as institutional capacity to accept responsibilities. Although it would address major challenges of decentralisation, in practice, it is very hard to implement such concept due to capability of many central governments to effectively apply asymmetric solutions.

Efficiency is an important characteristic of performance and refers to the quality or degree of producing a set of desired effects. The efficiency is reached if behavioural objectives are achieved and measurement is done by comparing any given result with an optimal result in terms of quantities (inputs and outputs) or values (cost, revenue or profit). Such comparison may take a form of ratio between reached to maximum output possible with given inputs, or ratio of minimal potential of required input to produce given output (Lovell, 1993).

Total efficiency measure may be decomposed to technical and allocative efficiency. Technical efficiency refers to the ability to reach maximal output from

the minimum quantity of inputs, while allocative efficiency refers to ability to use the inputs in optimal proportions (Farrell, 1957). The efficiencies may take a value between 0 and 1, having 1 as a measure of full efficiency and may be focused on revenue (input efficiency) or expenditure side (output efficiency). Also, the efficiency concept has to be considered taking into consideration the scale of operation that may not be always optimal i.e. may be too small or too large.

In measuring efficiency in public sector two major avenues may be explored: individual services/institutions/agencies and overall performance of certain level of government. In discussing efficiency measurement of local communities the starting point should be a basic rule of efficiency: ensuring a maximum output with given level of inputs (Koopmans, 1951; Lovell, 1993). It means that if one community may transform given inputs in certain output, than other communities shall be able to do the same or in case they do not, than we talk on (in)efficiency. In practice, it is not so simple and the major challenges are recognized in the area of input and output choices as well as methodological approach to define "efficiency" and its deviations. Efficiency of the government Decision Making Units (DMU) is influenced not only by the technical efficiency of DMU, but also by the heterogeneity and exogenous (environmental) factors not under the control of the DMU.

The major factors influencing efficiency and local accountability include spatial externalities, economies to scale, overall fiscal efficiency, regional equity and redistributive responsibilities of the government (Allen and Tommasi, 2001). Therefore effectiveness and efficiency of decentralization have to be measured by closeness to the optimal solutions whereby public provision of goods and services is provided through smooth mechanism of intergovernmental collaboration which is most beneficial to the citizens (Lane, 2000).

In general, findings of studies related to the overall municipal efficiency estimation are rather mixed, and it is hard to recognize patterns and universal determinants of (in)efficiency. The findings rather have confirmed that national specifics have high impact on efficiency scoring while selection of inputs have significant influence on efficiency score. Also, smaller local communities with homogeneous population are better positioned to serve preferences of its inhabitants. However, too small jurisdictions are facing lack of fiscal base, cannot exploit economy to scale, and often are exposed to lack of managerial competence and experience among the staff (Mill, 1861; Musgrave, 1959; Oates, 1972; Tullock, 1969).

This chapter aims to provide a framework for setting up research relevant for BiH context and for this purpose relevant studies on overall municipal efficiency in European countries have been selected and desk review conducted for 35 studies

presented in Table 1. The selection includes all available studies for transition economies in Europe (Czech Republic, FYR Macedonia, Serbia, Turkey), as well as relevant studies on developed European countries (Belgium, Finland, France, Germany. Greece, Italy, Portugal, Spain, Slovenia).

