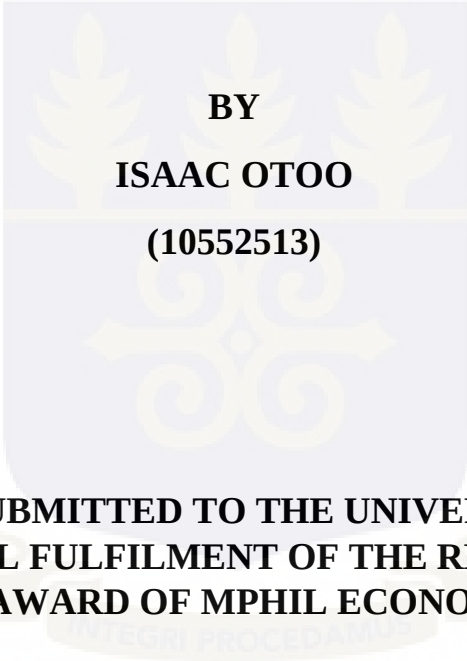


**UNIVERSITY OF GHANA
COLLEGE OF HUMANITIES**

**FISCAL DECENTRALISATION AND EFFICIENCY OF
METROPOLITAN, MUNICIPAL AND DISTRICT ASSEMBLIES
(MMDAs) IN GHANA**



**BY
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**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA,
LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR
THE AWARD OF MPhil ECONOMICS**

DEPARTMENT OF ECONOMICS

JULY, 2017.

DECLARATION

I, Isaac Otoo, hereby declare that this thesis was done by me under the supervision of Dr Michael Danquah and Prof Peter Quartey and that no part or whole of this has been submitted for another degree in Ghana or somewhere else.

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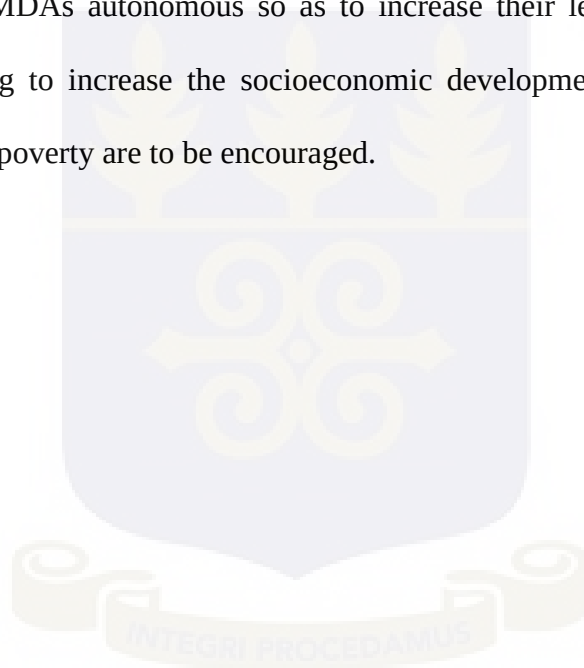
ABSTRACT

Fiscal decentralisation has gain prominence over the last three decades. Proponents of fiscal decentralisation believe that, devolving government tax and expenditure responsibilities to lower tiers of governments will lead to the efficiency of governments and ultimately enhance economic growth. On the other hand, those who oppose fiscal decentralisation argue that fiscal decentralisation will result in ruins and wrecks. However, it is disappointing to note that upon all the controversies in the theory, there is little empirical research to support either argument especially in SSA. It is this gap that this research seeks to fill by providing empirical research on the effect of fiscal decentralisation on efficiency of local service delivery by MMDAs in Ghana. Thus the principal aim of this study is to investigate the effect of fiscal decentralisation on the efficiency of local service delivery by MMDAs in Ghana.

To achieve our aim we have subdivided our objective into two; first we measure the efficiency of MMDAs in Ghana and after explain the variations in efficiency scores between MMDAs in Ghana. Two main approaches to the measurement of efficiency are adopted for this purpose namely the DEA and SFA. The choice of both approaches is to help check for the robustness of our results. A two-stage approach is preferred to measure and explain MMDAs efficiency using the DEA technique. First, efficiency scores are obtained by estimating an input-oriented VRS-DEA and later these efficiency estimates are then explained by a set of fiscal decentralisation and other control factors through a second-stage Tobit regression model. In the SFA technique, the one-stage approach is preferred.

Our results show that, on the average, MMDAs in Ghana are technically inefficient as they can reduce their current level of resources by between 26% (according to the SFA) and 55% (according to the DEA) and still be able to provide their current level of services. Factors

such as fiscal autonomy, ‘perceived’ competency of local governments and effective district administration (FOAT) were found to increase efficient behaviour of MMDAs in Ghana. Vertical imbalance, per capita statutory grant, incidence of poverty and population were, however, found to be negatively associated with efficiency. We therefore concluded that MMDAs that are able to generate a greater percentage share of their revenue through internal sources are likely to be more efficient than their counterparts that generate less. However, high dependence of MMDAs on the centre for their expenditures induces inefficiency. Based on the finding of the research, we recommend that both local and central government should endeavour to make MMDAs autonomous so as to increase their level of efficiency. Also programs that are going to increase the socioeconomic development of the citizenry like reduce the incidence of poverty are to be encouraged.



DEDICATION

I dedicated this thesis to; first my mother, Miss Kate Olivia Acquah, who has been a source of inspiration and encouragement to me and also Mr Kish Odum who made it possible for me to realise this dream and has supported me throughout my studies.



ACKNOWLEDGEMENTS

First of all my profound gratitude goes to the almighty God for giving me the wisdom and knowledge to overcome the toils and troubles in completing this work. My heartfelt appreciation also goes to my supervisors, Dr Michael Danquah and Prof Peter Quartey, for their immerse guidance, suggestions, constructive criticisms and helpful study materials recommended for this study. I also want to give a special thank you to Dr Michael Danquah who inspired my interest in efficiency estimation and measurement.

I am also indebted to Professor Evans Atta-Mills Foundation who sponsored me for my MPhil especially Dr Cadman Mills and Mr Cramer. I also recognise the efforts of my colleague and friend Mr Joshua Jein Konde whenever I called upon him to seek advice on matters that has to do with decentralisation and as far as fiscal decentralisation in Ghana is concerned. Again, I say a very big thank you to my comrades Prosper Kayelle, Daniel Ayenyebo and Scheninenda Ankomah for their advice and support throughout this thesis.

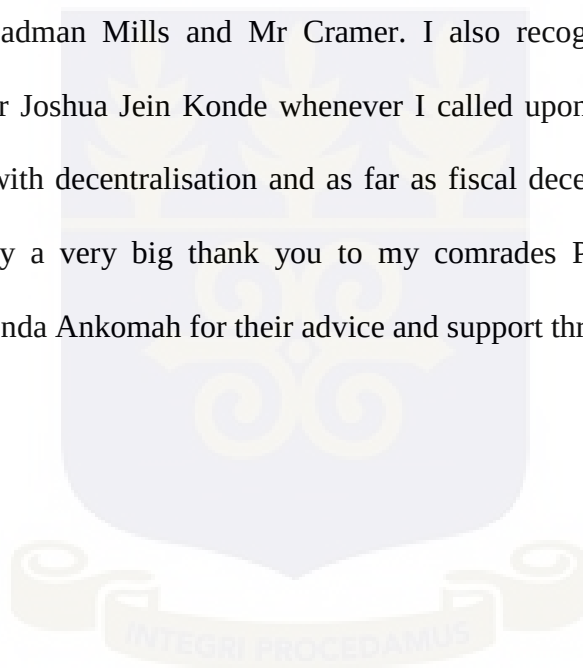


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ABBREVIATIONS

AAP	Annual Action Plan
BCC	Banker, Charnes and Cooper
CCR	Charnes, Cooper and Rhodes
CDD	Centre for Democratic Development
DAs	District Assemblies
DACF	District Assemblies' Common Fund
DDF	District Development Fund
DEA	Data Envelopment Analysis
DLT	District League Table
DMU	Decision Making Units
DT	Decentralisation Theorem
EECs	Eastern European Countries
FDH	Free Disposal Hull
FOAT	Functional Organisation and Assessment Tool
GoG	Government of Ghana
GSS	Ghana Statistical Services
JHS	Junior High School
IGF	Internally Generated Funds
LGS	Local Government Service

MCs	Minimum Conditions
MLGRD	Ministry of Local Government and Rural Development
MMDAs	Metropolitan, Municipal and District Assemblies
MMDCEs	Metropolitan, Municipal and District Chief Executives
MTDP	Medium Term Development Plan
NDAP	National Decentralisation Action Plan
NDPC	National Development Planning Commission
PMs	Performance Measures
PNDC	Provisional National Defence Council
RCCs	Regional Coordinating Councils
SDGs	Sustainable Development Goals
SFA	Stochastic Frontier Analysis
SSA	Sub-Saharan Africa
UN	United Nations
UNICEF	United Nations International Children's Emergency Fund
USA	United State of America
VRS	Variable Return to Scale

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Decentralisation, defined as the transfer of decision making in respect of political, administrative and fiscal responsibilities from the central government to lower levels of the government structure, has been on the rise in both the developed and developing world over the years (Panizza, 1999; Treisman, 2006). Countries around the world are devolving responsibilities to lower tiers of government because it is seen as the way to go if sustained economic growth and development is going to be achieved (UN, 1991; Bruno & Plestovic, 1996). Decentralisation can assume various forms, that is; deconcentration, devolution, delegation and privatisation. Administrative, political, fiscal and market decentralisation are the numerous types of decentralisation. Fiscal decentralisation can be defined as a type of decentralisation where there is the sharing of government's taxing and spending responsibilities between the central government and local governments (Porcelli, 2009).

Decentralisation is an art because the application of it is not a straightforward thing and different countries do things differently (Bahl, 2008). The implementation of decentralisation in any country depends on so many factors ranging from cultural, historical, political and geographical area (Arzaghi & Henderson, 2005). For instance, in Latin America, strengthening the transition to democratic rule has been done successfully through the acceptance of decentralisation (Smoke, 2001). In Eastern European Countries (EECs) like Russia, the collapse of autocratic leadership and extremely centralised socialist administrations has resulted in the implementation of decentralisation (Rodriguez-Pose & Kroijer, 2009). In Ghana, decentralisation has been implemented with the main aim of

running efficient government machinery and providing strong support for all-inclusive development (National Decentralisation Action Plan, 2003). The most important feature of an effective decentralisation is the devolution of government taxing and expenditure responsibilities (Ayee, 2004a; 2004b; Olowu & Wunsch, 2004). Crucial to the smooth implementation of fiscal decentralisation is to effectively plan a multitier public finance to provide public service at the least cost or with the minimum amount of resources while maintaining macroeconomic stability (DeMello, 2000).

In the literature, most authors have used the arguments for the implementation of decentralisation as benefits for fiscal decentralisation (Tiebout, 1956; Oates, 1972; Lockwood, 2002; Besley & Coate, 2003). One of the benefits of decentralisation is the superior information local governments command at the local level due to their closeness to local constituents and thus will be able to know their basic needs (Klugman, 1994). Also local constituents become abreast with the activities of local governments and therefore are able to monitor the activities of local government officials (Ostrom et al., 1993). With the proximity of local governments to the populace, there is optimism that local governments will be proactive in solving the basic needs of citizens through finding novel and superior means of providing quality services to meet the citizens' choice. Consequently, local governments will be efficient in providing well-tailored services to its citizens. Economic welfare is increased through the devolved supplies of public goods and services by matching exact choices and situations of their districts above a one-fit-all state delivery.

Metropolitan suburbs which are close to each other boost high movement across jurisdictions offering citizens the best tax and public goods bundles (Afonso & Fernandes, 2008). In the presence of competition among local governments for tax and public goods bundle, local governments are challenged to be self-restrained as constituents who abhor corrupt practices may switch between jurisdictions. An added benefit of decentralisation is the potential

recovery of state funds which are used to provide public goods and services (Briscoe & Garn, 1995; Litvack & Seddon, 1999). Generally, households are willing to pay for goods and services that are reactive to their demands. Thus institutionalising decentralisation to make the provisions of public goods and services to be responsive to local demand will enhance the recovery of state investments. Also, a provision of a public good by a benevolent central planner will perhaps be ineffective due to differences in local choices and cost. By taking into account the possible variations in choices and cost across different jurisdictions, a level of public good is produced which is restrictive to that particular jurisdiction. Therefore by limiting the provision of a public good to a particular jurisdiction where the demand for this public good is identical will ensure efficient distribution of this public good.

On the other side, critics of decentralisation (Bahl & Linn, 1992; Prud'homme, 1995; Tanzi, 1995) allude to budget overruns, corruption, competition for tax base and high business and trade costs as undesirable economic outcomes of decentralisation. With the knowledge that they will be rescued from their financial predicaments by the central government, local governments may engage in unproductive expenditures resulting in budget overruns. Local government officials may be more exposed to corrupt practices due to interests of select few. Also, since local governments command huge discretion in the utilisation of grants, the tendencies that these resources will fall into wrong hands are high. Giving local governments more autonomy than needed may end in central government struggling for tax base with these local governments. Excessive devolution of state power to local governments may hinder internal trade and also increase business cost due to the increased bureaucracy and multiplicity of taxes. The end of this all is that, local governments are unable to use the right combination of resources to provide quality public services to its populace.

The concept of decentralisation has been no different in Ghana as the country had its own informal system of decentralisation even before the arrival of the Europeans (Conyers, 2007;

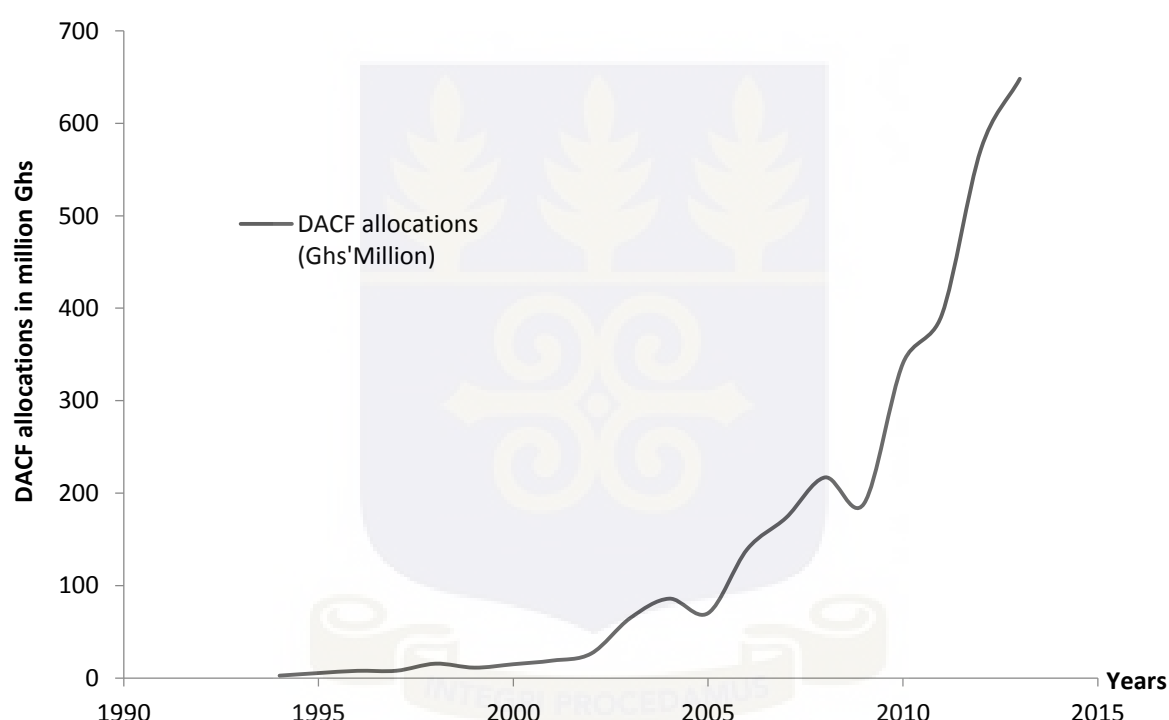
Friedrich-Ebert-Stiftung Foundation, 2010). The current system of decentralisation, which is referred to as the Local Government System, is rooted in Chapter 20 of the 1992 Constitution of the Republic of Ghana. The concept of decentralisation as espoused in the constitution, created the Metropolitan, Municipal and District Assemblies (MMDAs) to be the utmost 'political and administrative authority' in the district. In terms of fiscal decentralisation, the same Chapter 20 of 1992 Constitution, mandate the central government to allocate as a minimum five per cent of total government revenue to MMDAs for their smooth operations. Thus there is to some extent connection between transfer of funds from central government and the provision of services by MMDAs in Ghana.

