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The Efficiency of Public Service Delivery: A Study in Selected Urban Local Governments in Oromia Region, Ethiopia

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ABSTRACT

This paper evaluated the relative efficiency of urban local governments in Ethiopia, Oromia region in the delivery of different services during the period of 2016/17- 2020/21 using data envelopment analysis (DEA). Recurrent expenditure and capital expenditure are used as inputs, and population size and surface area of the town are used as outputs to measure efficiency. DEA with CCR and BCC models is used to measure efficiency. The determinants of efficiency are also analyzed by applying Tobit normal regression. Revenue per population, employee expenditure per population, population density, and population size are used as explanatory variables on the efficiency score. The overall technical efficiency measurement result shows that most of the towns were inefficient during the five - year period, and the mean efficiency level of the towns was decreasing from year to year. The causes of the inefficiency were both management-related and scale-related factors. The Tobit regression found that revenue per population, employee expenditure per population, and population size significantly influenced the efficiency scores of the studied towns. Therefore, this paper suggests that administrations of the studied towns improve their efficiency by correcting management - related and other factors that are the causes of the inefficiency.

Key words: Data envelopment analysis, determinants, Efficiency, local government, public service

1. INTRODUCTION

Most cities in different countries around the World are facing financing challenges as a result of budget deficits, financial debacles, unmaintained infrastructure, declining quality of services and other problems are unfortunate fate at the local government level. In order to minimize these problems most countries applied decentralization process with various degrees of progress and success (World Bank, 2014).

Central governments working for significant reduction in the public expenditure amount and improve administrative efficiency were mostly emphasized to strategic changes on the growing decentralization of the administrative power, the transfer of fiscal and administrative responsibilities from the central government to the local government with the purpose to improve the efficiency of the public expenditure and satisfy the needs of the citizens. It is recognized in the literature that decentralization of power and responsibilities to local governments improve the efficiency of the public expenditure and improve the public services (Barankay & Lockwood, 2007). However, the local governments fall under an increasing pressure for two very important and conflicting needs; to improve the service quality on one hand and at the same time to reduce the costs of services on the other hand (Hatry, 1999). Measuring the efficiency of local governments and identifying its determinants has become the subject of growing literature and major topic of debate in the last decades both for practitioners and policy makers in search for performance benchmarks needed to exercise accountability at government level and citizens and scholars to understand the causes of public spending increase and inefficiency (Afonso, Schuknecht, & Tanzi, 2005; Gupta & Verhoeven, 2001).

The main objectives of the efficiency measurement in public sector is to identify inefficiencies of the organization and to find opportunities for improvements in the ways resources are converted into outputs and to find out inefficiencies in the mix of production factors(Manning, Kraan, and Malinska 2006). The evaluation of efficiency requires quantitative information on costs (or physical inputs) and outputs of public sector provision (Moreno-Enguix and Bayona, 2017).

Efficiency is defined as the comparison between obtained and optimal values of firms output and input applied (Lovell, 1993). Productive or technical efficiency measures that the maximum local public services (outputs) are provided at the lowest possible cost (inputs) (Black, Calitz, & Steenekamp, 2009). Analyzing the determinants of the efficiency of the urban local governments' services delivery is also recognized as very important in the literature. For instance, Drew et al., (2015) stated that DEA can be used to find the determinants of efficiency in the urban local governments' service delivery and the results are useful for the reforms undertaken by the urban local governments. Alike this, Worthington, (2000) stated that the result of the determinants of urban local government efficiency is useful as efficiency result have implications of intergovernmental grants.

Following the adoption of federalism in Ethiopia, the urban local governments were assigned various powers and responsibilities which can enable them provide various services in an efficient and effective manner. According to, the urban local government proclamation No.65/2003 of the Oromia national regional state the urban local government of the Oromia national regional state has the responsibilities to provide efficient, and effective services to the

residents including environmental services, social services, cultural services, public utilities and protective services. Further, the proclamation stated that one of the objectives of urban local government is to ensure the provision of efficient and equitable urban services to the residents in a sustainable manner (Proclamation No.65/2003 the urban local government proclamation of the Oromia, 2003).

However, the urban local governments are not properly measuring their efficiency and also as far as the literature reviews for this study is concerned there is no previous studies conducted to measure the efficiency and determinants of efficiency in the study area. The empirical literature indicated that public sectors in developing countries are usually operating inefficiently because of different reasons. For instance, Therkildsen (2001) stated that a larger share of the public sector total expenditures are used for wages, which may have negative effects on the efficiency of the public sector because non-wage expenditures remain significantly underfunded. Feeny and Rogers (2008) also found that public sector efficiency is lower in small island developing states and Sub-Saharan Africa. These cause the need to conduct the study to evaluate the efficiency of services delivered by the urban local governments.