Table 1:   Overview of municipal efficiency studies

Country	Authors
Belgium	De Borger et al. (1994), De Borger and Kerstens (1996), Coffe and Geys (2005), Geys (2006), Geys and Moesen (2009), Ashworth et al (2014)
Czech Republic	Stasna and Gregor (2011), Stasna and Gregor (2015)
Finland	Loikkanen and Susiluoto (2005), Loikkanen et al. (2011)
France	Nieswand and Seiferd (2011)
FYR Macedonia	Nikolov and Hrovatin (2013)
Germany	Geys et al. (2013), Kalb (2012) Bischoff et al. (2013)
Greece	Athanassopoulos and Triantis (1998), Doumpos and Cohen (2014)
Italy	Boetti et al. (2012), Lo Storto (2013), Carosi et al. (2014), Agasisti et al. (2015), Lo Storto (2016)
Portugal	Afonso and Fernandes (2008), Da Cruz and Marques (2014), Cordero et al. (2016)
Serbia	Radulović and Dragutinović (2015)
Spain	Bosch-Roca et al. (2012), Benito et al. (2010), Cuadrado-Ballesteros et al. (2013), Zafra-Gomez and Muniz-Perez (2010), Balaguer-Coll et al. (2013), Perez-Lopez et al. (2015)
Slovenia	Pevcin (2014a), Pevcin (2014b)
Turkey	Kutlar and Bakirci (2012)

Source: own compilation

In estimating overall municipal efficiency, authors most often use Data Envelopment Analysis (DEA), than Stochastic Frontier Analysis (SFA) and in few cases Free Disposal Hull (FDH). The results of these studies are expressed by mean efficiency, and for some studies range is presented as values vary depending on output specifications. It may be observed that in some countries range is quite huge which means that selection of outputs have significant impact on efficiency estimation score. The highest range may be observed in case of Czech Republic (0.49), Portugal (0.46), Spain (0.37), Greece (0.35) and Turkey (0.33).

The common measure of input for efficiency estimation is either total or current budget expenditure. In several studies, in addition to total or current expenditure, personal, capital and financial expenditures are used as input variable as well (De Borger et.al, 1994; Bishoff et al., 2013; Da Cruz and Marques, 2014). There is only one study where own revenues were used as single input variable (Doumpos and Cohen, 2014). In terms of output data most used ones are: number of grant beneficiaries, number of pupils in primary schools, population, share of old people and length of roads. A number of studies also used public recreational facilities, cultural facilities, waste collection, street lightening, number of kindergartens and number of pupils in secondary school. Sample size varies from 74 municipalities analysed in FYR Macedonia (Nikolov and Hrovatin, 2013) to 2.017 municipalities analysed in Greece (Doumpos and Cohen, 2014). Majority of studies have been done in two stages which include municipal efficiency estimation at the first stage mainly employing DEA and/or SFA and second stage estimation which analyse determinants of (in)efficiency.

3   Methods and data

In general, efficiency estimation may be done by using deterministic approaches which interpret whole deviation from best practice frontier as inefficiency and stochastic frontier models to provide decomposition of deviation into inefficiency and a stochastic term (Deprins and Simar, 1983). Based on the assumed distribution, the methodology used in municipal efficiency estimation could be broadly divided into parametric (SFA) and non parametric methods (DEA, FDH). Parametric methods are used where assumed distribution is normal and assumed variance is homogenous, while non-parametric methods may be applied to any assumed distribution and any assumed variance. By definition parametric methods establish best practice frontier against which deviations may be measured, while in non-parametric approach the best practice frontier is generated by tight data enveloping.

Non parametric methods have a number of advantages over parametric ones and therefore are most used methods in analysis of municipal efficiency. The major advantages of nonparametric methods in comparison to parametric are greater flexibility (no need for any specification of functional form of the frontier in advance), less-restrictive assumptions and possibility of handling multiple inputs and multiple outputs in a simple way over parametric methods (Ruggiero, 2007). At the other side non-parametric methods have also disadvantages over parametric ones including deterministic nature in interpreting all deviations from the frontier as inefficiency without allowing for statistical noise, difficulties in making statistical inference and sensitivity to outliers.

Estimation of municipal efficiency by using DEA has a number of advantages over using other methods. Besides its rather technical nature, FDH is establishing

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a frontier and distance to the frontier as a measure of (in)efficiency, based on fixed level of input, which in case of municipality efficiency in BiH is not the best measure. The huge differences between municipalities and asymmetric decentralisation do not allow such, relatively simplified approach. Unlike to SFA, as non-parametric method, DEA allows considerable variation of inputs and outputs specification as well as development and formulation of different forms of relations between inputs and outputs. At the other side, the disadvantage of DEA is that it does not accommodate statistical noise as SFA. By applying DEA the entire deviation from the frontier is estimated as inefficiency without accommodation of environmental heterogeneity influence. In general, it may lead to understatement or overstatement of the efficiency level. However, in case of BiH, there is high level of dependency on upper government transfers based on standardized criteria, so this risk is reduced.