Between the year 1994 and 2013, a total of approximately three billion Ghana Cedis have been allocated to MMDAs in the form of grants through the District Assemblies Common Fund (DACF). This averages to some one hundred and fifty million Ghana Cedis every year. Also the MMDAs are empowered by the 1992 Constitution to charge fees, rates and also taxes. Besides, there is also the recent introduction of the District Development Facility (DDF) to further allocate funds to MMDAs from the central government for their smooth operations. It can therefore be said that MMDAs in Ghana receive a substantial amount of funding from the central government and also through internal sources. This is an indication that Government of Ghana (GoG) is committed towards better decentralisation and for that matter fiscal decentralisation. Figure 1.1 shows that DACF allocations to MMDAs have been increasing over the years.

Efficient delivery of public services by MMDAs should not be taken lightly if Ghana is going to reduce poverty levels and also consolidate the gains from economic growth. As a result, government both at the centre and local level have made strenuous effort through legislative instruments and other programs to avoid waste. One of the programs the central government has introduced to stimulate efficiency and accountability of MMDAs in the utilisation of

revenues is the Functional and Organisational Assessment Tool (FOAT). The FOAT has generated motivation for MMDAs to increase their administrative capacity and also to improve on their efficiency (Engineers without Borders, 2010). Several other laws like the Public Procurement Act, Financial Administration Act and the Financial Administration Regulations has been passed by the Parliament of Ghana as a check and balance system in the use resources by MMDAs.

Figure 1.1: DACF Allocations to MMDAs from 1994-2013



Source: Author's own construction (data was from DACF yearly allocations)

1.2 Problem Statement

Fiscal decentralisation has been the subject of public discourse in many countries. The argument for the adoption of fiscal decentralisation is the associated improvement in local governments' efficiency in the provision of basic services and promotion of economic development as predicted by the theory of fiscal decentralisation (Oates, 1993). As fiscal

decentralisation is gaining prominence, most countries have concurrently lost the capability of controlling the rising public spending resulting in cyclical fiscal predicaments (Junqueira, 2015). Nonetheless, local constituents have not declined their quest for further and improved provision of quality services at the local level. This places a high level of anticipation on local government officials to respond to the continuing and gradually cultured demands of local constituents.

Decentralising government responsibilities to lower tiers of the governance structure is viewed as one of the policies central governments have utilised to counter the increased new demands for better and quality service (Kazepov, 2010). If public officials are concerned about providing better and improved services at the local level while spending within their budgets, then a critical attention must be paid to performance (Favoreu et al., 2015). This has stimulated studies and discussions of local governments' efficiency as an alternative means of providing quick local services which is superior and produced using the least amount of resources. It is evident that research on local governments' efficiency is intensifying importantly in developing countries (Narbón-Perpiñá & Witte, 2016).

In the developed world, few studies have tried to link fiscal decentralisation with efficiency of local public service delivery (see for example De Borger & Kerstens, 1996b; Boetti et. al., 2010; Balaguer-Coll et. al., 2010) as well as in the developing world (see for example El Mehdi & Hafner, 2014; Yusfany, 2015). In all of these studies, little attention has been paid to the administrative capacity of local governments and its links to efficiency. Most studies of local governments in Ghana have focused on the impact of fiscal decentralisation on local economic development (see for example Fordjour, 2011; Zumegah, 2015) and revenue mobilisation (Owusu, 2012; Poupiel & Chimsi, 2015). The closest Ghana has come to measure local government efficiency is the Functional Organisational Assessment Tool (FOAT) and District League Table (DLT).

The FOAT was introduced in 2006 by the GoG to evaluate the overall performance of 138 MMDAs. It is a type of grant system based on performance where MMDAs are evaluated in their permissible duties and other obligations. The index captures both the professionals and representatives who are either voted for or selected to the MMDAs. The emphasis of the index is on the political, legal, fiscal and administrative environment in which MMDAs function (Ghartey et. al., 2015). The indicators are made empirically certifiable and the evaluation evidence-based so as to discourage biases in the evaluation procedure. There is a decomposition of the main evaluation into two several parts: the Performance Measures (PMs) and Minimum Conditions (MCs).

Conversely, DLT is produced together by UNICEF-Ghana and the Centre for Democratic Development (CDD), Ghana. DLT is an instrument for the consolidation of social accountability between the government and its inhabitants for development. DLT measures the average state of development of Ghana's 216 districts using a simple ranking tool. Districts are assessed in the provision of six crucial services including health, education, sanitation, water, security and governance. According to the DLT report (2014) some districts may be ranked high not because they are efficient in managing resources available to them but because they are getting more revenue in terms of government transfers and IGF due to economic activities in the district.

In both the DLT and FOAT, no conscious efforts are made to link the resources of the MMDAs and their outcomes in service delivery. If Ghana is going to end poverty; make sure there is zero hunger; provide good health and quality education for its citizens; provide access to clean water and sanitation; provide decent work and promote economic growth; and finally build sustainable cities and communities as espoused in the Sustainable Development Goals (SDGs), then a critical assessment of MMDAs in their service delivery must be conducted. This is because MMDAs are at the centre of providing critical public services at the district

level. With a focus on MMDAs fiscal and administrative capacity, this thesis is going to fill a huge gap in the literature by investigating the effect of fiscal decentralisation on the efficiency of MMDAs in Ghana.

1.3 Objectives of the Research

In this study, we investigate the effect of fiscal decentralisation on the efficiency of service delivery by MMDAs in Ghana. To achieve this, we have the following specific objectives:

1. To estimate the efficiency of local public service delivery by MMDAs in Ghana.
2. To establish a relationship between efficiency of local service delivery and fiscal decentralisation in Ghana.

1.4 Research Questions

The research questions that this thesis seeks to answer are:

1. Are MMDAs in Ghana efficient in their service delivery?
2. What type of relationship exists between fiscal decentralisation and the efficiency of local service delivery by MMDAs in Ghana?

1.5 Contribution of the Research to the Literature

This research contributes to the growing discussion of local governments' efficiency in three ways. First, this research will contribute to the growing literature on the effect of fiscal decentralisation on efficiency of service delivery by local governments. This is pertinent because it will give more information and expand the literature on fiscal decentralisation and public service delivery.

Again, in terms of policy, the research will make available valuable information for the implementation of decentralisation reforms. According to Bahl (2008) decentralisation is an art because the application of decentralisation is not a straightforward thing and different countries do things differently.

Lastly, this research will offer practitioners and stakeholders important document to which they can refer to, to inform them on how to go about future policy in building consensus and to empower local authorities to augment economic growth. This is crucial because the relationship between revenue mobilisation, taxes paid and service delivery is not better understood by MMDA officials, assembly members and citizens in some MMDAs in Ghana (Ankamah, 2012).

1.6 Organisation of the Research

The thesis is presented in six chapters. Background of the study, stating the study objectives, research questions, contributions of the study to the literature and organisation of the study have been presented in chapter one. Chapter two deal with the overview of decentralisation in Ghana. This include an account of decentralisation in Ghana, the legal environment of decentralisation in Ghana, the local government structure in Ghana and functions and operations of local governments in Ghana. Chapter three is devoted to the review of relevant literature in the area of decentralisation and economic efficiency and the relationship between fiscal decentralisation and efficiency of local governments. Chapter four presents the methods and approaches adopted for this study. In chapter five, a detailed presentation of empirical results is discussed. Finally, chapter six summarizes the findings of the study, draw some meaningful conclusions and offer some policy recommendations. It concludes with limitations and gap for further research.

CHAPTER TWO

DECENTRALISATION IN GHANA

2.1 Introduction

This chapter presents an overview of decentralisation processes in Ghana. It starts with a historical overview of decentralisation in Ghana: the pre-independence decentralisation, the period between 1957-1987 and 1988 till now. It also offers some of the legal frameworks that have ensured success in adopting decentralisation in Ghana up till now. It concludes with the structure of Ghana's local government and functions of MMDAs in Ghana.

2.2 Overview of Decentralisation in Ghana

Ghana has been no different from other developing nations in adopting decentralisation reforms. Even before the influx of the Europeans on the shores of Ghana, the then Gold Coast, some form of unauthorised decentralisation system existed in Ghana. Supported by their elders, the chiefs of various communities and towns were seen as the head of the people administering mainly law and order (Freidrich-Ebert-Stiftung, 2010). During the colonial days, the colonial masters (the British) used chiefs less prominently in their administration of the state. The British colony employed the chiefs or some units of loyal authority¹ to assist them mainly in 'law and order' administration. These administrative heads had powers which were undemocratic thus they were just agents 'hand-picked' by the colonial government (such that they were selected and not voted for) to assist in their administration of the country. They were given limited involvement in local administration with their main task being the keeping of peace in their various communities. In this system, the Units of Local

¹ These units of loyal authority were some influential people in the society.

² These chiefs were selected by the minister for Justice who was the minister in charge of local government then.

Government were titled 'Native Authorities' and the system of local government was known as the 'Indirect Rule System'.

There were two lines along which local government system that was practised in Gold Coast advanced. First, local governments in key municipalities were regulated through a succession of Municipal Council Ordinances and secondly, in the rest of the country local governments structures were regulated through a sequence of Native Jurisdiction Ordinances (Ahwoi, 2010). Along the coastal lines of Gold Coast, municipalities were set up by the 1859 Municipal Ordinance. Town councils which had elected members were set up in Cape Coast, Sekondi-Takoradi, Accra and Kumasi by a new ordinance in 1943. By 1951 a maiden Local Government Ordinance was commissioned as a response to the failures of previous ordinances acknowledged by the Coussey Committee and the 1948 unrest in the major cities in Gold Coast.

In 1953, there was the passage of the Municipal Councils Ordinance. The new ordinance did not bring any striking modifications since the major council was not affected in any way. The new ordinance set up as many as 26 Districts and 252 Urban and Local Councils (Ahwoi, 2010). With limited authority, the President of the council was to be the chief in that particular local/urban/district as the new system was in some way connected to the old system. This action was intended to further strengthen the already undemocratic powers of chiefs. Some inadequacies were encountered and under just five years of the implementation of the local government ordinance in 1951, a new commission was necessary to be set up headed by F.A. Greenwood. The F.A. Greenwood commission was charged with making new proposals for local government restructuring. The commission was to pay greater attention to local governments' expenditure control measures, taxation, and local government finance and revenue control systems. The recommendations as given in the F.A. Greenwood commission

report rarely saw daylight manifestation as Ghana, the then Gold Coast, attained her independence in 1957.

The local government system, after independence, saw some modifications being made through the constitution that brought into force Ghana's independence; the 1957 Constitution. The nation was then demarcated into five administrative regions as Ashanti, Eastern, Northern, Trans-Volta Togoland and the Western regions. The chiefs were still recognised when the new regions were created. With only the Asantehene who led the Ashanti region, the new established regions were led by representatives of the various Regional Houses of Chiefs of each region. Each region's development was placed in the care of the Regional Assemblies (equivalent of Parliament). The Local Government Councils which included the local/urban/district/municipal councils present before the constitution came into force were maintained. The activities of the regional assemblies (Parliaments) were met with serious resistance as they (the assemblies) did not recognise their own significance in administering governance at the local level. Pending the official declaration into effect of the '1960 Republican Constitution' which offered some modifications, the system of local government at the time remained unchanged.

The 1960 Constitution created additional regions. The total number of regions was increased to seven through the establishment of the Upper regions; currently Volta region, the Trans-Volta Togoland and the Central regions. After the declaration of the '1960 Republic Constitution', there was the immediate passage of Act 54 (the Local Government Act) in 1961. According to Ahwoi (2010), the nation was demarcated into local area councils, cities and municipalities by Act 54. Traditional power representation was vetoed by this Act but involvement of Area/Town/Village committees was accepted in the new local government system. The Act introduced elections of members into the various committees which were regarded as key modification in local government in Ghana. In the interim, Paramount

Chiefs² were made to chair the various District Councils within their jurisdiction and were to supervise the elections of substantive chairpersons. Although members of the District Councils were fit for being voted for again, they had a three year term.

In the Act, the district councils were to perform four major functions namely: management of the environment, infrastructure, social services provision and use the local police to provide security. The traditional sources of revenue to help local government financing were licenses, permits, fees, land revenues and so on. Yet still, inadequacies were still in existence which prompted the incorporation of various commissions to bring these inadequacies to a halt (Freidrich-Ebert-Stiftung, 2010). The Regional Councils were then created and empowered by Act 359 (the Local Administration Act) to appoint the Prime Minister of the Regional Chief Executives in 1971. There was an amendment of Act 359 in 1974 which removed the inadequacies associated with the old system. The new system integrated the central government and the local government into one government machinery. The new system had 273 Area/Municipal/Urban/Local Councils, 58 District councils and Regional Councils (Ahwoi, 2010).

Similar to the Local Administration Amendment in 1974, parliament was presented with the authority by the Constitution that returned Ghana to civilian rule to make legislations to establish Area, Village and Town development committees and District councils in 1979. The appointive authority was introduced anew to the chiefs to select one-third of the members of the several councils with the remaining two-thirds selected through public elections which was the most significant change. The traditional power which was hitherto vetoed by Act 54 of 1961 was brought back into Ghana's Local Government as spaces were created once again for traditional powers. Changes were made by the government to substitute part one of the 1974 local Administrations Act as a result of the provisions in the Chapter 20 of the 1979

² These chiefs were selected by the minister for Justice who was the minister in charge of local government then. Now the ministry that is charge of the local government (MMDAs) is the Local Government and Rural Development ministry.

Constitution. In addition, the power to appoint was now bestowed on the President and the Regional House of Chiefs had the opportunity to appoint two representatives on the Regional Councils. Again, memberships of the several Local Government units were redefined.

PNDC Law 207 gave birth to the present day system of local government in Ghana. The Law created the District Assemblies (DAs) as the utmost administrative and political power in the district. The number of MMDAs elevated from 65 to 110³ after the re-demarcation of the country and the maiden district assemblies' elections was held in 1989. In 1993 PNDC Law 207 was repealed and replaced by Act 462, a new Local Government Act, as a result of the provisions in the 1992 Constitution. The recommendations of the 1992 Constitution were that there should be devolution of Ghana's Local Governments system as much as possible to move good governance closer to the populace. As such there was to be the establishment of MMDAs to conduct government business at the local level as the Act mandated. Act 462 also amended the membership of the assemblies such that 70% of the members were to be elected and 30% appointed to the MMDAs by the government.

The MMDAs were to be the fulcrum of government machinery and to be the main body to make developmental and administrative decisions in the districts. As provided in Act 462, "A district assembly shall exercise political and administrative authority in the district, provide guidance, give direction and supervise the other administrative authorities in the district". The Act charge MMDAs to initiate, promote and implement 'plans and actions' that will contribute to the development of the districts. In terms of FD, there was to be the creation of the District Assemblies' Common Fund (DACF) to be managed by the DACF administrator. The fund was to be made up of at least 5% of the total revenue of the central government in a particular fiscal year and distributed accordingly by the DACF administrator to the MMDAs for their developmental projects in their various jurisdictions. Moreover, Section 86 (3) of

³ There are 216 MMDAs as at 2016.

Act 462 gives the MMDAs the power collect fees, levies and licences to provide for dependable and sufficient revenue sources so as to have a sound financial base as required by the 1992 Constitution. This was to ensure that funds are readily available to the MMDAs to deliver on their mandate and further strengthen autonomy of the MMDAs.