In short this study is needed and different from previous studies in the following aspects: First, most of the previous studies were conducted in developed countries which mean little is known about developing countries. Second, as far the literature reviews for this study purpose is conducted similar studies conducted in Ethiopia on the efficiency of urban local governments' services delivery are still limited and moreover similar study was not conducted in Oromia special zone surrounding Finfinne. Third, this study evaluates the efficiency of services delivery of the urban local governments by applying DEA with both CCR and BCC models and examined the determinants of efficiency.

Following the study gap identified above the following are the main questions which are addressed by this paper.

- ✓ How is the efficiency of urban local governments in providing services?
- ✓ What are the factors affecting the efficiency of the urban local governments?

1.2 Objective of the Study

The general objective of this study is to evaluate the efficiency of the urban local governments' service delivery in Oromia special zone surrounding Finfinne. The following are the specific objectives of this paper:

1. To evaluate the cost efficiency of the urban local governments' services delivery
2. To examine the determinants of the cost efficiency of urban local governments' services delivery

2. REVIEWS OF THE RELATED LITERATURES

2.1 General Concepts on efficiency

Efficiency analysis is originated from economic research, that efficiency is defined as the correlation between input and output (Deilmann et al., 2018). Therefore, high efficiency implies maximum outputs with minimum inputs. Similarly, Lovell (1993) defined efficiency as the comparison between obtained and optimal values of firms output and input applied. Efficiency is computed by the comparison which can take the form of the ratio of obtained to optimal output

attainable from a given input, or the ratio of minimum possible to obtained input required to produce given output, or some combination of the two.

The literature shows that different statistical techniques have been used to measure the efficiency of the government expenditure. One of the most widely accepted and used technique is data envelopment analysis (DEA), because this technique is superior in estimations that use ordinary least squares and consistent with the definition of production function (Russell, 1985).
Charnes et al. (1989) conducted the first application of DEA to the economic performance of the cities. In their study, the authors analyzed the efficiency of 28 cities in China using the data of 1983 and 1984 and made comparison of changes in efficiencies over the two years. To do this, they followed two approaches: computing the efficiencies separately for each year and grouping the 2 years of data together and treating each of the 28 key cities as a different DMU in each of the 2 years. As observed by Cullinane and Wang (2006), these two approaches, termed contemporaneous and intertemporal respectively, "are two extreme situations of window analysis where, respectively, the window widths are specifically allocated the boundary values of 1 and the number of periods".

2.2 Empirical literature on the measurement and determinants of efficiency

Da Cruz and Marques (2014) conducted a comprehensive survey of the previous studies conducted on the efficiency of local governments using DEA. They found that the surveyed studies used number of staff (labour), total expenditure and staff expenditure in addition to other expenditures as inputs to evaluate the efficiency of the services delivery by the local governments, while outputs used were varied considerably according to the national context. They also found that political ideology, population size, population density and income per capita are the most frequently used explanatory variables in the literature. Hunjet, Neralic and Wendell (2015) investigated the efficiency of 12 selected Croatian towns using data envelopment analysis. This study applied input oriented and output oriented DEA with CCR and BCC models. They considered employed assets and employed labor as inputs and total income as output.

Vanden Eeckhaut et al. (1993) suggested to use a cost efficiency measurement to analyze the municipality performance and they used municipalities current expenditure to measure their cost efficiency. Following this suggestion, the application of cost related observations as inputs is now widely recognized in the empirical literature (see, for instance, Afonso & Fernandes, 2008; Rogge & De Jaeger, 2013). On the other hand the outputs of the services provided by the municipality are proxy by the beneficiaries of the service. Total population and the geographical territory have been familiarized in the benchmarking model as comprehensive outputs. Though, not direct output, total population and the geographical territory are accepted as an important of the effort necessary to deliver the portfolio of municipal services (Balaguer-Coll et al., 2007; Cuadrado-Ballesteros et al., 2013 and Storto, 2016). Total resident population and surface measurement related to public services such as urban roads, parks and tourism area has been widely used as a proxy variable of demand for municipal services in a number of studies(Afonso and Fernandes, 2008; Storto, 2016).

Pinna and Torres (2001) investigated the efficiency of the local government services delivery in Spain's Catalonia region by focusing on urban public transport using DEA model. The study

found that the urban public transport service is efficient in the majority of the cities included in the analysis from the Catalonia region. Similarly, Byrnes et al., (2010) employed DEA to analyze the relative economic efficiency of urban water utilities in regional New South Wales and Victoria. Total operating costs was selected as input and complaints index and total potable water were selected as outputs.

Storto (2016) investigated the trade-offs between cost efficiency and public service quality of Italian major municipalities by applying DEA. The study found that there was scale inefficiencies in a number of municipalities, which a great amount of inefficiencies, were caused by decreasing returns to scale. Afonso et al., (2005) evaluated public sector efficiency for 23 industrialized countries and measured the input and output efficiency of public sector in the selected countries using non-parametric production frontier technique. The result shows significant differences in public sector performance and public sector efficiency, which implies many countries have the potential for expenditure savings.