3.1 Data Envelopment Analysis - DEA

DEA is a linear programming technique by which frontier over observed data is constructed and efficiency is calculated relative to the frontier and to competing DMUs by using selected inputs and outputs. Calculation is done for each DMU and efficiency estimated by comparing DMU performance with the performance of best practice DMU or efficient frontier which is assigned an efficiency score of 1. All technological possibilities of converting inputs into outputs available to DMU represent feasible production set. The efficient DMUs are on the boundary of such feasible production set and inefficient DMUs are those that have production set within the interior of this production set.

Originally, DEA was developed by Charnes, Cooper and Rhodes in 1978 with constant return to scale (CRS). Few years later, in 1984, Banker, Charnes and Cooper developed the model further by including concept of variable return to scale (VRS). Under VRS assumption DMU may have increasing or decreasing returns to scale. Increasing returns to scale imply that the DMU can gain efficiency by increasing production volume, while opposite holds for decreasing returns to scale.

For the purpose of analysis in this study the central method used is DEA and both, CRS and VRS have been calculated for individual DMUs which enables further analysis, including scale efficiency calculation.

3.1.1 Constant returns to scale - CRS

CRS DEA model is under the assumption that DMUs are operating at optimal scale and allows for estimation of overall technical efficiency without variations in returns to scale. Introducing the duality in linear programing, an envelopment form of the problem may be derived allowing for determination of linear

combination that minimizes the value of scalar θ. Scalar θ represents the minimum level to which use of inputs can be reduced without effect on output, and therefore scalar θ provides the value of the technical efficiency score (TE_{CRS}) for DMU ($i = 1, \ldots, N$).

$$TE_{crs} = \min_{\theta\lambda} \theta$$
$$\text{subject to } -q_i + Q\lambda \geq 0$$
$$\theta x_i - X\lambda \geq 0$$
$$\lambda \geq 0$$

By this equation two constraints were introduced. The first constraint refers to the same level of outputs (q_i) whereby we identify group that for each DMU analysed yields at least the same level of output. The second constraint is that DMUs are consuming just a proportion θ of each input (x_i) used by DMU. If $\theta=1$, DMU is efficient and all inputs cannot be reduced at the same time, although variation of use may improve efficiency. The multipliers for the input level for DMUs not located at the frontier, represent the weights related to the vector of constraints (λ is a Nx1 vector). The value θ must be calculated for each DMU and linear programming problem must be solved N times, for each DMU in the sample. In resolving the problem DMU is taken and the input vector x_i is radially contracted as much as possible within the feasible input set to produce projected points $X\lambda$ and $Q\lambda$. All DMUs in the sample are observed points which create piece-wise linear isoquant and introduced constraints ensure that projected points are kept within feasible set. Under CRS DEA production set is closed and convex and exhibits strong disposability (Coelli et al., 2005; Fare et al., 1994).

3.1.2 Variable returns to scale - VRS

CRS assumption is to be applied when DMUs are operating at optimal scale, while in practice, it is often not the case. DEA VRS specification results in measures of technical efficiency that are confounded by scale efficiencies. The model specification for DEA VRS requires modification of DEA CRS model by adding the convexity constraint $I1'\lambda=1$ and the envelopment form of VRS DEA model is as follows:

$$TE_{vrs} = \min_{\theta\lambda} \theta$$
$$\text{subject to } -q_i + Q\lambda \geq 0$$
$$\theta x_i - X\lambda \geq 0$$
$$I1'\lambda = 1$$
$$\lambda \geq 0$$

At this equation θ is the input technical efficiency score under VRS (TE_{VRS}) with possible value at the scale between 0 and 1. If $\theta=1$, than DMU is on the frontier and vector λ is an Ix1 vector of weights defining the linear combination of the peers. VRS DEA model allows greater flexibility in comparison to CRS DEA model and envelops data in a tighter way, so technical efficiency scores obtained

by DEA VRS model are greater than or equal to the ones obtained for same DMUs under DEA CRS model (Coelli et al., 2005; Afriat, 1972; Fare et al, 1985; Banker et al, 1984).