One of the most significant commitments by Ghana towards decentralisation and for that matter fiscal decentralisation was the putting into practice the District Composite Budget for the first time in 2011. The composite budget aim at bringing all the budgets of the departments created under LI 1961 (Administrative Decentralisation) into harmony and also convey their budgeting process under the control of the MMDAs (MMDAs composite budget manual, 2012). Government decided to speed up modifications to fiscal decentralisation by making funds accessible to the MMDAs to carry out their obligations as a response to the passing of LI 1961 into law. To ensure that the MMDAs are well funded, complete information of the assemblies' expenditures and revenues are attained thus making the implementation of the composite budget a key move towards proper fiscal decentralisation. In addition, public fund management is improved through transparency and accountability.

Previously the Assembly's Central Administration budget conformed to the District's Annual Action Plan (AAP) which is derived from the District Medium Term Development Plan (MTDP). However, the decentralised departments' budgets were aligned to their parent ministries' sector plans with very weak link to the Assemblies' MTDPs and AAPs. The decentralization policy was undermined through the uncoordinated district level budgeting and planning process. The inherent difficulty in allocating responsibilities and functions between local and central budgeting process was removed as a consequence of coming into effect of LI 1961. To have possession, authority, accountability and proper coordination, the various departments under the assembly and central administration's budgets are incorporated in the composite budget system.

2.3 Legal Environment

The decentralisation policy practised in Ghana since 1988 aim to advance accountability and good governance by, among other factors, bringing some features of fiscal, political and administrative decentralisation. Since then, Ghana's decentralised process have gone through various reforms through legislations and policies to give the MMDAs more power, authority and autonomy at the local level. The main reference laws in the administration of decentralisation in Ghana are the Local Government Act of 1993 (Act 462) and the paramount law of Ghana, the 1992 Fourth Republican Constitution. Other subsidiary legislations and Acts that have ensured a smooth implementation and strengthening of decentralisation in Ghana are:

- I. PNDC Law 327 (1993), The Civil Service Law;
- II. Act 455 (1993), The District Assemblies Common Fund (DACF) Act;
- III. LI 1589 (1994), Local Government Establishment instrument;
- IV. Act 480 (1994), The National Development Planning (Systems Act);
- V. Act 479 (1994), The National Development Planning Commission Act;
- VI. Act 584 (2000), Audit Service Act;
- VII. Act 656 (2003), Local Government Service Act;
- VIII. Act 663 (2003), Public Procurement Act;
- IX. Act 658 (2003), Internal Audit Agency Act;
- X. Act 654 (2003), Financial Administration Act;
- XI. LI 1802 (2004), Financial Administration Regulations;
- XII. The Legislative Instruments establishing the various Assemblies.

However, in December 2016 a new coherent Local Government Act, Act 936, was passed by the Parliament of Ghana and assented to by the President of the Republic. The Act provides stakeholders with a single document which combines five pieces of legislations on local

governance matters. The new Act joins together Chapter Twenty of the 1992 Constitution; Act 455, the DACF Act; Act 480, the Systems Act; Act 656, Local government Service Act; and Act 658, the Internal Audit Agency Act.

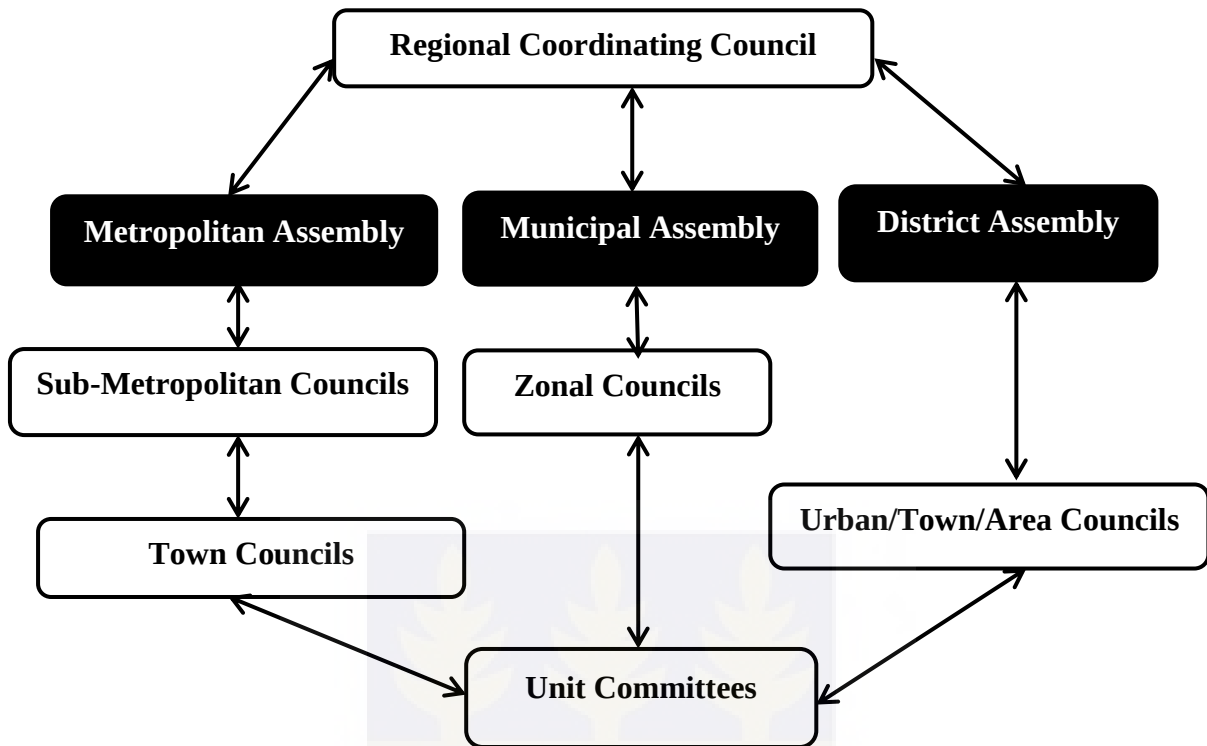
2.4 Structure and Composition of Ghana's Local Government

The management of Ghana has always had two machineries running severally: the first is the one which has offices at the level of the district with headquarters in the capital; and another which is called local government that are within precise vicinities and are independently located at the district. As currently developed by the Constitution in 1992 and also by Act 456, the Local Government Act in 1993, the traditional structure for Ghana's local system of governance has a three-level structure as originally established by Law 207 of the PNDC regime.

The machinery of government at the local level functions at the regional, district and sub-district levels. On the first level is the Regional Coordinating Council (RCC), the next level is Metropolitan/Municipal/District Assemblies (MMDAs) and the last level there is the Urban/Town/Area councils and unit committees. Though, in practice, the local government system in Ghana is considered to have a four level organisational structure with Unit Committees representing the elementary and bottommost component in the 'subsidiarity chain' upon which all others are built. Currently, there are 10 administrative regions, 216 MMDAs, about 1300 Urban/Town/Area Councils and over 16,000 Unit Committees (Commonwealth Local Government Forum, 2016).

The structure is presented in the figure 2.1 below:

Figure 2.1: Ghana's Local Government Structure



Source: Friedrich-Ebert-Stiftung Foundation Ghana, 2010

Thus Ghana's local government system has a structure as follows:

1. The Regional Coordinating Councils (RCCs).
2. Metropolitan Assembly consisting of a four level structure
3. Municipal or District Assembly consisting of a three level structure
4. Urban/Town/Area/Zonal Council
5. Unit Committee

Representatives from the House of Chiefs in each region and the various MMDAs make up the RCC. The representation on the RCC is as follows: the Regional Minister together with his deputy/deputies who are appointed by government with prior parliamentary approval; from every MMDA in the region, the Metropolitan/Municipal/District Chief Executives (MMDCEs) and the Presiding Members (PMs); with approval from the House, two chiefs elected by the Regional House of Chiefs; and lastly the regional heads of decentralised ministries, departments and agencies of government with no voting right. The secretary to the

RCC is the Regional Coordinating Director who is a professional civil servant and also heads the Regional Administrations. Their main function is to monitor the link among local and central government and also the coordination of policy execution among the MMDAs.

The composition of the MMDA consists of delegates who are elected and include: government appointees who are appointed by the president in discussion with other interest groups and the leaders of the traditional council; an assembly member who is elected by eligible voters in a particular electoral area; the MMDCE (similar to Mayor); and with no voting right, the districts member(s) of parliament.

The sub-metropolitan/district/Urban/Town/Area/Zonal council consist of five persons selected by the government, ten Unit committee representatives and five representatives of the District Assembly. Members of the Unit Committees are elected concurrently with the assembly members of the Assembly.

2.5 Functions and Operations of MMDAs in Ghana

The functions of the MMDAs are clearly spelt out in section 12 of the Local Government Act of 2016, Act 936. MMDAs perform a number of functions though their major purpose is to initiate and execute plans that will ensure the economic development of their districts by providing guidance, direction and supervision to the other administrative authorities in the district. Consequently they are to perform ‘deliberative, legislative and executive’ functions as prescribed by the Act. In order not to restrict the MMDAs in the performance of the above mentioned functions, Act 936 itemised some specific functions to be performed. These include, first, to ensure their jurisdictional development MMDAs are to articulate and implement plans, programmes and strategies to maximise the available resources in their jurisdictions. They are to make sure that any impediments to development are removed and

also champion and provide backing for programmes that increase productivity and social development of their constituents.

Bearing in mind equity and fairness among males and females, MMDAs are also to sponsor and support students from the district to attain higher education particularly in social services like health and education to fill the human capital needs of the district. They are to take charge of the developing, improving and managing human settlement and the environment. Moreover, MMDAs should work together with national and local security agencies are to safeguard that security within their boundaries is maintained and public safety is also promoted. Relevant to the attainment of the previous function, MMDAs are to ensure that justice is served by making available and easy access to court. Last but not the least, they must be seen to promote and hold on to our cultural heritage.

From the above functions, it can be deduced that MMDAs in Ghana offer a range of public services to their constituents in their respective jurisdictions. However, these services are provided with a varying degree of political responsibilities and authorities. The scope of service delivery is determined by the type of district assembly⁴. In general, the scope of service delivery by MMDAs in Ghana include basic education, social welfare, health clinics, cemetery services, museums and libraries, water and sanitation, refuse collection, environmental protection and transport. Most of the times, there is a conflict between central government and MMDAs' provisions of basic services at the local level (Kuusi, 2009).

To be able to perform the above mentioned functions effectively, MMDAs should have a regular and reliable stream of revenues. Indeed Chapter 20 of the 1992 Constitution of Ghana recognise this and thus empowers the MMDAs to impose levies, taxes, fees and rate for their smooth operations. Subsequent to Chapter 20 of the constitution, Schedule 8 to 12 of the local government Act of 2016, Act 936, list a range of establishments, goods and properties

⁴ Section 4 (a) of Act 936 describes three types of districts: a district, which should have a population of at least 75, 000; a municipality, which should have a population of at least 95, 000 and a metropolis, which will have a population of not less than 250,000.

district assemblies can charge licence fees and impose levies, rates and taxes. Also the same Chapter of the constitution establishes the District Assemblies Common Fund (DACF) which will be distributed to the MMDAs according to a formula approved by parliament every fiscal year. In recent times, the GoG and its development partners have instituted a performance based grant system called the District Development Facility (DDF) to allocate further funds to MMDAs. Generally, revenue sources of MMDAs are categorised into three main groups: Own generated revenue which most of the times is referred to as Internally Generated Funds (IGF); transfers which include the DACF, DDF and other government and donor transfers; and lastly, ceded revenue.

It will be realised that MMDAs command a substantial amount of resources at the local level. In order not to misappropriate these resources and engage in inefficient spending, the Auditor General is mandated by the constitution to audit these MMDAs and submit its report to the parliament for onward action. In the case of abuse of power or maladministration, the Commission for Human Right and Administrative Justice (CHRAJ) is empowered to open investigations into the operations of MMDAs upon request from a citizen(s).

2.6 Departments under MMDAs in Ghana

Before the coming into effect of LI 1961 in 2009, The Local Government Instrument (Departments of District Assemblies Commencement), Ghana was running an uncoordinated system of decentralisation. In that, the budgets of the various MMDAs were only for the central administration and it conforms to the Annual Action Plan (AAP) of the District which is derived from their District Medium Term Development Plan (MTDP). On the other hand, budgets of decentralised departments were aligned to their parent Ministries' Sector plan thereby resulting in a very weak link to the Districts' AAP and MTDP. This led to a conflict between the central and local government as regards to assignment of responsibilities. The LI

1961 set in motion the decentralised departments as department under the district assemblies as a means of addressing this inherent difficulty in responsibility assignment. LI 1961 establishes 16 departments in Metropolitan Assemblies, 13 departments in District Assemblies and 11 departments in District Assemblies⁵. The number of departments an assembly has defines its responsibilities and thus, the scope of service delivery.

The Central Administration is responsible for the district's general administration needs and also offers support services to other departments under the assembly. Prudent and sound financial management of the district is placed under the direct care of the Finance department. The Education department in the district joins together the Ghana Education Services (The District's Directorate of Education), the Youth Council, the Sports Council and the Library Board operating under the District's jurisdiction. The department is responsible for pre-school, basic school, special school, youth and sports development and organisation, and library services. The Health department at the district level is made up of the Office of District Medical Officer of Health and the Environmental Health Unit. The department among others offers advice on the construction and rehabilitation of health facilities in the district. They also provide assistance in operating and maintaining of health facilities.

The Works department combines District Water and Sanitation unit, Rural Housing and Works Unit, Public Works department, Feeder Roads and Rural Housing departments. The department is mandated to ensure easy access to roads, markets, public buildings including offices and also provide portable water. They also work with the Electricity Company of Ghana to provide street lighting in the district. The Waste Management Department is tasked with the provision of infrastructure and also outline programmes for the efficient and effective management of waste in the district. The Agriculture Department among other things provide and promote extension services to farmers in the district and also all issues

⁵ Table 2.1 gives the details of specific departments under each Assembly.

relating to agriculture including veterinary and irrigation services, forage production, agro-processing and storage. There is also the Physical Planning Department which manages the activities and performs the function of Town and Country Planning and Parks and Gardens departments.

Table 2.1: Departments under MMDAs in Ghana

Metropolitan Assemblies	Municipal Assemblies	District Assemblies
1. Central Administration Department	1. Central Administration Department	1. Central Administration Department
2. Finance Department	2. Finance Department	2. Finance Department
3. Department of Education, Youth and Sports	3. Department of Education, Youth and Sports	3. Department of Education, Youth and Sports
4. Metropolitan Health Department	4. Municipal Health Department	4. District Health Department
5. Department of Agriculture	5. Department of Agriculture	5. Department of Agriculture
6. Physical Planning Department	6. Physical Planning Department	6. Physical Planning Department
7. Department of Social Welfare and Community Development	7. Department of Social Protection and Community Development	7. Department of Social Welfare and Community Development
8. Works Department	8. Works Department	8. Works Department
9. Department of Trade and Industry	9. Department of Trade and Industry	9. Department of Trade and Industry
10. Natural Resources Conservation, Forestry, and Game and Wildlife Department	10. Natural Resources Conservation, Forestry, and Game and Wildlife Department	10. Natural Resources Conservation, Forestry, and Game and Wildlife Department
11. Disaster Prevention Department	11. Disaster Prevention Department	11. Disaster Prevention Department
12. Department of Roads	12. Department of Roads	
13. Department of Transport	13. Department of Transport	
14. Waste Management Department		
15. Budget and Rating Department		
16. Legal Department		

With attention to national policy, the Department of Social Welfare and Community Development provides assistance to the Assembly in the formulation and implementation of social welfare and community development policies. When it comes to the developing and sustaining forestry and wildlife resources in the district, the Department of Natural Resource Conservation, Forestry and Game and Wildlife is placed in charge. Thus this department under the Assembly merges the functions of Forestry and Wildlife Department. Another important and key department which is under the MMDAs is the Department of Trade, Industry and Tourism. As the name suggest, the main function of this department is to provide directions as regards to issues of trade, cottage industry and tourism in the district. This department is made up of the previous National Board for Small Scale Industries (NBSSI). Other departments under MMDAs are the Budget and Rating Department which is in charge of the preparation and execution of budgets, the Legal Department which handles all legal issues of the Assembly and the Disaster Management and Prevention Department. Moreover, there is also the Department of Roads and Department of Transport.