Drew, Kortt and Dollery (2015) investigated the determinants of the efficiency of the local governments in Australia using DEA. They used number of staff, employee costs, capital costs and borrowing costs as inputs and number of businesses in the municipality, number of households in the municipality, total length of roads and population size as outputs. The study used the exogenous variables such as population, population density, unemployment rate, average annual wage rate, total liabilities, total infrastructure value, total grants, length of sealed roads and length of unsealed roads to analyze their impact on the efficiency score. The paper found that statistically significant negative impact of total liabilities and total value of infrastructure on the efficiency score, while population density, grants, depreciation and length of unsealed roads have statistically significant positive impact on the efficiency score of the local governments. Similarly, Fogarty and Mugera (2013) analyzed the impact of exogenous variables on raw and bias-corrected VRS efficiency score. The regression found that population density has statistically significant positive impact on the raw VRS efficiency score, while employee costs per local resident has statistically significant negative association on the bias corrected VRS efficiency scores.

Afonso and Fernandes (2008) assessed the relative efficiency of local government of Portuguese. They assessed the efficiency of local municipalities using DEA and parametric analysis. The result shows that most of the studied municipalities could improve their performance without necessarily increasing municipal spending. Further, this study analyzed the determinants of efficiency score using tobit regression analysis. The result reveals that population density, population growth, municipal per capita purchasing power and the closer the municipalities to the capital positive significantly influences the efficiency score of municipalities. In contrast Balaguer-Coll et al., (2019) investigated the determinants of local government efficiency and spatial interdependence, evidence from Valentian region, Spain. They measured the efficiency of the local government using DEA and applied population density, income and other explanatory variables to estimate their impact on efficiency score. However, the regression result shows that population density and income have no significant impact on the efficiency score of the local government.

2.4 Conceptual Framework

Several studies applied population size, population growth, capital costs, employee costs, operating costs, population density, employee costs per local resident and income per local resident as explanatory variables of the efficiency score (see, for instance, Drew et al., 2015; Fogarty and Mugera, 2013; Afonso and Fernandes, 2008; and Balaguer-Coll et al., 2019). Following the review of the literature and the availability of data in the studied towns, appropriate variables were selected, and the following conceptual framework was developed for this study:

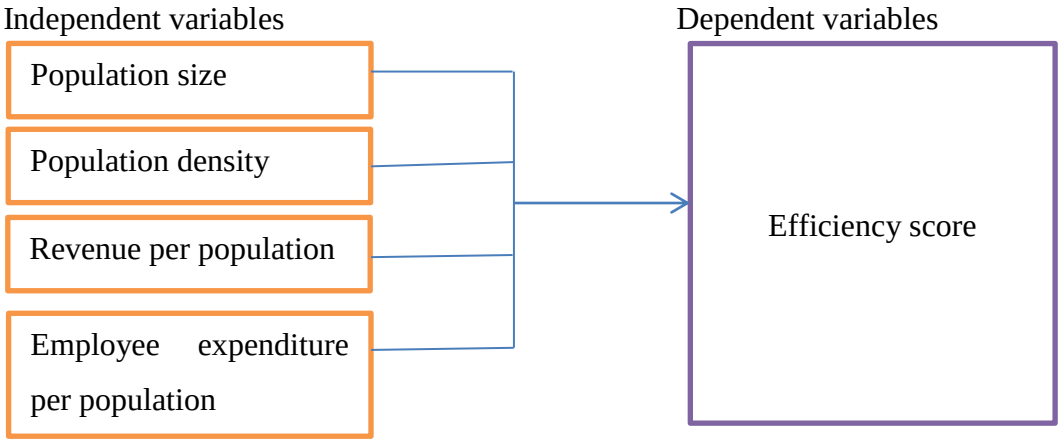

Figure 1: Conceptual framework
Source: Developed from the literature

3. METHODOLOGY AND DATA

3.1 Measurement of the towns' efficiency Model

This study used financial and non-financial data of urban local governments in the Oromia region, Oromia special zone surrounding Finfinne during the fiscal period of 2016/17 to 2020/2021. Towns in the Oromia special zone surrounding Finfinne were the target of this study because there was no previous similar study in the towns, their homogeneity in terms of their proximity to the capital city, the fast growth of the towns, and regional government special emphasis on the development of these towns. The required data were obtained from each towns and Oromia regional state Bureau. There are eight towns in the Oromia special zone surrounding Finfinne and all are included in the study. The urban local government efficiency is evaluated using data envelope analysis (DEA).

The DEA is the most widely used non-parametric technique of data analysis in several studies to measure the efficiencies of decision-making units (see for instance: Storto, 2015; Sufian et al., 2016 and Henriques et al., 2018). According to Wanke et al., (2016) the DEA is the broadly accepted technique as the most useful non-parametric technique to evaluate efficiency. The efficiency frontier concept was originated by Farrell (1957) and then Charness et al. (1978) proposed the CCR model by extending Farrell's efficiency frontier concept. CCR model is a technique that is useful to identify the best practices from an efficient frontier that includes efficient DMUs. It also shows the directions for the inefficient DMUs to become efficient.