The convexity constraint introduced in DEA VRS model ensures benchmarking of inefficient DMUs of similar size and projected point on DEA frontier is a convex combination of observed DMUs. In DEA CRS, DMUs may be benchmarked against DMUs of significantly different size.

3.1.3 Scale efficiency

Calculation of efficiency estimation under DEA CRS and DEA VRS for DMUs in observed sample allows measuring scale efficiency of DMUs. DEA VRS scores may be greater than or equal to DEA CRS. In case when DEA CRS score is not equal to DEA VRS score it indicates that DMU has scale inefficiency (Balk, 2001). The scale inefficiency means that DMU does not operate at optimal scale and is calculated as the ratio between DEA CRS and DEA VRS score:

$$SE = TE_{crs}/TE_{vrs}$$

This allows for decomposition of DEA CRS efficiency score into pure technical efficiency (TE_{vrs}) and scale efficiency influence i.e. $TE_{crs} = TE_{vrs} \times SE$. When the value of SE=1 it implies scale efficiency.

3.2 Data selection

Taking into consideration that statistical data are collected at entity level, as well as for district Brcko, respective Statistical Agencies have developed their own systems and methodologies, that are not always aligned and comparable between different entities. Therefore, the selection of data and the choice of efficiency determinants was limited to the data collected under the same methodology.

There is very limited literature and studies available on overall municipal efficiency and in particular, there are very few studies on transition countries in the Western Balkan region. For the purpose of this study 35 studies in European countries have been reviewed from the point of methodology used, in particular inputs and outputs used for estimation of overall municipal efficiency. The analysis resulted in identification of the most commonly used input being budget expenditure, while on the outputs side the ten most frequently used are: Population, Length of roads, Number of grant beneficiaries, Number of pupils at primary school, Population older than 65 years, Size of public recreational facilities, Quality of services, Tonnes of waste collected, Cultural facilities and Basic health care. These outputs are further evaluated from the point of relevance to the BiH context having in mind specific administrative set up and municipality jurisdictions. The fact that there is a difference between municipality jurisdictions in FBiH and RS also has to be taken into consideration. The common jurisdictions are found in the areas of primary school, roads maintenance and basic

health care as well as in general services to citizens. Therefore, finally the
following input and outputs are selected:
Input variable (I):
I1: Total budget expenditure – proxy for all inputs
Output variables (O):
O1: Population – proxy for overall administrative services to citizens
O2: Number of pupils in primary school – proxy for educational services
O3: Length of roads in kilometres – proxy for quality of transport service
O4: Number of doctors – proxy for health care services

Unit of analysis is municipality or Decision Making Unit (DMU) and data are
collected for 141 municipalities using the official sources such as Statistical
yearbooks of FBiH and RS 2015 and published results of latest two censuses in
BiH: 2013 and 1991 census. Having in mind special status given to district Brcko,
this municipality has been excluded from the analysis. For the purpose of this
analysis the fact that some municipalities have a status of "city" was not taken as
relevant if these "cities" are consisted out of only one municipality.