2.7 Scope of Service Delivery by MMDAs in Ghana

According to the National Decentralisation Action Plan (NDAP, 2003) of Ghana; policy planning, evaluation, monitoring and promotion is vested in the central government (Ministries, Departments and Agencies of central government); the Regional Coordinating Councils (RCCs) main responsibilities are coordination and monitoring of programs; while at the district level, MMDAs are entrusted with implementation of development programs. This makes MMDAs key in development programming and to a very large extent service delivery at the local level. Notwithstanding, service delivery and development program implementation remains a shared responsibility between the central and the local government.

For example in the provision of education services, basic education is assigned to MMDAs while the central government have control over education policy and vocational/technical and tertiary education. In health services MMDAs main task are public health, environmental protection and sanitation. As regards to utilities, MMDAs exercise complete responsibility over water supply service while the central government takes control of electricity production and distribution. Furthermore, refuse collection and disposal is well under the mandate MMDAs. Refer to table 1A in the appendix for complete assignment of responsibilities between central and local government for service delivery.

In this chapter, we have presented a history of decentralisation in Ghana. We started with the pre-independence form of decentralisation, the structure and operations of local government during the colonial days and also the post-independence modifications to the local government structure. We also discussed the current system of local government in Ghana and again the changes that have been made to our local government system to date. We presented the legal regime within which MMDAs operate in Ghana and the structure and composition of the current local government system in Ghana. We proceeded with discussions on the various functions performed by MMDAs as mandate by relevant laws, their funding sources and modus operandi of MMDAs in Ghana. The chapter concluded with the departments that fall under each category of MMDA and the scope of their service delivery.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

In this chapter, a review of relevant literature on decentralisation, fiscal federalism (fiscal decentralisation)⁶, economic efficiency, local government efficiency among others is conducted. It begins with the theoretical review given an in depth review of studies in decentralisation and the forms it takes, fiscal decentralisation, economic efficiency and how it has been measured. The subsequent section does justice to the empirical review. We also present a comprehensive review of studies of local government efficiency from developed and developing world with emphasis on Sub-Saharan Africa (SSA).

3.2 Theoretical Review

3.2.1 Decentralisation

Decentralisation has been viewed as both an ultimate aim in good government and key condition for realising sustainable growth (Chikulo, 2000). The World Bank (2000) describes decentralisation as the assignment of government's power and duties for public tasks from the central administration to intermediate and local governments or quasi-independent government organisations and/or the private sector. The World Bank sees decentralisation as a mixture of fiscal, political and administrative phenomenon.

Decentralisation is a comprehensive subject and it has been defined and used to express different opinions by various authors (Rondinelli, 1981; Conyers, 1983; Rondinelli et al., 1983; Hyden, 1983; Mawhood, 1983; Smith, 1985; Falleti, 2004). Rondinelli (1981) and

⁶ Fiscal federalism and fiscal decentralisation will be used interchangeable as they mean the same thing theoretically.

Rondinelli et al. (1983) contributed much to the literature on decentralisation and they define it as:

The means of transferring or delegating authority to plan and make decisions and manage public functions from the central government and its agencies to field organizations of those agencies, subordinate units of government, semi-autonomous public cooperation, area-wide development authorities, functional authorities, autonomous local governments or non-governmental organizations (Rondinelli et al. , 1983; page 13) .

The above definition offered by Rondinelli (1981) and Rondinelli et al. (1983) is regarded as the most complete and comprehensive as it spelt out what, why and to whom authorities and responsibilities has to be transferred. Accordingly, authorities are devolved to plan, make decisions and perform government functions and they are to be devolved to autonomous local governments, functional authorities and semi-autonomous public cooperation, field agencies of government, area-wide development authorities, and subordinate units of government.

Conyers (1983) defines decentralisation as the shifting of both political decision making and administrative power to lesser tiers of the government structure. To Conyers any assignment of authorities or responsibilities of government to any subnational level from the state can be termed as decentralisation. Smith (1985) views decentralisation as reassigning policymaking power and management from central government to lesser tiers of governments and also seems to be much related to politics. For Smith, decentralization concerns refocusing governance from the state to local authorities. Falleti (2004) defines decentralisation as a state policy which is intended to assign power, tasks, or resources to a lower level government from a higher level of government. Accordingly, Falleti (2004) views decentralisation as a sequence of process, territorial interests and feedback effect.

3.2.2 Forms of Decentralisation

Rondinelli (1981) and other authors like Rondinelli and Nellis (1983), and Rondinelli et al (1989) have identified numerous forms of decentralization. These include deconcentration, delegation, devolution and privatisation. The various form of decentralisation will be briefly discussed below.

Deconcentration

This form of decentralisation is seen as the lowest form. According to Rondinelli (1981), it simply consist of transfer of assignments to staffs of subsidiary units of government outside the capital of a particular country with little or no capacity to determine in what shape or form these assignments should be performed. These tasks are transferred from central government ministries or headquarters which are normally located in the country's capital. This form is very common in Ghana where government corporations such as Electricity Company of Ghana (ECG) have offices at places outside Accra (the national capital). The decentralisation which took place during the colonial days also took this form.

Delegation

In delegation, particular actions or a range of actions are decentralised to a board of authority which is created by the central government to plan and implement these actions assigned to them (the board) within exact spatial limitations of the organisation (Rondinelli, 1981). It is presumed that the organisations have technical and administrative expertise to perform the responsibilities assigned to them efficiently. They have some authority to formulate policies, regulate, plan and perform all managerial functions of the organisation they are delegated to. A lot of examples can be cited in Ghana. For example, the various boards that oversee the activities of the various state organisations.

Devolution

This is regarded as the most purest and extensive form of decentralisation. This occurs when the central government transfers administrative management, decision making, and finance powers to pseudo independent units of local government. In this form, local governments are; to be autonomous, to be allocated a jurisdiction in clear and legally recognised boundaries, and given the power to raise the required resources for development. Ghana's decentralisation process is of this form whereby the MMDAs are given legislative, deliberative and executive authority at the local level.

Privatisation

Some authors do not recognise privatisation as a form decentralisation. Privatization includes the process whereby the central government diversify the obligations for particular functions and assigning them to private enterprises so as to ensure increased competitiveness and efficiency (Lauglo, 1995; Savas, 2000). A classic example in Ghana is the privatisation of Ghana Telecom to Vodafone in 2007.

3.2.3 Fiscal Decentralisation

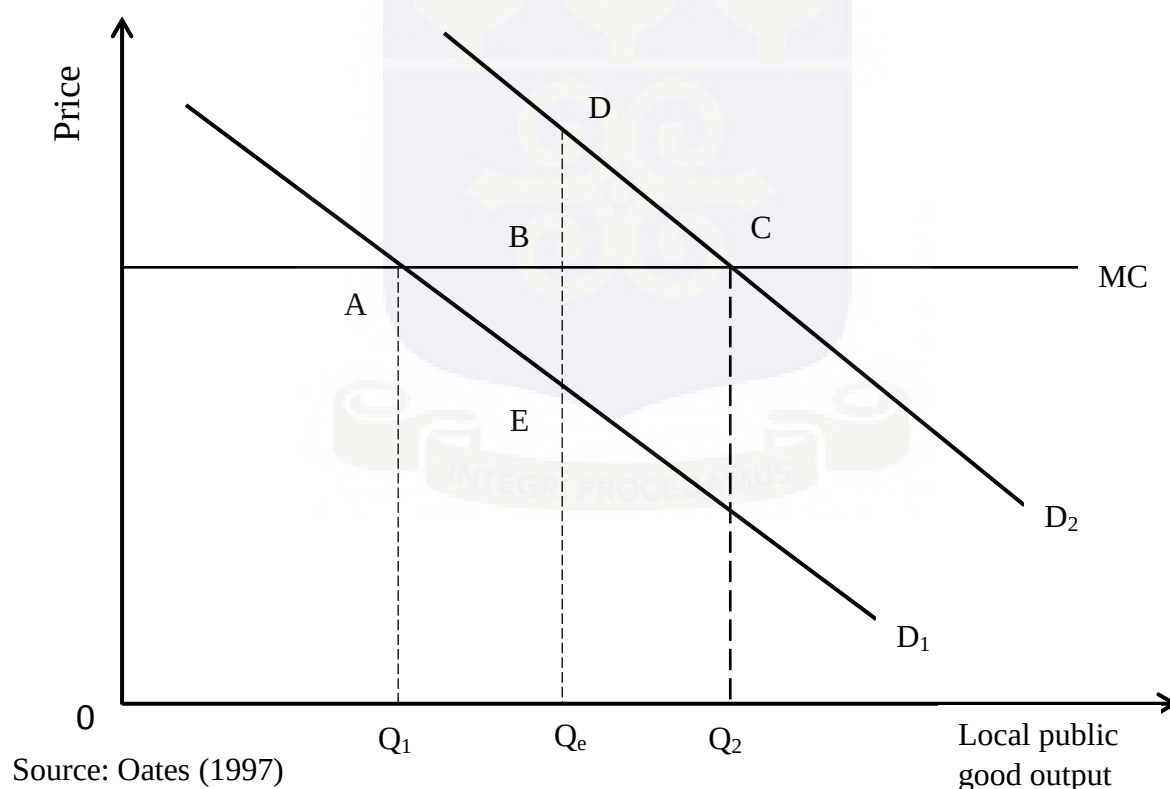
Fiscal decentralisation is the spread of central governments' taxing and spending authority to lower tiers of government. Porcelli (2009) describes fiscal decentralisation as either concerning subsidiarity of expenditures when spending tasks is given up to local governments, or devolution of a tax tool when the task of raising revenue through taxes is assigned to local governments. Thus Porcelli (2009) views fiscal decentralisation as an institutional framework in two ways; expenditure devolution and revenue devolution. According to Musgrave (1959) and Oates (1972) the original theory of fiscal decentralisation provides a universal prescriptive outline for the transfer of roles to diverse levels of government and the suitable fiscal instruments for executing these roles.

Oates (1972) decentralisation theorem (DT) places the provision of goods to which demand is peculiar to a jurisdiction in the hands of local governments whereas the central government should be concerned with the reallocation of income and the stabilisation of the economy.

The DT proposition states simply that

For a public good—the consumption of which is defined over geographical subsets of the total population, and for which the costs of providing each level of output of the good in each jurisdiction are the same for the central or for the respective local government—it will always be more efficient (or at least as efficient) for local governments to provide the Pareto-efficient levels of output for their respective jurisdictions than for the central government to provide any specified and uniform level of output across all jurisdictions (Oates, 1972; page 35).

Figure 3.1: Welfare Gains from Fiscal Decentralisation



In figure 3.1 we demonstrate the welfare gains from fiscal decentralisation as opined by Oates (1972). Assume that the curves D_1 and D_2 are the demand curves for a public good in

jurisdiction 1 and 2 respectively. We also assume that the cost for providing this good is same across all jurisdictions which is given by the straight line MC. Then Q_1 and Q_2 represent the optimal output levels for jurisdictions 1 and 2 respectively when the production of these goods is placed in the care of local authorities. Now let assume the central government want to introduce a one-size-fit all policy in the provision of public good across all jurisdictions then the output level which is optimal is Q_e . Clearly the loss to societal welfare is given by the triangles ABE and BDC accordingly. Thus it is proven that decentralised provisions will increase overall society welfare since Pareto-efficient provisions are delivered at each jurisdiction.

The basic problem therefore is how to plan multitier governance structure which will be able to appropriately allocate tasks and fiscal tools within a suitable framework. As opined by Oates (1999; 2) “we need to understand which functions and instruments are best centralized and which are best placed in the sphere of decentralized levels of government”. Therefore, the main problem of fiscal decentralisation is unravelling the straight down organisation of the public sector. Therefore, a proper fiscal decentralisation distinguishes clearly the roles for both central government and local governments in terms of their taxing and spending responsibilities.

Fiscal federalism theory has grown through the years and different doctrines and modifications have been proposed by different authors (Lockwood, 2002; Besley & Coates, 2003; Lockwood, 2007) to further make a case for fiscal decentralisation. In their study of compromise between decentralisation and centralisation in a political economy context, Lockwood (2002) and Besley and Coate (2003) moved off completely from the key assumptions of Oates (1972) DT. The assumption of benevolent central planner was abandoned in favour of a more genuine case of varying provisions of public goods at different jurisdictions by the central government. In this setting the provisions at the various

jurisdictions is carried out by way of negotiations among the various jurisdictions through their representatives. According to this model legislative rule supersedes the central planner's behaviour.

Assuming equal choices and spill over effect exist, Lockwood (2002) demonstrates that, centralisation can never match the efficiency levels which can be realised with decentralisation. Lockwood (2002) paid more attention to the compromise between centralisation and decentralisation. Efficient compromising process is determined by the least cost combination of resources which limit the extent of efficiency gains from centralisation. Consequently, there is a higher likelihood that production of public goods which has high surpluses will be overlooked in favour of those with substandard quality. In effect equilibrium provision of public goods in a centralised environment will be less efficient to decentralised provisions.

Given heterogeneous demand across jurisdictions, Besley and Coate (2003) interest was on voters' strategic preference of representatives. In a situation where homogeneous choice among jurisdictions and spill over effects even exist, Besley and Coate (2003) illustrates that, the level of welfare gains from decentralisation is always and everywhere higher than the welfare gains from centralisation. This is because the median voter will all the time choose a representative whose preference is higher if not at least equal to his own preference which results in the production of public good which is more efficient under decentralisation equilibrium.

Lockwood (2007) assumed a direct democracy where alternative government policies and programmes are executed through popular votes substituting the political economy model's assumption of benevolent government. The idea is for the citizens to choose the best from a range of contesting public goods and tax bundle. Even if the average choice is equal to the

median voter choice, DT will still be valid. Two possible situations arise in the face of this. First, regardless of no externalities and variation of choices across municipalities, centralised provisions benefits may be over and above the decentralised provisions; and secondly, welfare gains from decentralised provisions can be greater than centralised provisions irrespective of equal preferences and spill-over effects.

The above new and significant theories have given more reasons why decentralised provisions should be always preferred to centralised provisions even in the existence of benevolent central planner, externalities and identical choices. It is therefore safe to conclude that the argument for the devolution of governments' tax and spending responsibilities has always been on the grounds of efficiency. Thus fiscal decentralisation theorem is conclusive that decentralised provision of public service is always Pareto-superior to centralised provisions.

3.3.1 Efficiency in Economics

Efficiency is at the centre of any economic analysis; be it at the level of individual, firm or government. Economic efficiency at the microeconomics level can be defined as maximisation of output given inputs or minimising inputs used given output or the least cost combination of inputs. A comprehensive description of efficiency is offered by Koopmans (1951). Koopmans characterised a firm to be efficient if a fall in any factor necessitate a rise in at least one other factor or a minimum of a unit fall in production, and when a rise in production necessitate a minimum of a unit fall in production or a rise in at least one factor. Lovell (1993) examines the difference between observed inputs and outputs and optimal levels of inputs and outputs respectively as he studied the efficiency levels of production units. With a given output, Lovell observes the ratio of measured inputs and the least possible inputs required to produce the output. Alternatively, the comparison can take the form of the ratio of measured output to maximum output producible with a given input.

Kumbhakar & Lovell (2000) opined that, in order to achieve their goals, producers assign some available inputs to produce an output. They then view efficiency as the ability of a producer to combine successfully existing inputs to produce outputs. Alvarez et al. (2005) define efficiency to mean producing at a least cost or producing the feasible amount of output from a given set of inputs. Fried et al. (2008) describes efficiency as evaluating observed performance as against optimal performance as located on the related production possibility. The assessment can be done as evaluating actual inputs to minimum possible input needed for output production; or the evaluating actual output to the maximum obtainable from a given set of inputs; or a blend of the two.