The CCR model evaluates the efficiency of DMUs based on the constant return to scale (CSR) also known as the CRS model. It evaluates the efficiency frontier from the ratio of two linear combinations and measures the relative efficiency of each DMU in CRS which has a value between 0 and 1. By following this approach the CCR model can determine whether a DMU is in constant, increasing, or decreasing returns to scale. The CCR model input-oriented efficiency function with m input variables, s output variables, and n decision-making unit (DMU) is presented in equation (1), as shown as follows:

$$\begin{aligned} &\text{Min } \theta \\ &\quad \theta,\lambda \\ &\text{Subject to } \theta x - X\lambda \geq 0 \\ &\qquad Y\lambda \geq y \\ &\qquad \lambda \geq 0 \end{aligned} \tag{1}$$

Where
xo column vector of input for DMUo
yo column vector of output for DMUo
X matrices of input vectors for all DMUs
Y matrices of output vectors for all DMUs
λ column vector of intensity variables denoting linear combinations
DMUs θ radial contraction factor that can be applied to DMU_o's inputs

This model tries to find out how the production is maximized while at the same time all inputs can be reduced (i.e., 1 – θ), or while keeping at least provision of the same level of outputs as the original DMU. This model further considers that efficient DMUs will not be able to further reduce inputs and have an efficiency score (θ^*) of one.

Another useful non-parametric efficiency measurement model created by Banker et al. (1984) was the BCC model. The BCC model is the extended model of the CCR model and Farrell's concept of efficiency measurement. This model measures efficiency based on VRS (variable returns to scale), while the CRS model measures efficiency based on the CRS. The BCC model is also known as VRS (variable returns to scale). The DEA under the CCR model measures the efficiency of DMUs based on technical efficiency only, while the BCC model divides the technical efficiency into PTE(pure technical efficiency) and SE(scale efficiency). Equation (2) presents the BCC model for input oriented:

$$\begin{aligned} &\text{Min}_{\theta\lambda}, \theta \\ &\quad \text{Subject to } -yi + Y\lambda \geq 0 \\ &\qquad \theta x_i - X\lambda \geq y_o \\ &\qquad N1'\lambda = 1 \\ &\qquad \lambda \geq 0 \end{aligned} \tag{2}$$

where Y and X respectively denote a matrix of output measures and a matrix of input measures, $1'\lambda = 1$ is the convexity constraint added to the CCR model to take into account the effect of variable returns to scale and Θ is a real variable (Banker et al., 1984).
Equations (1) and (2) are different in the addition of the constraint that the sum of the intensity variables, λ's, be equal to one in the BCC model.

This study used input oriented CCR model and BCC model to measure the efficiency of urban local governments of Oromia region, the case of special zone surrounding Finfinne. Vanden Eeckhaut et al. (1993) used municipalities' current expenditure to measure their cost efficiency. Currently the application of cost related observations as inputs is widely recognized in the empirical literature (see, for instance, Afonso & Fernandes, 2008; Rogge & De Jaeger, 2013). On the other hand the outputs of the services provided by the municipality are proxy by the beneficiaries of the service. Total population and the geographical territory have been familiarized in the benchmarking model as comprehensive outputs. Though, not direct output, total population and the geographical territory are accepted as an important of the effort necessary to deliver the portfolio of municipal services (Balaguer-Coll et al., 2007; Cuadrado-Ballesteros et al., 2013 and Storto, 2015). Total resident population and surface measurement related to public services such as urban roads, parks and tourism area has been widely used as a proxy variable of demand for municipal services in a number of studies(Afonso and Fernandes, 2008; Storto, 2015).
Therefore, by following a number of empirical literature two inputs and two outputs are selected for this study. The inputs are the annual expenditure both Recurrent and capital expenditure related to the provision of the selected services provided by the towns and the outputs are proxy by the total population(beneficiary of the services) and geographical territory of the town.

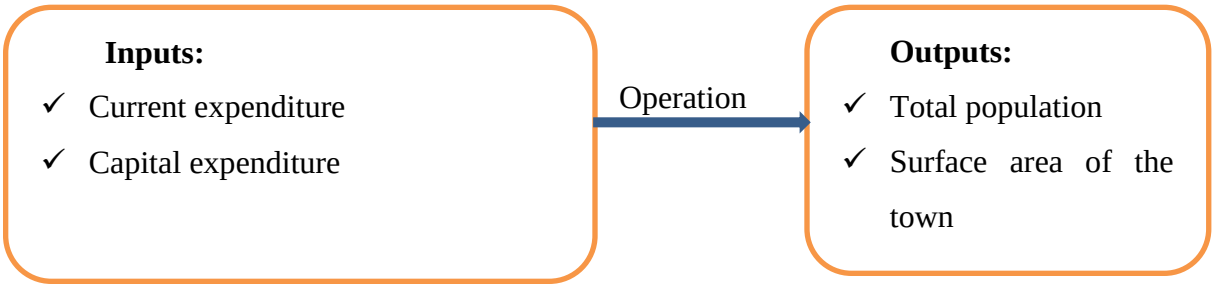

Figure 2: Inputs and outputs model of efficiency measurement
Source: adopted from Afonso & Fernandes, 2008; Rogge & De Jaeger, 2013; Cuadrado-Ballesteros et al., 2013 and Storto, 2015.