The rationale for choosing total budget expenditures as an input is based on the
fact that in BiH difference between current and total expenditures is relatively
small due to high dependency on transfers and limited borrowing capacity.
Inclusion of capital expenditures in estimation of municipal efficiency shows
municipality's capacity to either borrow or manage access to grant funds, which is
a result of an extra effort and capability of municipal staff to improve citizen's
wellbeing and municipal infrastructure. Total budget expenditure significantly
varies: from 233.226 BAM in Istočni Mostar to almost 95 milion BAM in Banja
Luka. There are 2 municipalities without pupils in primary school (Istočni Drvar
and Istočni Mostar), 4 municipalities without asphalt roads (Istočni Drvar, Istočni
Mostar, Petrovac and Petrovo) and 8 municipalities without doctors (Bosansko
Grahovo, Dobretići, Donji Žabar, Istočni Mostar, Jezero, Kupres-RS, Osmaci,
Pelagićevo and Vukosavlje).

DEA input and outputs descriptive statistics presented in Table 2 show significant
variation among municipalities for all inputs and outputs.

Table 2: DEA input and outputs descriptive statistics

Variable	Mean	St.dev	Min	Max
I1: Total budget expenditures (in BAM)	8.636.879	10.951.852	233.226	94.964.650
O1: Population	26.232	29.531	109	199.191
O2: Number of pupils in primary school	2.093	2.381	0	15.651
O3: Length of roads in kilometres	61	46	0	250
O4: Number of doctors	43	105	0	844

Source: own calculation

Population represents number of inhabitants in municipality and is based on the
latest census (2013). The smallest municipality by population is Istocni Drvar with
only 109 inhabitants, while the largest municipality in BiH is Banja Luka with
almost 200,000 people. Length of roads refers to the length of asphalt roads in
municipality and it is used as a proxy for quality of transportation. Number of kids
at primary school is used as a proxy for provision of educational services. Similar
to the health care, secondary schools and faculties are in principle at
Cantonal/Regional level, while municipalities are in charge for primary education.
Number of doctors represents number of doctors working in a municipality and
providing services to municipal citizens. This variable is used as a proxy for
quality of the health care. Although the health care is organised on
Cantonal/regional level, primary care is still provided at municipal level through
family medicine concept.

4   Results

The scoring of BiH municipalities has been done for 141 municipalities applying
DEA-VRS assumption. Out of total number of municipalities in BiH, only
municipality Brčko has been excluded from the analysis due to specific status and
priority in budget transfers. The calculation has been done under both VRS and
CRS assumption. CRS DEA model is under the assumption that DMUs are
operating at optimal scale and allows for estimation of overall efficiency without
variations in returns to scale, which is enabled under DEA VRS model. Having in
mind huge differences in size of BiH municipality, overall efficiency under VRS
is better measure of municipal efficiency in BiH, while scoring under CRS
assumption is done to enable scale efficiency calculation. Descriptive statistics of
municipal efficiency estimation under VRS and CRS assumption as well as scale
efficiency are presented in Table 3.

Table 3: Descriptive statistics of DEA overall and scale efficiency

	Overall efficiency VRS	Overall efficiency CRS	Scale efficiency
Mean	0.71153	0.53978	**0.74579**
Median	0.72988	0.52324	**0.78749**
Standard Deviation	0.20816	0.25059	**0.21104**
Minimum	0.09511	0.05893	**0.14263**
Maximum	1.00000	1.00000	**1.00000**
Count	141	141	**141**

Source: own calculation

According to DEA-VRS scoring, on average, municipalities in BiH have low
efficiency (0.71153), which means that with the same level of input outputs may
be increased by almost 30%. About one half of total municipalities (49%) have
efficiency score lower than the average and the lowest efficiency score is below
10% (municipality Istočni Stari Grad). As presented in Figure 1, only 23 or 16%
of municipalities in BiH are efficient while 13% of municipalities exhibit relative
efficiency. Remaining 71% of municipalities are inefficient and are almost equally
distributed in three groups: moderately inefficient (25%), considerably inefficient
(23%) and extremely inefficient (23%).