From the forgone discussion, two possible definitions are provided. Efficiency can mean producing the maximum output from a given inputs or using the least amount of inputs to produce a given output. In both ways, the definition given above is what is termed as technical efficiency. Other types of efficiency are allocative (cost) and profit (scale) efficiency. Allocative efficiency is a situation whereby producers combine the right amount of inputs to produce an output given input prices. Profit or scale efficiency on the other hand is a situation whereby price of output and the cost of producing an additional unit of the output are the same. Technical and allocative efficiency are necessary but not sufficient condition for profit maximisation. That is, a producer can be allocatively and technically efficient but scale inefficient. That is a producer may combine the right amount of inputs but not producing at the minimum cost.

Leibenstein (1966) explained by his X-efficiency theory that firms may not be exhibiting optimizing behaviour because of fluctuating and imperfect conditions, including technology and not necessarily that they are employing the wrong combinations of inputs. Leibenstein discusses that firms operate in an external and internal conditions or environment which differs in comparison to their organisational situations. Furthermore, there is the possibility of

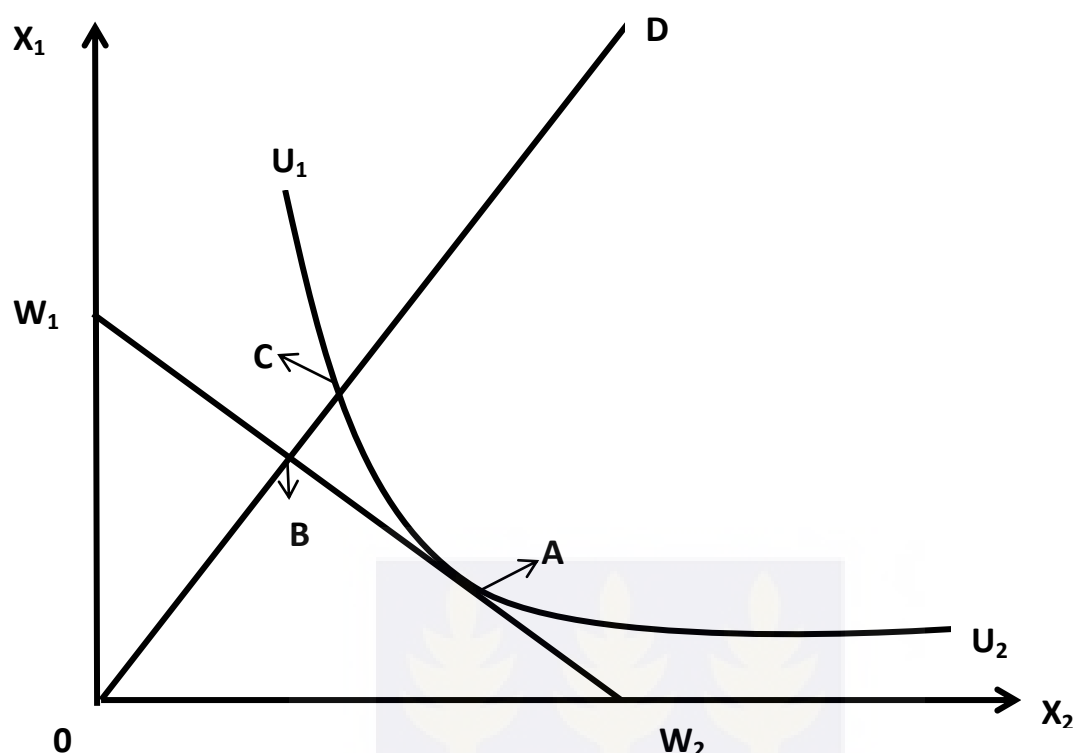
inconsistencies between observed factors employed and minimum inputs and of observed outputs and feasible outputs and also possible variations in the use of effective factors between firms in the same industry. Leibenstein clarifies that the 'effort input' concerning usage and apportioning of these inputs in the firm relates to X-efficiency thereby making a distinction between X-efficiency and allocative efficiency. Therefore X-inefficiency is the apportioning of less work effort than required for profit maximisation which results in possible output loss.

However, X-efficiency does not determine economic efficiency but rather economic efficiency relies on X-efficiency. X-efficiency will be lower if there is less 'effort input' resulting from the utilisation of more factor inputs or cost and vice versa. Firms whose performance approximates the theoretical optimum are X-inefficient. Assuming firms have identical technology and relative prices for factor inputs, there could still be the possibility of firms having their average cost curve still above the minimum.

3.3.2 Measurement of Efficiency

Debreu (1951) and Koopmans (1951) conceptualised the idea of efficiency measurement and popularised through objective investigations by Farrell (1957). No proper measurement of efficiency and frontier analysis can be done without the work of Farrell (1957). Debreu (1951) and Farrell (1957) familiarised technical efficiency measurement. They presented the definition of technical efficiency measurement as; one minus the maximum equiproportionate (i.e., radial) decrease in all inputs that is feasible with a given technology and outputs assuming an input conserving orientation. With an output augmenting orientation their measure is defined as the one minus the maximum 'radial' increase in all outputs that is feasible with given technology and inputs.

Figure 3.2: Debreu and Farrell Measure of Technical and Allocative Efficiency



Farrell's measure of efficiency can be illustrated in the figure 3.1. We assume a producer employing inputs X_1 and X_2 to produce an output q . U_1U_2 is the unit isoquant of the producer and W_1W_2 is the isocost line. Assuming the producer is producing at point D , the technical inefficiency is measured by the ratio OC/OD . Now assume that inputs prices are observed then allocative inefficiency is measured by the ratio OB/OC . The overall inefficiency (allocative plus technical) is given by the ratio OB/OD . At point A , the producer is both technical and allocatively efficient.

Due to the impossibility of altering the 'radial', technical efficiency is assigned the number one with technical inefficiency measured by any number between zero and one. Shepherd (1953) contributed to the literature by his introduction of input distance function. The functional form of the technology in production gives the input distance function. Following from Farrell's work, different authors (Afriat, 1972; Charnes et al., 1978) have proposed

different techniques for measuring efficiency. The estimation of production frontiers and measure of efficiency can generally be classified into two groups namely;

- a) Non-parametric models which are made up of models developed by Farrell (1957) and Charnes et al. (1978), the Data Envelopment Analysis (DEA); and the Free Disposal Hull (FDH) developed by Deprins et al. (1984).
- b) Parametric models made up of the Deterministic Frontier Analysis (DFA) developed by Aigner & Chu (1968) and the one developed independently by Aigner et al (1977) and Meeusen & van den Broeck (1977) in separate papers, the Stochastic Frontier Analysis (SFA).

Nonparametric Approach to Efficiency Measurement

The Data Envelopment Analysis (DEA) has been usually fitted into the non-parametric approach (Murillo-Zamorano, 2004). The DEA approach to efficiency estimation started with the seminal work of Farrell (1957). Farrell (1957) used a frontier of unit-isoquant to characterise the production possibility set and since Farrell's efficiency scores relied on data, a functional form was not explicitly imposed on the data. Consequently, the production possibility set which is made up of a convex hull of inputs and outputs vectors were used to estimate efficiency in production.

Charnes et al. (1978) have since reformulated Farrell's work as a problem of mathematical programming and extended it to include many inputs and outputs⁷ and has since been referred as the CCR model. The new model was named by Charnes et al. (1981) as the Data Envelopment Analysis (DEA). DEA estimates production frontiers and use it to evaluate efficiency scores of decision making units (DMUs) by comparing the efficiency scores to the estimated frontiers through the use of linear programming techniques on observed data. The

⁷ The original work by Farrell (1957) consisted of only a single input and output analysis.

model as proposed by Charnes et al. (1978) is an input oriented measure of efficiency and assumes constant returns to scale, convexity of the set of feasible input and output combinations and strong disposability of inputs and outputs. The assumption of disposability infer that any inputs expansion does not by any means transforms into output contraction and also any output contraction can be produced by identical quantities of inputs.

Let consider an N producers employing X vector of inputs to produce an output vector Q . For the n th producer, q_n and x_n represents it outputs and inputs respectively. Subject to the constraint that identical ratios for all other producers is either less than or equal to one, the CCR model measure efficiency for the n th producer as a ratio of weighted outputs over weighted inputs. The ratio is maximised for each producer. This is presented mathematically as;

$$\begin{aligned} \text{subject to} \quad & \text{Max}_{u,v} \quad f_o = \frac{u^1 q_n}{v^1 x_n} \\ & \frac{u^1 q_i}{v^1 x_i} \leq 1 \\ & u, v \geq 0 \quad \text{where } i = 1, 2, \dots, 3 \end{aligned} \quad (3.1)$$

u and v are outputs and inputs weights respectively; which are going to be obtained by solving the mathematical program above. The above program has an infinite number of solutions and thus we would want a unique solution which requires the imposition of the condition $v^1 x_n = 1$ which will give us:

$$\text{Max}_{\mu, \nu} \quad g_o = \mu^1 q_n$$

$$\text{subject to} \quad v^1 x_n = 1 \quad (3.2)$$

$$\mu^1 q_i - v^1 x_i \leq 0 \quad i = 1, 2, \dots, N$$

$$\mu, v \geq 0$$

The form of linear program presented above is called the multiplier form and the change in notations signifies that this is a different problem of linear programming. We now deduce a dual of this problem as:

$$\begin{aligned} & \text{subject to} \quad \text{Min}_{\rho, \tau} \quad \rho \\ & \quad -q_n + Q^1 \tau \geq 0 \\ & \quad \rho x_n - X^1 \tau \geq 0 \\ & \quad \tau \geq 0 \end{aligned} \quad (3.3)$$

Where ρ is the efficiency score for the n th producer and thus, is a scalar. τ is a vector of activity intensity. Rho (ρ) is the measure of technical efficiency and must be less than or equal to one (such that, $0 < \rho \leq 1$). If $\rho = 1$ then the producer under evaluation is technically efficient, or else, if $0 < \rho < 1$ then the producer is said to be technically inefficient.

The work by Charnes et al. (1978) has been modified by Banker et al. (1984) by relaxing the assumption of constant returns to scale and have considered a model of variable return to scale. They did this by imposing a convexity assumption: $I1^1 \tau = 1$ on equation (3.3). The VRS-DEA which is sometimes called the BCC model is therefore given by;

$$\text{Min}_{\tau, \rho} \quad \rho$$

$$\text{subject to} \quad -q_n + Q^1\tau \geq 0 \quad (3.4)$$

$$x_i\rho - X^1\tau \geq 0$$

$$I1^1\tau = 1, \quad \tau \geq 0$$

DEA defines a frontier envelopment surface for the entire sample observations with those DMUs lying on the frontier considered efficient and those lying outside the frontier classified as inefficient. Inefficiency scores will then be calculated for each one of them by comparing each DMU with a single referent DMU. Thus DEA compares each DMU with all the other DMUs, and identifies those units that are operating inefficiently compared with the other units. It also measures the degree of inefficiency of the inefficient DMUs compared to the best practice units. The best practice units are assigned with an efficiency score of one with the less efficient DMUs assigned a score between zero and one. Other authors have considered other forms of the model like output orientation and cost.

The other nonparametric approach is the Free Disposal Hull (FDH) reference technology which was proposed by Deprins et al. (1984). The FDH maintains the assumption of free disposability associated with the DEA but relaxes the assumption of convexity of the production set making it a more realistic assumption since it is almost not possible to estimate a convex production sets theoretical or validate it empirically. Therefore, both the FDH and DEA are consistent estimators if there is a convex production set but without it, the DEA becomes an inconsistent estimator. Due to its fewer assumptions, the FDH has a lower convergence rate as compared to the DEA.

The main advantage of the nonparametric approach is that no functional form is imposed on the data and accordingly misspecification of functional form is avoided. The main disadvantage of the nonparametric approach is that it is highly sensitive to outliers and

efficiency scores are points estimate making it impossible for statistical inference. Again there is provision for statistical noise or measurement error. Also, it requires a huge data set to give robust results.

Parametric Approach to Efficiency Measurement

As stated earlier, the parametric approach is decomposed further into Deterministic and Stochastic Frontier Analysis. Aigner and Chu (1968) were the first researchers to estimate a deterministic frontier production function using Cobb-Douglass technology which was linear in logs. Due to some limitations on technology within a particular industry, production units may operate in contrast as a result of variances in their production scale or the structure of their management (Aigner & Chu, 1968). The stochastic frontier approach is demonstrated below. Let,

$$y \leq f(x) \quad \text{with } i = 1, 2, \dots, n \quad (3.5)$$

Equation (3.5) represents a production function showing the relationship between inputs x , and output y , in which for any given observation, the observed value of y must be equal or less than $f(x)$, the potential level of output. Technical efficiency according to Debreu (1951) & Farrell (1957) is the proportion of observed output to maximum obtainable output. Applying the same definition here gives us:

$$TE = \frac{y}{f(x)} \leq 1 \quad (3.6)$$

Where $0 \leq TE \leq 1$.

Aigner & Chu (1968) then assumed a log linear Cobb-Douglass technology to describe the functional form of production in equation (3.5). Their functional form is given by;

$$Y_i = A X_{1i}^{\beta_1} X_{2i}^{\beta_2} U_i \quad (3.7)$$

Where U_i is a random disturbance term taking values between zero and one (i.e. $0 \leq U_i \leq 1$).

Taking natural logs of equation (3.7) and generalising to include multiple inputs will give:

$$\ln Y_i = \alpha + \sum_{k=1}^K \beta_k x_{ki} + \varepsilon_i = \alpha + \sum_{k=1}^K \beta_k x_{ki} - \mu_i \quad (3.8)$$

Where α is $\ln A$, $\ln X_{ki} = x_{ki}$ and $\mu_i = -\varepsilon_i = -\ln U_i$ which is a non-zero disturbance term measuring technical inefficiency.

The non-stochastic right hand side of the above equation is what is termed as deterministic frontier. Aigner-Chu proposed the estimation of the equation (3.8) by either linear programming or quadratic programming. In a deterministic frontier, the whole deficit in production is attributable to technical inefficiency. That is any inefficiency observed in production is due to the producer's own incompetence. Unfavourable factors such as bad weather, floods, and unfavourable economic outcomes which can affect production are not catered for in the deterministic frontier. Also, measurement errors (errors due to the choice of functional form) are not taken into consideration as well as statistical noise (errors due to omitted variables). That is what the Stochastic Frontier Analysis seeks to solve.

The Stochastic Frontier Analysis (SFA) is an extension to the deterministic frontier Analysis. Afriat (1972) was the first to conceptualise the idea and Aigner et al. (1977) and Meeusen and van den Broeck (1977) developed it further in separate papers. The deterministic frontier model was modified to include measurement errors and statistical noise to account for factors that are under the firm's control (inefficiency) and those factors that are out of the hands of the producer (noise). They accomplished this by decomposing the error term into two. An error term capturing both; statistical noise (to capture environmental shocks to production), and measurement errors (captures the firm specific effect); and another non-negative error term with one-sided distribution picking up the inefficiency. A SFA model can now be written as:

$$y_i = f(x_i)TE_i e^{v_i} \quad (3.9)$$

v_i captures statistical noise and measurement errors and all other terms are defined as before.

Applying natural logs to equation (3.9) gives;

$$\ln y_i = \alpha + \beta^T x_i + v_i - \mu_i = \alpha + \beta^T x_i + \varepsilon_i \quad (3.10)$$

Equation (3.10) is the stochastic production frontier with v_i having symmetric distribution capturing the random effect of measurement errors and factors that are out of control of the production unit. Technical inefficiency is then captured by the error term $-\mu_i$, where $\mu_i \geq 0$. The non-negative technical inefficiency error term ensures that all observation lie on or below the frontier. The noise component v_i is assumed to be independently and identically distributed and distributed independent of u_i . Thus the sum of the error terms is asymmetric.

The main disadvantage of this model is the imposition of a functional form which can be overly limited. A more general translog specification is used most of the times to overcome this problem (Christensen et al., 1973). Also, it is not possible to decompose the individual error terms into their two components part and thus it becomes difficult to measure the relative inefficiency of firms. This can be overcome by estimating a mean efficiency score over the sample.