3.2 Determinants of efficiency Model

One of the specific objectives of this study is to identify the determinants of urban local government efficiency score. Following the literature reviewed a large number of explanatory variables was required, that are potential to impact the efficiency performance of the urban local government. However, data availability was the major constraint. The impact of four explanatory variables on the efficiency scores of CRS and VRS was tested using Tobit estimations. Since a number of efficiency scores obtained using DEA result in equal unit, it looks appropriate to use Tobit regression model. Hence, four explanatory variables include revenue per resident, employee expenditure per resident, population size and population density are considered in the estimation of determinants of efficiency scores. The explanatory variables used in this paper are explained as follows.

Population density: A number of studies applied population density as the explanatory variable of the local government efficiency (See for instance; Drew, Kortt and Dollery, 2015; Fogarty and

Mugera (2013) and Cruz and Marques, 2013). Drew, Kortt and Dollery (2015) and Fogarty and Mugera (2013) found that population density has positive significant impact on the efficiency score of the local government. In contrast, Cruz and Marques (2013) and Afonso and Fernandes (2008) found that population density has no significant impact on the efficiency score of the local government.

Ho1: Population density has a positive significant impact on the efficiency score of urban local government.

Population size: There several studies which used population size as the explanatory variable of the efficiency score of the local government (see for instance; Drew, Kortt and Dollery, 2015 and Cruz and Marques, 2013). Afonso and Fernandes (2008) found that population growth positive significantly influences the efficiency score of municipalities.
Ho2: Population size has a positive significant impact on the efficiency score of urban local government.

Revenue per population: Empirical literature reveals the existence of the association between revenue per population and efficiency score. Da Cruz and Marques (2014) stated that income per capita is the most frequently used explanatory variable in the literature. Afonso and Fernandes (2008) study result reveals that municipal per capita purchasing power positive significantly contributes to the increase in efficiency of the municipalities. In contrast Balaguer-Coll et al., (2019) found that disposable income per capita has no significant impact on the efficiency score.
Ho3: Revenue per population has a positive significant impact on the efficiency score of urban local governments.

Employee expenditure per population: Employee expenditure is the commonly used explanatory variable of efficiency score. Fogarty and Mugera (2013) analyzed the impact of employee costs per local residents and found that employee cost per local resident has statistically significant negative impact on the efficiency score.
Ho4: Employee expenditure per population has a negative significant impact on the efficiency score of urban local governments.

Using the DEA efficiency score of the urban local governments which its model presented in the previous section, the paper now presents the model used to analyze the determinants of efficiency score. In this study, the dependent variable values are efficiency scores that are either efficient or inefficient. When the dependent variable is censored, values in a certain range are all transformed into a single value. Therefore, since a number of efficiency scores obtained using DEA results in equal units, it looks appropriate to use the Tobit (censored) regression model. The model for the Tobit estimations by regressing the efficiency score, θ, on a set of selected explanatory variables is presented as follows:

$$\theta_i = \beta_o + \beta_1 X_i + \beta_2 Y_i + \beta_3 M_i + \beta_4 N_i + \varepsilon i$$

Where X is a measure of population density at the urban local government, Y measure population size, M measure employee expenditure per population and N measure revenue per population and Ɛ is the error term.

4. RESULTS AND DISCUSSIONS

4.1 Descriptive statistics of the data

Table 4.1 presents the mean, minimum, maximum and standard deviation of the input and output variables used in the study. Population size and surface area proxy to the output variable while total expenditure proxy to input variable.

Table 4.1 Descriptive statistical analysis of all towns' aggregate input and output data

Input and output variables	Statistical measure	Statistical measures in thousand('000)				
		2020/21	2019/20	2018/19	2017/18	2016/17
Population size	Mean	188	179	168	158	137
	Min	75	71	67	64	60
	Max	422	385	368	353	264
	STDEV	139	129	118	108	81
Surface area	Mean	10	10	10	7	7
	Min	6	6	6	2	2
	Max	18	18	18	10	10
	STDEV	4	4	4	3	3
Total expenditure	Mean	91951	60504	50102	39217	38474
	Min	46924	29361	28006	20596	20410
	Max	201195	112240	90020	74685	80647
	STDEV	51704	27968	22689	17684	21900

Source: Computed from different reports

The mean for all variables shows an increasing trend during the five years of analysis. Similarly the standard deviation was also consistently increasing during the analysis period. The efficiency measurements of the towns which are presented in next sections are made using the data presented in the table 4.1.