**Figure 1:** DEA-VRS overall efficiency of BiH municipalities
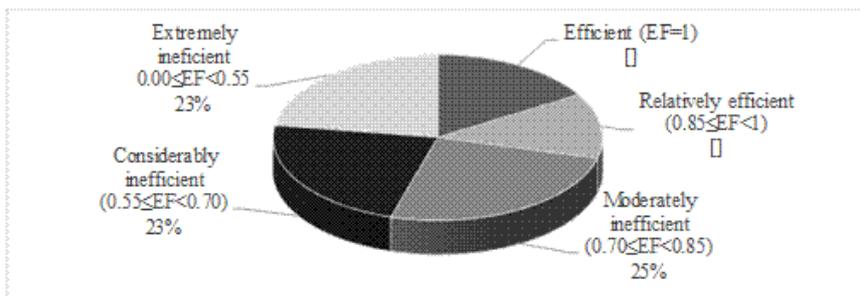
Source: own calculation

A unit is considered to be scale efficient when having optimal size of operations
and any modification of the size will make the unit less efficient. Full scale
efficiency i.e. when SE is equal to 1 is reached when unit is found efficient under
both assumptions, CRS and VRS.

The average scale efficiency reached by BiH municipalities is 74.5% and ranges
from only 14% to 100%. As presented in Figure 2, only 15 or 11% of
municipalities managed to use full advantages of economies to scale. Further 25%
exhibit relative scale efficiency, while remaining 64% of municipalities exhibit
moderate to extreme scale inefficiency. Among scale inefficient municipalities,
only 15 municipalities, or 13% of total exhibit decreasing return, while 87% of
municipalities operate at suboptimal scale i.e. have increasing returns to scale.

Figure 2: Scale efficiency of BiH municipalities
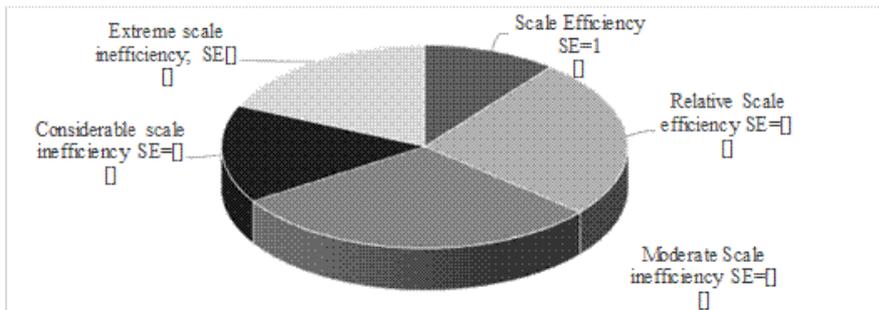
Source: own calculation

The results of efficiency estimation and scale efficiency calculation are further
analysed taking into consideration population size as a precondition to reach
optimal scale in provision of municipal services.

Out of 141 municipalities observed, almost two thirds, 93 in total, have less
inhabitants than the BiH average. Also, about 30% of municipalities have less than
10.000 inhabitants. As discussed earlier the purpose of creation of 33 new
municipalities under DPA was to preserve stability and accommodate interests of
ethnic groups. These new municipalities are very small by population size (on
average 5.800 inhabitants) and are highly dependent on transfers from upper
government levels (half of them show dependency rate of 80% or higher). These
33 municipalities account for only 3% of total BiH population, but their creation
has significantly affected overall efficiency as vast majority of them (82%) are
inefficient. In this regard, the rest of municipalities and respectively citizens have
paid quite a high price in terms of efficiency gains and inability to reach
economies of scale due to fragmented administration.

The average efficiency calculated based on the population of the municipalities in
Table 4 shows strong impact of the number of inhabitants on overall efficiency.