3.2 Empirical Review

The study of local government's efficiency is a small research area as compared with other public sector research areas although the cited works on it has been growing over the years (Junqueira, 2015). There have been many empirical studies that have focused on the evaluation of efficiency in local governments from multiple points of view and contexts (Narbón-Perpiñá & De Witte, 2016). We can identify two types of empirical research: one evaluate local governments' efficiency in the delivery of multiple services; and the other

focus on a particular (singular) service offered by local governments examples of that include education services delivery (Stevens, 2005), waste management (Bosch-Rocha et al., 2012), road maintenance (Kalb, 2012), health services delivery (Mbonigaba & Oumar, 2014) and so on. Whereas some authors evaluate cost efficiency of local governments (Loikkanen & Susilouto, 2005; Pevcin, 2014a) others focus on the technical efficiency of local governments (Geys & Moesen, 2008; Lo Storto, 2013).

Furthermore, while some authors (Moore et al., 2005; Stastna & Gregor, 2011; Marques et al., 2015) just measure the efficiency of local service delivery, other authors (Balaguer-Coll et al., 2007; Afonso & Fernandes, 2008) conduct further investigations into what determine efficiency of local service delivery. Studies by Balaguer-Coll et al. (2010a) and Boetti et al. (2012) have actually investigated the impact of fiscal decentralisation on the efficiency of local governments. However, some authors in trying to determine what causes inefficient spending behaviour of local governments have included fiscal decentralisation variables (De Borger & Kerstens, 1996a; Balaguer-Coll et al., 2007; Benito et al. 2010). Others still investigate the links between efficiency and other policy variables like direct democracy (Asatryan & De Witte, 2015), political competition (Ashworth et al. 2014), municipal size (Bonisch et al., 2011; Soukopová et al., 2014) and ethnic fragmentation (Nikolov & Hrovatin, 2013). The review focuses on related studies that investigated the effect of fiscal decentralisation on the efficiency of local governments in the provision of multiple services.

Using a wide range of parametric (deterministic and SFA) and nonparametric (FDH and DEA) reference technologies, De Borger & Kerstens (1996a) assessed 589 Belgian municipalities for their spending efficiency. Total current expenditure was their measure of main input while beneficiaries of minimal subsistence grant, primary school enrolment, public recreational facilities and share of aged population 65 and above was the range of outputs measures used. Findings of the studies showed that high tax rates impact positively

on the efficiency of municipalities in Belgium; however, grant was shown to influence efficiency negatively. Also, mean efficiency scores for Belgium municipalities ranged between 0.57 and 0.94. They furthermore find out huge disparities in efficiency scores with fairly low rank correlation between the two approaches.

Balaguer-Coll et al. (2010a) measured the efficiency of local governments in Spain and investigated whether enhanced autonomy has improved efficiency. They applied the two-stage DEA and one-stage SFA approaches to measure efficiency and determine the impact of enhanced autonomy has on efficiency. The main categories of inputs variables used included current expenditures, capital expenditures and financial expenditures. On the other side, their output variables included street lighting points, tons of waste collected, street infrastructure, public building, number of *Lonjas* (markets), public parks and assistance centres. His findings were that enhanced autonomy of local government improves efficiency. Stated differently, increased autonomy of Spanish municipalities increases efficient spending behaviour. There was a high variation in mean efficiency scores for municipalities in Spain ranging from 0.53 to 0.90.

Boetti et al. (2010) evaluated 262 Italian municipalities in the province of Turin for their spending efficiency using DEA and SFA techniques. They used current expenditures in general administration, road maintenance and local mobility, garbage collection and disposal, education and elderly care and social services as their main input indicators. Their output indicators included total population, total length of municipal road, waste collected, enrolment in nursery, primary and secondary school and population aged 75 and over. They concluded that, municipalities that are fiscally autonomous- measured as the share of own taxes in current expenditure-exhibit less inefficient spending. They also found that there is excess spending whenever elections are proximate confirming the 'electoral budget cycle'. The average efficiency scores were between 0.74 and 0.80.

Using the DEA, Benito et al. (2010) measured and explained the difference in mean efficiency of 31 Spanish municipalities in the Murcia Region. Benito et al. (2010) used a wide range of outputs variables in police, cultural, sports, green areas, refuse collection and water supply services. Their main input variables included personnel expenditure, current consumption and current transfers. Their results were that a higher tax burden seems to impact on efficiency positively. Also, outsourcing water supply to an entity which the local assembly has power over improves efficiency as compared to privatisation. Moreover, they discover that high economic level is associated with high efficiency but the association was weak. Placing the management of refuse collection in the hands of public officials was also found to be more efficient than to place it in the hands of the private sector but again the evidence in support of this was weak. The difference in average efficiency scores for Spanish municipalities in Murcia region was between 0.53 and 0.90

In the developing world, De Sousa & Ramos (1999) used current expenditure as their main input variable and also population, waste collection, water supply and primary and secondary school education as their output variables, to measure the technical efficiency of Brazilian local governments. Their main technique used was the DEA. The differences in efficiency for Brazilian municipalities were quite wide ranging from 0.52 to 0.92. Moreover, Yusfany (2015) utilised the DEA approach to measure and explain the relative efficiency of Indonesian local governments. Per capita expenditure was used as the main input while primary school enrolment rate, length of road, health centres, access to electricity and water, economic growth, unemployment rate and poverty were used to construct an output variable which he referred to as Local Government Output Indicator (LGOI). The results from the study were that transfers from central government drive inefficient spending behaviour of local government in Indonesia. Also population density and the extent of ethnic

fragmentation had a positive impact on efficiency. The average efficiency of Indonesian local governments was 0.50.

On the African continent, El Mehdi & Hafner (2014), using DEA analysed the efficiency of municipalities in Morocco. Their measure of input was local revenue and the ratio of municipal revenue to operating expenditure which they termed financial autonomy was used as an output measure. They concluded that mean efficiency differs from 0.30 to 0.50. In SSA, Monkam (2014) also assessed 231 South African local municipalities in their productive efficiency by adopting the DEA approach. Total municipal current expenditure was used as measure of input and number of consumer units receiving water, sewerage, solid waste management and electricity services and total municipal population were the measures of output. Their findings indicated that fiscal autonomy-measured as share of local taxes in total revenue-had a positive and significant relationship with efficiency. Also the management skill and the number of municipal managers impacted efficiency positively. Moreover, high income and highly educated households were found to be not motivated to take part in decision making. They also found that South African local municipalities on average have an efficiency score of 17%. Put differently, South African local municipalities could use averagely 83% fewer resources to theoretically produce equal output levels or deliver basic services.

The approaches to measure efficiency of local governments were mainly the DEA, FDH and SFA. The DEA has been the most dominant approach due to its less restrictive assumptions and greater flexibility to accommodate multi-input and multi-output analysis than the parametric approach (Ruggiero, 2007). However, some authors (for example De Borger & Kerstens, 1996a) have provided evidence that combining both parametric and nonparametric approaches give more robust results than restricting it to only one approach. There are varying degrees of inputs and outputs indicators employed to measure local governments'

efficiency. The choice of inputs and outputs depend first; on the availability of data; and also the institutional arrangement regarding the mandate of local governments in a particular country. The outputs and inputs measures were crude proxies due to the difficulty in measuring and quantifying public sector outputs and inputs.

In modelling for the inclusion of nondiscretionary inputs, a two-stage approach has been used mostly when efficiency scores are obtained by the DEA and FDH approach. However, when efficiency estimates are obtained by the SFA approach, the one-stage approach proposed by Battese & Coelli (1995) has been used most of the times. The non-discretionary inputs included socioeconomic and demographic features, political and fiscal decentralisation. From the review, most studies investigating local government efficiency are done for developed countries with few focusing on developing countries and for that matter SSA. Indeed the literature on the impact of fiscal decentralisation on efficiency of local government is scant if non-existent. However, as in the case of developed regions some authors include fiscal decentralisation variables as a determinant of efficiency (Monkam, 2014; Yusefany, 2015). This leaves a huge gap in the literature on fiscal decentralisation and the efficiency of local government, especially in the SSA. Our contribution to the literature will be to investigate the influence of fiscal decentralisation and effective district administration as represented by Functional Organisational Assessment Tool (FOAT) has on efficiency of MMDAs.

In this chapter we have reviewed relevant literature relating to decentralisation and in this respect fiscal decentralisation, the concept of economic efficiency and how it is measured and we concluded with an empirical review of local governments' efficiency in the developed and developing world with special emphasis on SSA.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter discusses the techniques which are used for this study. The next section will give the theoretical underpinnings of productivity and efficiency measurement. The subsequent section will present the model for the nonparametric approach (DEA) to efficiency measurement with a subsection on presentation of Tobit regression model. This is followed by the parametric approach (SFA) in next section. The chapter ends with a section on data sources for my variables and how the variables are described and measured.

4.2 Theoretical Underpinnings

Our definition of production is, minimising inputs as much as possible to produce a given quantity of outputs. We will consider n producers using a vector of inputs $x = (x_1^n, x_2^n \dots x_m^n) \in R_+^m$ to produce a vector of outputs $q = (q_1^n, q_2^n \dots q_k^n) \in R_+^k$. Then the technical know-how in transforming inputs into outputs can be given as:

$$T = \{(q, x); x \text{ can produce } q\} \quad (4.1)$$

We can then transform the above equation into a set of inputs requirement as:

$$L(q) = \{x: (q, x) \in T\} \quad (4.2)$$

The inputs set $L(q)$ is a pool of input vectors x that are used in the production of no less than the output vectors q . To which for every output vector q have an input isoquant given by:

$$l(q) = \{x: x \in L(q), \lambda x \notin L(q), \lambda < 1\} \quad (4.3)$$

Then the input efficient set derived from the input isoquant can then be given as:

$$E(q) = \{x: x \in L(q), x' \notin L(q) \text{ for } x' \leq x\} \quad (4.4)$$

We can similarly deduce the input distance function for the input set according to Shepherd (1953) as:

$$d_i(q, x) = \max \left\{ \delta: \frac{1}{\delta} x \in L(q) \right\} \quad (4.5)$$

With a vector of output, the above function describes the technology of production by considering the least proportionate reduction of the input vector. The distance is equal to one if the input vectors belong to the input isoquant and the distance will be greater than or equal to one if the input vectors belong to the input set. This can be expressed in mathematics as, $d_i(q, x) = 1$ if $x \in l(q)$ and $d_i(q, x) \geq 1$ if $x \in L(q)$. The input distance function is also non-decreasing in x and non-increasing in q . It is also concave in x and quasi-concave in q . The idea behind the input distance function is to describe the production technology of producers without imposing any behavioural assumption on them (Coelli et al., 2005).

4.3 Empirical Model

In this thesis, we apply the DEA and SFA to measure the efficiency of 216 MMDAs in Ghana for the year 2013 using expenditure on; compensation for employees, assets and goods and services and total coverage area as inputs and District Composite Output Indicator (DCOI) as output. Following from the objectives of the study, we adopt a second stage Tobit regression to DEA estimates; while in the SFA case we use the one stage approach offered by Battese & Coelli (1995) to investigate the impact of fiscal decentralisation and other control variables on the efficiency of MMDAs in Ghana.

4.3.1 The DEA Model

We estimate an input oriented variable returns to scale version of the DEA (VRS-DEA). That is, we are interested to know how much inputs can be reduced while producing the present levels of outputs by MMDAs. Let consider N MMDAs using a vector of inputs X to produce a vector of outputs (local service delivery) Q . Our inputs include expenditure on compensation of employees which represent labour inputs; expenditure on assets representing capital inputs; expenditure on goods and services representing material inputs and total coverage area representing land inputs. On the output side, we use a composite output which we call District Composite Output Indicator (DCOI) and we calculate it using MMDAs outcomes in education, health, waste and lastly water delivery services. Then for the i th MMDA, q_i represents its output (DCOI) and x_i represents its inputs. Consequently our DEA model will be given by;

$$\begin{aligned} & \text{Min}_{\lambda, \rho} \quad \rho \\ \text{Subject to: } & -q_i + Q^1 \lambda \geq 0 \\ & x_i \rho - X^1 \lambda \geq 0 \\ & \lambda \geq 0 \end{aligned} \quad (4.6)$$

q_i is a 1×1 vector of output indicator for the i th MMDA;

x_i is a 4×1 vector of input indicators for the i th MMDA;

Q is a 216×1 vector of output for all MMDAs;

X is a 216×4 matrix of inputs for all MMDAs;

λ is a 216×1 vector of weights; and

ρ is the measure of efficiency for the i th MMDA, which should be less than or equal to one. That means, $(1 - \rho)$ represents the proportion of inputs that should be reduced for the i th MMDA.

We assume that MMDAs do not operate under full scale meaning we estimate the variable returns to scale (VRS) version of the DEA model as proposed by Banker et al. (1984). We do this by imposing a convexity assumption: $I1^1\tau = 1$ on equation (4.6). The VRS-DEA is therefore given by;

$$\begin{aligned} & \text{Min}_{\lambda, \rho} \quad \rho \\ \text{Subject to:} \quad & -q_i + Q^1\lambda \geq 0 \\ & x_i\rho - X^1\lambda \geq 0 \\ & I1^1\lambda = 1, \quad \lambda \geq 0 \end{aligned} \quad (4.7)$$

We will then solve the above linear programme for each of the 216 MMDAs using the Benchmarking package (Bogetoft & Otto, 2015) in ‘R’⁸ and to obtain for each MMDA an optimal set (λ^*, ρ^*) , where λ^* is the optimal vector of activity and ρ^* is a vector of technical efficiency measures, thus it satisfies $0 < \rho^* \leq 1$. The constraint $I1^1\tau = 1$ ensures that only MMDAs of identical sizes are evaluated against inefficient MMDAs and it is also an indication that we are estimating a VRS-DEA. All other notations are as before.

4.3.2 Tobit Regression Model

The effect of fiscal decentralisation on the efficiency of MMDAs is going to be investigated in a second stage Tobit regression model. We also include some control variables that are found to be associated with local government efficiency (see for example DeBorger & Kerstens, 1996a; Benito et al. 2010). Our choice of a Tobit regression model is as a result of

⁸ R is a computer language and environment for statistical analysis and computing.

the structure of our regressand; it takes non-negative values that are less than or equal to one (i.e. $0 < te = \rho^* \leq 1$). Thus, using a Tobit model will produce consistent estimates of the parameter as compared to using an OLS model.

Our Tobit model will be given as:

$$\rho_i^* = \beta FD_i + Z_i \alpha + \epsilon_i \quad (4.8)$$

Where ρ_i^* is the technical efficiency estimated for the i th MMDA obtained by solving the linear program in (4.7). FD_i is a vector of fiscal decentralisation measure. Z_i is a matrix of control variables which influence technical efficiency of MMDAs in Ghana and α and β are vector of parameters to be estimated. ϵ_i is a normally distributed vector of error terms with mean zero and a constant variance, such that $\epsilon_i \sim N(0, \sigma_\epsilon^2)$. The control variables will include FOAT (*foat*), ‘perceived’ competency of MMDAs (*Com*), per capita grant (*grant*), incidence of poverty (*poin*), average years of education (*edyrs*) and total district population (*pop*).

Our main variable of interest is fiscal decentralisation. By fiscal decentralisation we mean either how fiscally autonomous a district assembly is or the degree at which district assemblies depends on the central government for their expenditure. The proxies to measure fiscal decentralisation are fiscal autonomy and vertical imbalance. It can be predicted that a high fiscal autonomy will induce public accountability and so will impact on technical efficiency positively. This is because citizens will want to know what their monies is been used for and thus will demand better services from local government officials. Thus we anticipate a positive relationship between fiscal autonomy and efficiency of MMDAs in Ghana (Boetti et al. 2010; Stastna & Gregor, 2011). Vertical imbalance can be predicted to have a negative association with efficiency of MMDAs. This is because over reliance on the central government implies that MMDAs are not generating enough internally. That is, as MMDAs increase their IGF in total revenue, the share of central government transfers in total

revenue reduces. In fact, the correlation between our two fiscal decentralisation variables is negative one (see table 1C in appendix). We run a baseline model with fiscal decentralisation and other control variables. This is to first, check for the robustness of our results and also which fiscal decentralisation variable has significant impact on efficiency of MMDAs.