4.2 Measurement of towns' efficiency

This paper evaluated the efficiency of social services, transport service and environmental service delivery of the eight towns located in Oromia region, Oromia special Zone surrounding Finfinne. Accordingly table 4.2 depicts the five years statistical summary result of the town's efficiency for social services, transport service and environmental services using constant returns to scale (CCR) and variable returns to scale (VRS).

4.2.1 Efficiency score of the towns

Table 4.2 Summary of CCR and BCCR analysis result

Statistical measure	Technical efficiency	Pure technical efficiency	Scale efficiency
Mean	0.66	0.77	0.78
Min	0.11	0.12	0.53
Max	1.00	1.00	1.00
STDEV	0.25	0.22	0.15

Source: Computed from different reports

The summary mean efficiency score presented that 0.66(66 percent), 0.77(77 percent) and 0.78(78 percent) for the technical efficiency, pure technical efficiency and scale efficiency respectively. These mean results imply that towns are in general not efficient during the analysis period. Their performance during the five year periods clearly shows that the towns properly used only 66 percent of their resources during the periods. The remaining 34 percent were not properly used to deliver the required services during the periods.

The summary of minimum and maximum efficiency result shows that there were high disparities among towns during the study periods. The efficiency levels ranges from as low as 0.11(11 percent) score to a maximum of 1(100 percent) score for the overall technical efficiency, as low as 0.12(12 percent) score to a maximum of 1(100 percent) score for the pure technical efficiency and as low as 0.53 (53 percent) score to a maximum of 1(100 percent) score for scale efficiency during the study periods. These evidences show the existence of high inefficiency of resource utilization by the towns.

The standard deviation analysis shows the 0.25, 0.22 and 0.15 for the overall technical efficiency, pure technical efficiency and scale efficiency respectively. This proves that there were high differences of the efficiency levels between towns and over the years.

Table 4.3 Summary of the towns on the efficiency and inefficiency frequency

DMU (Towns)	Social Services			Transport Services			Environmental Services		
	TE	PTE	SE	TE	PTE	SE	TE	PTE	SE
Burayu	3	4	3	2	3	2	2	4	2
Dukam	1	1	1	0	0	0	0	0	0
Galan	0	5	1	0	1	0	0	0	0
Holeta	0	0	0	0	0	0	0	0	0

Laga Tafo	0	0	0	0	0	0	0	0	0
Sebeta	1	3	1	0	3	0	0	4	0
Sendafa	0	1	0	3	4	3	5	5	5
Sululta	0	3	0	0	0	0	0	1	0

Note: DMU-Decision making unit, TE-Technical efficiency, PTE-Pure technical efficiency, SE-Scale efficiency.
Source: Computed from different reports

As presented and discussed on the table 4.3 high disparity exists among the towns on their efficiency levels. The minimum and mean of the towns' efficiency proves the existence of high efficiency levels variance among the towns. During the five years of analysis there was no town that consistently efficient in social services and transport service provision. However, in environmental services provision Sendafa town was consistently efficient during the five years. To put the towns with the relative highest efficient and lowest efficient, the overall technical efficiency analysis found that Burayu town was the most efficient town by scoring one for three years by social services delivery, while Sendafa town was the most efficient town in delivery of transport service and environmental services.
Pure technical efficiency analysis shows that Galan was the most efficient town by scoring one in all five years (consistently efficient) of the study period and followed by Burayu town scored one for four years, while Sendafa was the most efficient town under transport service and environmental services by scoring one for four years in delivery of transport service and five times (consistently efficient) in delivery of environmental services.

Scale efficiency shows that Burayu town was the most efficient by scoring one for three years in delivery of social services and followed by Dukem, Galan and Sabata as the second most efficient towns by scoring one for a single year. Whereas Sendafa town was the most efficient town by scoring one for four years in delivery of transport service and five times in delivery of environmental services.

Generally the finding shows that only Sendafa was consistently efficient by all measurement methods (overall technical efficiency, pure technical efficiency and scale efficiency) in delivery of environmental services during the five years of the analysis period. Moreover, the towns' efficiency level shows high variances in their efficiency score. For instance, Holeta and Laga Tafo towns were the least efficient towns as they were consistently inefficient in all measurement methods and in delivery of all the three types of services during the five years of analysis.