Table 4: Breakdown of efficiency scores by population size

Population	<5,000	5,000 - 15,000	15,000 - 30,000	30,000 - 45,000	>45,000	TOTAL
Number of municipalities	**24**	**38**	**40**	**18**	**21**	**141**
Overall efficiency VRS						
Number of efficient municipalities	1	3	4	3	12	**23**
% efficient	4%	8%	10%	17%	57%	**16%**
Average efficiency	0.59097	0.66735	0.68792	0.78832	0.90842	**0.71153**
Scale efficiency						
Number of efficient municipalities	1	1	2	2	9	**15**
% efficient	4%	3%	5%	11%	43%	**11%**
Average efficiency	0.67799	0.62482	0.76258	0.80000	0.91843	**0.74579**

Source: own calculation

Under DEA-VRS assumption, small municipalities, with population less than 5,000 have only 4% of efficient municipalities, while this percentage in municipalities with over 45,000 inhabitants is 57%. Among municipalities with less than 5,000 inhabitants, there is only one efficient municipality – Bosansko Grahovo. The average cost efficiency of municipalities with more than 45,000 inhabitants is as high as 0.90842, showing that these municipalities, on average may increase their outputs by 10% to reach full efficiency. Looking at the averages, small municipalities, with population less than 5,000 may improve its performance significantly and increase outputs by 40% with the same level of input (total budget expenditure).

The scale efficiency scores show that almost half of large municipalities reached scale efficiency as well, while only 1 small municipality reached scale efficiency. Therefore, decentralisation did not contribute to the citizens' well-being, neither have set up the framework for efficiency at municipal level. In current administrative set up more than half of population lives in 25 largest municipalities, while other half is dispersed over remaining 116 municipalities. Only about 8% of total population in BiH lives in the smallest 50 municipalities, while 10 largest municipalities account for 30% of total number of inhabitants in BiH.

5   Conclusions

More than half of BiH population lives in 25 largest municipalities, while 50 smallest municipalities account for only 8% of total population. Besides lack of possibility to reach economies of scale, budget spending per capita and fiscal dependency of the smallest municipalities are higher than the BiH average. It creates latent conflict with developed and efficient municipalities which are funding inefficiency and political/ethnical aspirations of small municipalities.

Having this in mind, further deepening of economic development gap between municipalities in BiH is to be expected. Majority of municipalities are too small to exploit economies to scale and improve efficiency in service provision on their own and at the same time are highly dependent on budget transfers that are allocated on the basis of population and land area. Many countries with much simpler decentralisation structure were not successful in encouraging voluntary mergers of municipalities and it is also not likely to happen voluntarily in BiH. But decentralisation system and legal framework does not pose insurmountable obstacles to exploit economies of scale as municipalities do have possibilities to cooperate and join efforts.

DEA VRS municipal efficiency estimation showed that on average BiH municipalities may increase outputs by 29% without changing inputs employed (total budget expenditure) and that only 23 or 16% of municipalities are cost efficient. In a similar manner, scale efficiency estimation shows that only 15 or 11% of total municipalities are scale efficient. While fragmentation of municipalities resulted in political stabilisation of the country, it did not foster economic efficiency.

Dayton Peace Agreement, which provides a basis for decentralisation in BiH, is probably the most criticised document in BiH. Nevertheless, the experience of comparable developed and transition countries shows that there can be certain paths in terms of respecting ethnic and religious interest found, while still having efficient administration.

Asymmetric decentralisation may be a solution to accommodate different interests and ensure stability and integrity. It is in particular the case for fiscal decentralization where BiH may use experience of other transition countries, for example FYR Macedonia.

Furthermore, the current legislation enables partnership agreements and joint provision of services by municipalities, which may lead to immediate increase of efficiency in small municipalities. Cooperation agreements may be powerful tools to overcome inefficiency of small municipalities and reach economies to scale, as confirmed by examples of Belgium, Sweden and Switzerland.

Reforming upper level governments to reach more lean structure and better specialisation is required, but not necessarily in terms of constitutional changes. It shall rather be in form of establishing lean national, entity and cantonal government by embedding control mechanisms into the system, rather than creating supervisory roles and institutions. This is a central feature of Switzerland model and is also embedded in the governance systems in Croatia and Slovakia.

Among more measures that require stronger reforms, changing the criteria for distribution of revenue may be also a powerful tool in pushing efficiency efforts, as demonstrated by the Belgium case as well as stronger, selective support to private sector development as demonstrated by the Swedish model.

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