An effective district administration can be theorised to have an impact on technical efficiency of MMDAs. For example an effective management of district resources will mean that a least combination of these resources are being used for provision of services. We therefore proxy for district administration with FOAT and incorporate it in our Tobit model. We expect a positive relationship between FOAT and efficiency of MMDAs in Ghana. Furthermore a high incidence of poverty in a district will mean that the district cannot generate enough in terms of IGF for its developmental agenda. Also poor households will find monitoring cost of projects as very high and will therefore be unable to criticise projects. This in the end will lead to high inefficient spending behaviour among local government officials. So we expect poverty incidence (*poir*) to have a negative relationship with technical efficiency.

It has been found that per capita block grant (*grant*) which includes DACF and DDF has an association with technical efficiency of local governments (Geys & Moesen, 2009; Kalb, 2010). This is because the famous ‘fly paper’ effect may be encouraged when the centre transfers funds to the peripheral in the form of grants. The effect of ‘fly paper’ is predictable since the nation as a whole suffers from the extent of any inefficient spending activities by local governments officials (Silkman & Young, 1982). So grant will also be included in our Tobit model. We therefore expect per capita grant to have a negative association with efficiency of MMDAs in Ghana. We also include ‘perceived’ competency of MMDAs (*Com*) in our model. It is measured as the percent of residents who see the local governments (MMDAs) as competent. An MMDA that is perceived by its residents as competent is expected to distribute resources efficiently for the overall development of their jurisdiction.

However, MMDAs that are perceived by their residents as less competent are likely to distribute the available resources inefficiently to promote the development of their jurisdiction.

A population which has a high average years of education will mean less time is spent on citizens who seek municipal services thereby improving the effectiveness of time use. Also, high average years of education will imply citizens will demand more from local government officials by way of putting pressure on them (local government officials) through the media and formation of pressure groups and civil society organisations (CSOs). So it is expected that the variable average years of education (*edyrs*) will impact on technical efficiency of MMDAs positively. A district with a large population is likely to benefit from scale economies when providing services to its residents. As a result efficient provision of services by local governments is induced. We capture this effect by adding the variable population (*pop*).

Therefore our Tobit model will be presented as:

$$\rho_i^* = \text{constant} + \beta FD_i + \alpha_1 \text{float}_i + \alpha_2 \text{Com}_i + \alpha_3 \text{grant}_i + \alpha_4 \text{poin}_i + \alpha_5 \text{edyrs}_i + \alpha_6 \text{pop}_i + \epsilon_i \quad (4.9)$$

Where β and α 's are coefficients to be estimated, FD_i is the fiscal decentralisation variable; ϵ_i is error term that captures statistical noise. Equations (4.9) will be estimated using the *censReg* package (Henningsen, 2017) in R.

4.3.3 The SFA Model

We model MMDAs as firms in the same industry using minimum resources to obtain a given level of service delivery. Our main output measure is a composite output (*Q*) of MMDAs outcomes in health, education, waste management, and water supply services. Our input measures include expenditure on compensation which represent labour inputs (*Lab*),

expenditure on asset representing capital inputs (*Cap*), expenditure on goods and services representing material inputs (*Mat*) and total district land size representing land input (*Lan*). Then our stochastic production frontier will be given by:

$$Q_i = g(Cap_i, Lab_i, Mat_i, Lan_i)TE_i e^{v_i} \quad (4.10)$$

Applying natural logs to equation (4.10) gives:

$$q_i = g(cap_i, lab_i, mat_i, lan_i) + \ln TE_i + \ln e^{v_i} \quad (4.11)$$

Where technical efficiency = $TE_i = e^{-u_i}$. Consequently our equation (4.11) will now be given as:

$$q_i = g(cap_i, lab_i, mat_i, lan_i) + v_i - u_i \quad (4.12)$$

The next step is to decide which functional form is suitable when estimating the above function. The Cobb Douglass and Translog technologies are the two widely used functional forms that are used to describe the production process. The Translog is mostly preferred technology because of its flexibility, that is, it is the generalisation of the Cobb Douglass function; and also it can easily handle second derivative approximations. However, we opt for the Cobb Douglass specification since its best describes our data set. Indeed our test for the appropriate functional form failed to reject the Cobb Douglass (see table 4.1). Our stochastic frontier can now be given as:

$$q_i = \beta_0 + \sum_{m=1}^4 \beta_m \ln x_{mi} + v_i - u_i \quad (4.13)$$

Where $\ln x_i$ is the natural log of the input variables for the *ith* MMDA, $\ln q_i$ represent natural log of the DCOI for the *ith* MMDA and β_m is vector of coefficients to be estimated. v_i is an identically and independently distributed random variable with mean zero and a constant variance [*i.e.* $N(0, \sigma_v^2)$] and it is distributed independently of u_i . It represents the normal

symmetric error term and captures statistical noise and measurement errors. u_i is a one-sided normal distribution truncated above at zero and to satisfy $u_i \geq 0$ and measures technical efficiency (Battese & Coelli, 1995).

Another advantage of the SFA is that one can easily deal with the problem of heterogeneity in data. Since by definition Metropolitan and Municipal Assemblies are ‘larger’ in terms of population and also more resourced and developed than District Assemblies, we expect some heterogeneity in our model. To cater for this heterogeneity concern we include two dummy variables – one for metropolitan assemblies (*met_d*) and the other for municipal assemblies (*mun_d*) - in the production function. Our model will now be given by:

$$q_i = \beta_0 + \sum_{m=1}^4 \beta_m \ln x_{mi} + D_i + v_i - u_i \quad (4.14)$$

Where, D_i is a district⁹ specific dummy for Metropolitan and Municipal Assemblies.

The efficiency component of the error term (u_i) can further be decomposed into a deterministic component and a random component as:

$$u_i = \gamma FD_i + \delta Z_i + \varepsilon_i \quad (4.15)$$

Where FD_i is our fiscal decentralisation variable, Z_i is a matrix of explanatory variables (control variables) which are expected to impact technical efficiency of MMDAs; they include FOAT (*foat*), ‘perceived’ competency of MMDAs (*Com*), per capita grant (*grant*), total population (*pop*), poverty incidence (*poin*) and average years of education (*edys*). γ and δ are vector of parameters to be estimated. ε_i is a truncation of a normal distribution with mean zero and variance σ^2 . Our inefficiency model will then be given as:

⁹ We use district here to represent all Metropolitan, Municipal and Districts Assemblies.

$$u_i = \text{constant} + \gamma FD_i + \delta_1 \text{float}_i + \delta_2 \text{Com}_i + \delta_3 \text{grant}_i + \delta_4 \text{poin}_i + \delta_5 \text{edyrs}_i + \delta_6 \text{pop}_i + \varepsilon_i \quad (4.16)$$

Equations (4.14) and (4.16) are estimated simultaneously using maximum likelihood techniques. The estimation is done using R package “frontier” version 1.1-2 which was written by Coelli and Henningsen (2017).

Table 4.1: LR Test for the Stochastic Production Function and Efficiency Model

Null	Chisq	Pr(>chi)	Decision
A Cobb-Douglass function is appropriate	15.97	0.1005	failed to reject H_0
No inefficiency effects	34.955	5.435e-06	reject H_0

4.4 Variable Description, Measurement and Data Sources

We use four variables to proxy for capital, labour, material and land inputs. Total MMDAs’ actual expenditure on assets is used to represent capital inputs; total MMDAs’ actual expenditure on compensation of employees is used to represent labour inputs and MMDAs actual expenditure on goods and services is used to represent material inputs. Land inputs are represented by the total coverage area of the MMDAs’ jurisdiction. Total MMDAs actual expenditure on assets, compensation for employees and goods and services were taken from the various MMDAs 2013 budgets. Land inputs, that is total jurisdictional coverage area was taken from the District Analytical Report (2014) produced by Ghana Statistical Services (GSS).

We also measure MMDAs output in four mandatory and key services delivered; this includes supply of education, health, water and waste management services. Education is defined as net enrolment rate and it is measured as percentage of school children enrolled into basic¹⁰

¹⁰ According the Ghana Education Services basic education is defined as education that starts from Pre-School to Junior High School (JHS).

schools in total children of official school going age. The data on education was obtained from Ghana Education Service' (GES) Education Management Information System (EMIS) portal. The data on health is defined as delivery by skilled staff which is measured as percentage of skilled deliveries in expected deliveries. This data was obtained from the UNICEF's Ghana website; this was data they used for the 2014 DLT and they were acquired from the Ghana Health Services (DHIMS).

Output in water supply services is defined as household access to 'improved water¹¹' sources for drinking and it is measured as percentage of district household population having access to improved water sources for drinking. Waste Management service is defined as household solid waste collection in the district. It measure is the percentage of districts' households who have their solid waste collected. Both the water supply and waste management services data were extracted from the District Analytical Report (2014) from GSS. Following from Afonso and Fernandes (2008), we construct a District Composite Output Indicator (DCOI) using these four output variables. The composite output measure the average performance of MMDAs in the delivery education, health, water and waste services. Our composite output is a simple average of MMDAs outcomes in the delivery of education, health, waste and water services. Since all the output variables are measured in percentages, we simply aggregated them and divided by the total number of output variables. That is, our composite output indicator is given by:

$$DCOI(Q_i) = \frac{\sum_{n=1}^4 y_i}{4} \quad (4.16)$$

¹¹ We define access to improved drinking water sources according UNICEF definition which is the access to water sources which by its construction or through active intervention is free from outside contamination like faecal matter. They include pipe-borne water, boreholes or tube wells, protected wells and springs and rainwater collection.

Where, $DCOI (Q_i)$ is District Composite Output Indicator and y_i is the i th output variable. A summary statistics of the output variables which are going to be used in the computation of the composite output indicator is presented in table 4.2.

Table 4.2: Summary Statistics of Output Variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
net enrolment rate (ner)	216	63.63	16.99	19.90	100.00
delivery by skilled staff (delskil)	216	52.31	25.06	10.10	100.00
waste collection (waste)	216	7.09	11.57	0.40	77.10
improved water sources (water)	216	79.74	15.55	34.00	99.70

Approximately 7% of households in Ghana have their solid waste collected implying that MMDAs performs badly in waste management. Offinso North District performs worst in waste management as the district is able to collect a paltry 0.40% of solid waste generated in the district. The best performing district in waste management is La Dadekotopon Municipal Assembly which is able to collect 77.10% of waste generated in the district. This should be expected as most metropolis and municipalities in Ghana generate the most waste per capita (Miezah et al., 2015).

However, MMDAs performance in education, health and water supply services was relatively better. The average net enrolment rate among districts in Ghana is 63.63%, percentage of deliveries by skilled attendant had a mean of 52.31% and averagely 79.75% of households in Ghana had access to improved water. Net enrolment rate had a range of 19.9% and 100%; delivery by skilled staff ranged between 10.10% and 100%; and access to improved water sources ranged from 34% to 99.70% indicating huge disparities in education, health and water service delivery between MMDAs in Ghana.

We now move on to our fiscal decentralisation and the other control variables. Our main variable of interest is fiscal decentralisation and we proxy for that with fiscal autonomy and

vertical imbalance. Fiscal autonomy can be defined as the percentage share of own source revenue (IGF) in total districts' revenue. In fact, according to the GoG Intergovernmental Fiscal Decentralisation Framework (2008), the more internally generated funds (IGF) an MMDA is able to collect the more autonomous it is. Consequently, we measure fiscal autonomy as the percentage of IGF in total MMDAs' revenue. Vertical imbalance is the extent to which local government depends on the central government for their expenditures. This is measured as the percentage of central government's transfers in total MMDAs expenditure. The variables which were used in the calculation of our fiscal decentralisation variables were taken from the MMDAs 2013 budgets. These include total (actual) district's revenues, total IGF, DACF and DDF received and total expenditures.

Per capita grant is defined as statutory grant (DACF and DDF) per population. It is measured as ratio of DACF and DDF to total district population. Population figures for each district were taken from the District analytical report (2014) published by GSS. FOAT is used to proxy for district administration and we use the performance measures from the 2013 FOAT assessment to measure for district administration. This data was obtained from the Local Government Services (LGS) website. We measure 'perceived' competency of MMDAs (COM) by the percent of people who see the local governments (MMDAs) as competent. The data on this variable was gotten from the GLSS 6 (2012/2013). We use poverty incidence to measure the relative poverty of a particular district. It is measured as the percentage of district population who are living below the poverty line. Data on poverty incidence was derived from Ghana Poverty Mapping Report (2015) published by GSS. We measure educational level of citizens as the average years of education in the district. Average years of education is measured as the average years of schooling. The data on average years of education was extracted from the GLSS 6 (2012/2013) by GSS. Population is defined as total number of inhabitant in a particular district.

We have provided the techniques and approaches we used to estimate and explain the efficiency of MMDAs in Ghana in this chapter. We started with theoretical underpinnings of our model and moved on to our empirical model. In the empirical model, the DEA and SFA models were presented. A subsection on Tobit regression model was provided when presenting the DEA model. We concluded with a section on how our variables which we are used in the estimation of our models were defined and measured.



CHAPTER FIVE

ANALYSIS AND DISCUSSION OF EMPIRICAL RESULTS

5.1 Introduction

This chapter presents the empirical results and findings obtained from the study. It starts with a brief description of the variables used in this research. This is followed by the presentation of the efficiency scores from the DEA estimation and subsequently we present the results of our Tobit regression model. Subsequently, SFA efficiency scores and covariates explanation is presented. The chapter concludes with a summary of the chapter.

5.2 Descriptive Statistics

This study assesses all the 216 districts existing in Ghana in 2013 for their efficiency in four key sectors; education, health, water and sanitation, and waste management. The efficiency scores obtained are then explained by seven covariates which include fiscal decentralization (fiscal autonomy and vertical imbalance), poverty incidence, per capita grant, population, Average Years of Education, Competency of MMDAs and FOAT (Functional Organization Assessment Tool). Table 5.1 presents the characteristics of this data set regarding their means, standard deviations and range.

On the average, MMDAs spend more on capital than material and labour as represented by their corresponding means. The average percentage spending on capital was 41.85%; on material was 30.41%; and on labour was 27.74%. This may be due to strict directions given to MMDAs on the use of central government and donor grants. For instance, transfers of DACF and DDF are mainly for capital expenditures with little room for other expenditures. There was a high variation in all expenditure categories. The least percentage of labour,

capital and material spending were 0.06%, 0.20% and 0.54% while the highest percentage expenditure was 80.95%, 91.09% and 91.31% respectively. The mean coverage area (jurisdictional area) of a district in Ghana is 1169.21kmsq with a range of 12.3kmsq and 8340.1kmsq.

Table 5.1: Descriptive statistics of input and outputs and covariates

Variable	Obs.	Mean	Std. Dev.	Min	Max
<u>Inputs and Output</u>					
labour (L)	216	27.74	18.28	0.54	91.31
material (M)	216	30.41	17.80	0.06	80.95
capital (K)	216	41.85	20.89	0.20	91.09
land (T)	216	1169.21	1252.02	12.3	8340.10
DCOI (Q)	216	50.69	11.67	22.42	79.74
<u>Fiscal Decentralisation and other Controls</u>					
Fiscal Autonomy (<i>fd_1</i>)	216	11.86	11.79	0.12	69.73
Vertical imbalance (<i>fd_2</i>)	216	88.14	11.79	30.27	99.88
Grant per capita (<i>grant</i>)	216	13.34	11.39	1.54	134.48
Population (<i>pop</i>)	216	13,5703	18,6043	22,286	1,869,476
Average years of education (<i>edysr</i>)	216	4.77	1.50	1.31	8.60
FOAT (<i>foat</i>)	216	92.13	4.68	70.00	99.00
Poverty incidence (<i>poin</i>)	216	30.94	20.75	1.30	92.40
Competency of MMDAs (<i>Com</i>)	216	60.21	17.49	8.65	100

Source: Author's own calculations with the help of STATA 13.

Moving on to the District Composite Output Indicator (DCOI), the mean score was 50.69% with a range of 22.42 and 79.74. Greater Accra averaged the highest composite score, scoring 60.60 and with a score of 43.24, Northern region was the region with the least performance. Upper East, Ashanti, Upper West, Central, Western, Brong Ahafo, Eastern and Volta placed 2nd, 3rd, 4th, 6th, 7th, 8th and 9th respectively. These results are very similar to the 2014 DLT scores produced by UNICEF-Ghana and CDD-Ghana. The variation in the scores will be due to the number of outcome variables¹² used and also the choice of indicators¹³.