The towns' efficiency analysis also found that in the delivery of social services, the return to scale of the towns, in particular, indicated that the most efficient town, Burayu, experienced a constant return to scale for three years, especially in recent years, while Sabata and Dukem experienced a constant return to scale for one year, which is not in recent years. Burayu and Sabata experienced decreasing returns to scale in earlier years of the analysis period, which is for one year. On the other hand, all other towns in all years have experienced an increasing return to scale. By giving more emphasis to the recent result and the result of most of the towns, the result,

in general, implies that towns in the zone should increase their level of operation in order to improve their efficiency in social service delivery. The transportation service analysis found that in recent years, Burayu town experienced a constant return to scale, while Sendafa town experienced constant returns to scale for three years in the earlier years of the analysis period. In the recent two years, all other towns experienced an increasing return to scale, except Sabata, which experienced a decreasing return to scale in 2019/20. In earlier years, in 2018/19, 2017/18, and 2016/17, Burayu, Dukem, Sabata, and Sululta experienced decreasing returns to scale, while all others experienced increasing returns to scale. Therefore, by giving more emphasis to the recent trends, Burayu experienced a constant return to scale, and others experienced an increasing return to scale. This implies that towns in a state of increasing return to scale should have to increase their level of operations in order to improve their efficiency.

Different from the social services and transport service return to scale, the analysis of the environmental services found that Sendafa experienced constant return to scale during the analysis period, while Burayu experienced constant return to scale only in the earlier two years of analysis period. And different from others Holeta experienced increasing return to scale during the analysis period. By focusing on the recent three years result except Sendafa and Holeta all towns experienced decreasing return to scale in delivery of environmental services. This implies that Holeta town environmental services should increase their level operations to improve their efficiency, while all other except Sendafa should decrease their level of operations to improve their efficiency.
As presented above only a few towns which were on the efficiency frontier for different number of years in delivery of social services, transportation service and environmental services during the study period experienced constant return to scale. The constant returns to scale imply that the towns in that status should operate at that particular level in order to stay on their efficiency frontier.

Table 4.4 Mean efficiency score of social services over the years

	Year	Technical Efficiency Score	Pure Technical Efficiency Score	Scale Efficiency Score
Mean	2020/21	0.63	0.82	0.76
	2019/20	0.71	0.83	0.84
	2018/19	0.70	0.85	0.80
	2017/18	0.71	0.84	0.83
	2016/17	0.70	0.86	0.80

Source: Computed from different reports

To measure the efficiency of social services the input variables used are operating expenditure and capital expenditure for the services whereas the output is proxy to the population size of the town who are the beneficiary from the services. Following this approach the analysis result presented in table 4.4 shows that mean scores of overall technical efficiency, pure technical efficiency and scale efficiency score shows decreasing trends during the five years of analysis periods, besides fluctuation and constant scores in some years. The lowest efficiency score was found in 2020/21 in all three efficiency measurement methods. This result needs more attention

because the inefficiency was increasing from year to year and gets low in 2020/21. The causes for the inefficiency were both of management related factor and scale related factors, the level of contribution of these two factors for the inefficiency were close to each other.

Table 4.5 Mean efficiency score of transport service over the years

	Year	Technical Efficiency Score	Pure Technical Efficiency Score	Scale Efficiency Score
Mean	2020/21	0.56	0.64	0.83
	2019/20	0.71	0.83	0.84
	2018/19	0.60	0.73	0.80
	2017/18	0.65	0.76	0.83
	2016/17	0.67	0.85	0.78

Source: Computed from different reports

The efficiency of transport service was measured using the input variables of operating expenditure and capital expenditure for the service whereas the output is proxy to the population size of the town who are the beneficiary from the services. By analyzing the output produced using the identified inputs the results presented in table 4.5 shows that mean scores of overall technical efficiency and pure technical efficiency were decreasing except shows increased score in 2019/20, while scale efficiency score shows fluctuation scores during the five years of analysis periods. The lowest efficiency score was found in 2020/21 for technical efficiency and pure technical efficiency, while the lowest score of scale efficiency was obtained in 2016/17. The result of overall technical efficiency and pure technical efficiency needs more attention because the inefficiency was increasing from year to year and gets low in 2020/21. The causes for the inefficiency were both of management related factor and scale related factors, but the contribution of management related factor for the inefficiency was higher than the contribution of scale related factors.

Table 4.5 Mean score of environmental services efficiency over the years

	Year	Technical Efficiency Score	Pure Technical Efficiency Score	Scale Efficiency Score
Mean	2020/21	0.61	0.75	0.82
	2019/20	0.63	0.71	0.89
	2018/19	0.65	0.72	0.90
	2017/18	0.67	0.79	0.83
	2016/17	0.69	0.78	0.88

Source: Computed from different reports

To measure the efficiency of environmental services the inputs used are operating expenditure and capital expenditure for the environmental related functions. The outputs are the surface area of the town and population size of the town. Based on this data the five years mean efficiency analysis result shows that the towns were inefficient during the periods. The mean score of overall technical efficiency show decreasing result during the periods. On the other hand the mean score of pure technical efficiency and scale efficiency shows fluctuating results during the five years of analysis periods. The lowest efficiency for overall technical efficiency and scale efficiency was recorded in 2020/21. This result needs more attention because the inefficiency was high in 2020/21 using overall technical efficiency and scale efficiency relative to other years. The causes for the inefficiency were both of management related factor and scale related factors, but management related factor (pure technical efficiency) contributed more for the inefficiency.

4.2.2 Determinants of urban local government efficiency performance

Table 4.6 presents the results of the analysis of the determinants of urban local government efficiency score by applying the censored normal Tobit regression model. This model is used because there is a right-censoring in the dependent variable (i.e VRS efficiency score). In this second stage analysis, the tobit regression model was run on all urban local governments efficiency scores because there were not sufficient observations to run a separate regression for each urban local government.

Table 4.6: Censored normal Tobit regression result

Variables	Tobit regression(VRS)
_cons	1.035603
Revenue per population	-0.03551**
Employee expenditure per population	0.03277*
Population size	0.00456*
Population density	0.0012381

* Significant at 0.05 level
** Significant at 0.01 level

As presented in table 4.6 three explanatory variables among the four explanatory variables included in the analysis are found to be significant. Accordingly, revenue per capita has a negative significant impact on the efficiency scores of urban local governments in the study area. Therefore, it was rejected that the null hypothesis of revenue per capita had a positive impact on the efficiency. This result is inconsistent with the previous studies results in different countries. For instance, Afonso and Fernandes (2008) found a positive significant impact of per capita income on the efficiency score of municipalities, while Balaguer-Coll et al., (2019) found per capita income has no significant income on the efficiency scores of the local governments. The result of this study implies that the increase in revenue per capita of the studied towns resulted in a decrease in their efficiency, this could be caused by a lack of appropriate revenue and resource utilization management system in place.

The analysis found that employee expenditure per population has a positive significant impact on the efficiency score of the local governments. Therefore, it was rejected that the null hypothesis of the employee expenditure per population had a negative significant impact on efficiency. This finding is in contrast to the previous studies' findings. Fogarty and Mugera (2013) found that employee cost per local resident has a statistically significant negative impact on the efficiency scores of the local government. This can imply that an increase in the number of employees and (or) an increase in employee income improved the efficiency of the local governments.

The literature shows a strong association between population size and efficiency scores of urban local governments. This paper found that population size has a positive significant impact on the efficiency scores of urban local government. Therefore, it was accepted that the null hypothesis of the population size had a positive significant impact on the efficiency. This result is consistent with the finding of the previous studies. Afonso and Fernandes (2008) found that population growth positive significantly influences the efficiency score of municipalities.

However, the Tobit regression analysis also found that population density has no significant impact on the efficiency score of the urban local government. This result is consistent with the findings of Cruz and Marques (2013) and Afonso and Fernandes (2008) found population density has no significant impact on the efficiency scores of the local government. And the result is against Drew, Kortt and Dollery (2015) and Fogarty and Mugera (2013) found that population density has positive significant impact on the efficiency score of the local government.

5. CONCLUSIONS AND RECOMMENDATIONS

This paper evaluated the efficiency of the urban local governments in Oromia special Zone surrounding Finfinne using data envelopment analysis during the period of 2017-2021. The paper also examined the determinants of efficiency scores of the urban local governments. The CCR model and BCC model are applied to evaluate the efficiency level of the selected services delivered by the urban local governments. Two inputs and two output variables are used to measure the efficiency of social services, transportation and environmental services provided by the towns.

The finding of the overall technical efficiency for social services, transportation service and environmental service shows the decreasing level of efficiency from year to year during the analysis periods and the lowest efficiency was scored in 2020/21. Moreover the level of inefficiency was high during the periods. This needs much attention from the administration of the urban local governments and other levels of the governments who are concerned about the efficiency of service delivery to improve the efficiency level rather than experiencing decrease in efficiency.

Similarly the pure technical efficiency shows that the levels of efficiency were decreasing from year to year with exceptional rises in the middle during the analysis period for social services and transportation service. And the lowest efficiency score was recorded in 2020/21. While environmental service efficiency score was fluctuating from year to year for pure technical

efficiency. This implies that management related factors are the cause for the inefficiency and decreases inefficiency level of the towns over the study periods.

Regarding the scale efficiency the results reveals fluctuating efficiency score during the five years of analysis. Though the scores fluctuate from year to year, the lowest efficiency score was found in 2020/21 for the social services and environmental services. This implies that factors which are not related to the management were also the cause for the inefficiency of the services provided by the urban local governments. Therefore, the urban local governments are suggested to consider the non-management related factors that can make inefficient their service delivery and take the necessary corrective action to improve their efficiency.
Though evaluated services experienced decreasing or fluctuating efficiency levels, besides all services were inefficient in their mean score during the five years period. Both management related factors and scale related factors were the cause for the inefficiency of the towns. Therefore, the administrations of the towns are suggested to improve their operation management systems to improve the efficiency.

The tobit regression result reveals that revenue per capita has negative significant impact on efficiency score, while expenditure per resident and population have positive significant impact on the efficiency score. This means towns generating higher revenue are less efficient. Therefore, local governments of the area who are generating higher revenue relative to other local governments in the zone are suggested to properly use their revenue, because management of their higher revenue is the cause for their inefficiency.

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