¹² The DLT used seven outcome variables in education, health, water, sanitation, police and governance.

¹³ The indicators used in the DLT included average pass rate in four BECE subjects, delivery by skilled staff, rural water supply coverage, district classified as open defecation, police per population and minimum condition for FOAT.

Table 5.2: Regional Analysis of DCOI

Region	Mean	min	Max	Rank
Greater Accra	60.60	41.55	79.74	1 st
Upper east	56.07	42.34	68.21	2 nd
Ashanti	53.85	23.22	82.00	3 rd
Upper west	53.42	36.24	82.88	4 th
Central	53.04	33.82	70.01	5 th
Western	51.84	32.74	85.10	6 th
Brong Ahafo	50.92	22.42	81.48	7 th
Eastern	47.86	26.34	85.79	8 th
Volta	44.11	26.89	63.19	9 th
Northern	43.24	28.90	78.93	10 th

Moving on to the fiscal decentralisation and the control variables, MMDAs were overly dependent on central government transfers for their expenditures. Internally generated funds averaged 11.86% of total district revenue while central government transfers averaged around 88.14% of total district expenditure. The average district in Ghana has a FOAT performance score of about 92%. There was a little variation in FOAT performance scores between districts in Ghana with a minimum value of 70 and a maximum of 99. The mean average years of education of residents among district is Ghana is approximately five years. This variable also showed little variation with a standard deviation of 1.50 and a range of 1.31 and 8.60. The mean per capita grant among districts in Ghana was about 13.36 Ghana cedis in 2013 with a standard deviation of 11.39. It also showed a high variation between districts with a range of 1.54 Ghana cedis and 134.48 Ghana cedis.

The average incidence of poverty in Ghana in 2013 according to our data was around 30.94% with a standard deviation 20.75 and a range of 1.30 and 92.40. La Dadekotopon Municipal Assembly had the lowest incidence of poverty while Wa West Municipal assembly recorded the highest incidence of poverty. There is a huge disparity in poverty incidence among districts in Ghana. There also was a high variation among districts in Ghana as regards to literacy rate. The district which is less populated (minimum for population) is Banda which

has a population of 22,286. On the other hand, the district which is most populated is Kumasi Metropolitan Assembly which has a population 1,869,476. Districts in Ghana have an average population of 135,703. Finally about sixty (60) percent of Ghanaian holds the view that local governments (MMDAs) in Ghana are competent. This variable saw a huge variation as the district with the least competency level score of 8.63% (Saboba District Assembly) while the most competent district had a score of 100% (Lambussie Karni District Assembly).

5.3 DEA and Tobit Analysis

5.3.1 DEA Efficiency Scores

Using our inputs (expenditure on assets, compensation of employees and materials and total coverage area) and our output (DCOI), we estimated an input-oriented VRS-DEA model with the help of the Benchmarking Package (Bogetoft & Otto, 2015) in 'R'. Each variable was mean normalised to ensure that the data set was of equal magnitude and unit of measurement. This is done to avoid any scaling issues which may be associated with the data set. The results of the efficiency estimates are discussed below.

Table 5.3 gives the frequency distribution of efficiency scores. From the table, a total of 32 MMDAs representing 14.81% were found to be technically efficient, obtaining an efficiency score of one ($E=1$). This implies that 32 MMDAs were located on the efficient frontier or were dominant among their peers. About 141 MMDAs representing 65.28% obtained an efficiency score between 0 and 0.5 indicating that most MMDAs can theoretically reduce their inputs by between 50% and 100% without decreasing their current output levels. The rest of the MMDAs representing 19.91% obtained an efficiency score between 0.5 and 0.9. The mean efficiency score for MMDAs in Ghana is 0.45208. This simply indicates that, on

the average, MMDAs in Ghana could theoretically maintain their level of output with approximately 55% lesser resources.

Table 5.3: Frequency Distribution of DEA Efficiency Scores

Efficiency range	freq.	Percentage
$0.0 \leq E < 0.1$	14	6.48
$0.1 \leq E < 0.2$	33	15.28
$0.2 \leq E < 0.3$	44	20.37
$0.3 \leq E < 0.4$	27	12.50
$0.4 \leq E < 0.5$	23	10.65
$0.5 \leq E < 0.6$	18	8.33
$0.6 \leq E < 0.7$	8	3.70
$0.7 \leq E < 0.8$	10	4.63
$0.8 \leq E < 0.9$	5	2.31
$0.9 \leq E < 1.0$	2	0.93
$E = 1.0$	32	14.81

Table 5.4: Summary Statistics of DEA Efficiency Scores

Obs.	Min.	1st Qu.	Median	Mean	Std. dev.	3rd Qu.	Max.
216	0.0525	0.2253	0.3576	0.4521	0.2994	0.6601	1.0000

Municipal assemblies exhibited more efficient behaviors than Metropolitan and District Assemblies respectively. Municipal, Metropolitan and District Assemblies averaged an efficiency score of 0.5108, 0.4901 and 0.4283 respectively as shown in table 5.5. Table 5.6 presents a summary statistics of efficiency score by region¹⁴. From table 5.6, it can also be deduced that on the average, MMDAs in the Greater Accra region were the most efficient averaging an efficiency score of 0.6322 with 3 out of 13 MMDAs obtaining an efficiency score of one. This was followed closely by MMDAs in Central region with mean efficiency score of 0.5636 with 5 out of 20 districts in the region obtaining an efficiency score of one. MMDAs from the Ashanti region followed averaging an efficiency score of 0.4848 with 5 out of 30 MMDAs achieving a perfect efficiency score of one. MMDAs in the Eastern region

¹⁴ A full presentation of efficiency scores of all MMDAs is provided in the appendix.

were behind Ashanti region averaging an efficiency score of 0.4595 and 5 out of a total 26 MMDAs achieving efficiency score of one. Upper West region was 5th best efficient region with a mean efficiency score of 0.4564 and also only one district obtaining an efficiency score of one. Western, Volta, Brong Ahafo, Upper East and Northern regions came in at 6th, 7th, 8th, 9th, and 10th positions respectively. They obtained a mean efficiency score of 0.4559, 0.4499, 0.3880, 0.3671, and 0.3165 accordingly.

Table 5.5: Summary Statistics of Efficiency Scores by Type of Assembly

Type of Assembly	Mean	Std. dev.	Min.	Max
District	0.4298	0.2996	0.0525	1.0000
Municipal	0.5108	0.2842	0.0907	1.0000
Metropolitan	0.4901	0.4033	0.1290	1.0000

Table 5.6: Summary Statistics of Efficiency Scores by Region

Rank	Region	Mean	Min	Max	No. eff. Districts
1	Greater Accra	0.6322	0.2054	1.0000	3
2	Central	0.5636	0.1659	1.0000	5
3	Ashanti	0.4848	0.1290	1.0000	5
4	Eastern	0.4595	0.0949	1.0000	5
5	Upper West	0.4564	0.1091	1.0000	1
6	Western	0.4559	0.0853	1.0000	4
7	Volta	0.4499	0.0874	1.0000	3
8	Brong Ahafo	0.3880	0.0525	1.0000	3
9	Upper East	0.3671	0.1723	0.7388	0
10	Northern	0.3165	0.0746	1.0000	3

5.3.2 Fiscal Decentralisation and Other Determining factors of Technical Efficiency

As mentioned earlier, our main objective is to investigate the impact of fiscal decentralisation has on the efficiency of MMDAs in Ghana. To do this we estimated a second-stage Tobit regression model with our efficiency scores obtained from the VRS-DEA model as our dependent variable and fiscal decentralisation and other control variables which have an effect on efficiency of local governments. These variables include fiscal autonomy and vertical imbalance for the fiscal decentralisation variables; and per capita block grant, poverty incidence, effective district administration (FOAT performance measures), ‘perceived’

competency of local governments (MMDAs), average years of schooling and population as our control variables. Again, the Tobit regression was executed through the R package censReg (Henningsen, 2017). The results of the Tobit regression is shown in table 5.7.

From table 5.7 both of our fiscal decentralisation variables, fiscal autonomy (fd_1) and vertical imbalance (fd_2) were statistically significant at 5% level and had positive and negative signs respectively in all the models. This implies that fiscal autonomy had a significant positive influence on technical efficiency while vertical imbalance had a negative and significant impact on technical efficiency. This means that a high dependence on central government by MMDAs results in inefficient spending behaviors. This relationship endorses the traditional theory of fiscal decentralisation which postulates that the larger the share of own source revenue in total district revenue, the more accountable local government officials are towards their constituents. Consequently efficient use of resources is encouraged. However, if the share of central government transfers is large in total district revenue, local government officials may engage in expenditures which will not match cost to benefits and therefore will be inefficient.

Proceeding to the other control variables, Per capita grant (grant) was significant at five percent level and had a negative relationship with efficiency. Alternatively, districts with high per capita grant are less efficient. This result reiterates that over reliance of MMDAs on the central government for their expenditures encourage inefficiency. Population had a negative relationship with efficiency and was significant at one percent level in our entire model. This result is surprising and interesting and it shows that districts in Ghana are not taking the advantages associated with economies of scale. Given that most local governments in Ghana are district assemblies and also district assemblies are less developed and have less resources might be the reason for this result. Nonetheless, a further investigation must be conducted to ascertain the cause of this phenomenon.

Meanwhile, poverty incidence had a negative and significant relationship with efficiency of MMDAs. This means that the higher the incidence of poverty, the higher the inefficient spending behavior of MMDAs. This is because poor households will find it costly to monitor the activities of MMDAs. Also, in district where there is high incidence of poverty, MMDAs cannot generate enough internal resources for their developmental programs. FOAT, ‘perceived’ competency of MMDAs and average years of schooling had a positive but insignificant impact on MMDAs efficiency respectively so we cannot say much about their impact on efficiency of local service delivery.

Table 5.7: Results of Tobit Regression Model

Variables	Model 1 Estimates	Model 2 Estimates	Model 3 Estimates	Model 4 Estimates
<i>Constant</i>	0.2635*** (0.0531)	0.9227 (1.9914)	3.7678*** (0.6697)	3.8671* (2.1216)
<i>logfd_1</i>	0.1028*** (0.0236)	0.0629** (0.0276)		
<i>logfd_2</i>			-0.7370*** (0.1496)	-0.5919*** (0.1697)
<i>logfoat</i>		0.4713 (0.4096)		0.4141 (0.4062)
<i>loggrant</i>		-0.1270** (0.0523)		-0.1288** (0.0507)
<i>logCom</i>		0.0463 (0.4358)		0.0672 (0.0590)
<i>logedyrs</i>		0.1100 (0.1896)		0.0446 (0.1878)
<i>logpoin</i>		-0.0959*** (0.0337)		-0.0844** (0.0331)
<i>logpop</i>		-0.2033*** (0.0595)		-0.2091*** (0.0590)
<u>Variance Parameters</u>				
<i>logSigma</i>	-1.1091*** (0.0547)	-1.1618*** (0.0546)	-1.1215*** (0.0546)	-1.1769*** (0.0545)
<i>Log-likelihood</i>	-96.4361	-85.6884	-93.1795	-82.0253
<i>Obs.</i>	216	216	216	216

NB: ‘*’, ‘**’, and ‘***’ denotes significance at 10%, at 5% and at 1% level respectively and

Standard errors are in parentheses.

Our results justify the regional ranking of efficiency scores. MMDAs in Greater Accra, Central, Ashanti, Eastern and Western regions averaged had an efficiency score which was above the mean efficiency score. This is because these regions rely less on the central governments for their expenditures; receives the least grant per capita; generate enough resources internally; and also has the least incidence of poverty. On the other hand, MMDAs in Volta, Western Brong Ahafo, Northern and Upper East regions rely more the central government for their expenditures; generate fewer resources internally; receives the most grants per capita and also has the highest incidence of poverty. This explains why MMDAs in these regions averaged a mean efficiency score which was below the average. The only exception is the Upper West region which had an average score above the mean efficiency score but has high poverty incidence and also rely heavily on the central government for its expenditures.

5.4 SFA Analysis and Determining factors of Technical Efficiency

5.4.1 SFA Efficiency Scores

This section presents the results and also discussion of efficiency scores using the SFA approach. Using our output (DCOI) and inputs (actual expenditures on compensation of employees, assets and goods and services and total coverage area), we estimated a Battese & Coelli (1995) SFA using maximum likelihood techniques with the help of ‘frontier v1.1-2’ package for ‘R’. Before we move on to the discussion of our empirical results, we discuss brief observations we made during our estimations. First, in modelling SFA the choice of a functional form is very crucial. Therefore we tested for the appropriateness of two major functional forms used in empirical analysis of efficiency of local governments; the Cobb-Douglass (CD) and the more general translog functional forms. We executed this by conducting a likelihood ratio (LR) test of the null hypothesis that the CD is sufficient. Even

though the LR test failed to reject the null (see table 4.1) we still estimated the CD and translog specification of the production function and then compared both results (refer to Table 1E in the appendix for the LR tests conducted). Moreover, the results produced by the CD specification made more intuitive sense than the results obtained by the translog specification.

Secondly, for robustness purposes we estimated a baseline model with fiscal decentralisation and other control variables. That is, we estimate the first model with fiscal autonomy as a determinant of efficiency. We then estimate another with fiscal autonomy and other controls (foat, COM, grant, poin, edyrs and pop) as determinants of efficiency. We did same for the other measure of fiscal decentralisation, vertical imbalance. We then conducted a LR test of no inefficiency effects. The LR test rejected the null of no inefficiency effects at 1% level of significance (see table 4.1). We now move on to discuss the efficiency estimates obtained by the four models. Also the results produced by Model 4 were the most consistent and robust of the entire four models. Indeed the LR test rejected the other three models and accepted the fourth model (Table 1E). Thus, in this section, we will concentrate on Model 4 in discussing the distribution of efficiencies among regions and districts.

According to our 4th model, the mean efficiency score from all the four models was 0.7438 as shown in table 5.8. This indicates that MMDAs in Ghana can theoretically reduce their resources by approximately 26% and still be able to provide their current level of services. There was a little variation in efficiency scores between districts as the district with least efficiency scored 0.3973 and the district with the highest efficiency scoring 0.9794 with a standard deviation of 0.1371. Other characteristics of the distribution of efficiency scores are provided in table 5.8.

Table 5.8: Summary Statistics of SFA Efficiency Scores

Model	Obs.	Mean	Std. Dev.	Min	Max
Model 1	216	0.8038	0.1159	0.4869	0.9635
Model 2	216	0.7522	0.1333	0.4156	0.9771
Model 3	216	0.7346	0.1321	0.4197	0.9777
Model 4	216	0.7438	0.1371	0.3973	0.9794

Table 5.9: Summary Statistics of Efficiency Scores by Type of Assembly

Type of Assembly	Mean	Std. Dev.	Min.	Max.
District	0.7261	0.1387	0.3973	0.9794
Municipal	0.7886	0.1218	0.5507	0.9753
Metropolitan	0.7910	0.1442	0.6139	0.9390

Table 5.10: Summary Statistics of SFA Efficiency Scores by Region

Rank	Region	Mean	Std. Dev.	Min.	Max.
1	Upper West	0.8212	0.1087	0.6036	0.9608
2	Upper East	0.8173	0.0905	0.6367	0.9237
3	Greater Accra	0.7922	0.1221	0.5531	0.9551
4	Western	0.7904	0.1238	0.5386	0.9781
5	Ashanti	0.7721	0.1641	0.4066	0.9794
6	Central	0.7575	0.1159	0.5534	0.9312
7	Brong Ahafo	0.7508	0.1270	0.3973	0.9571
8	Eastern	0.6900	0.1478	0.4240	0.9321
9	Northern	0.6828	0.1266	0.5062	0.9459
10	Volta	0.6663	0.1124	0.4436	0.8657

Moving on to the regional analysis, MMDAs in Upper West region averaged the highest mean efficiency score with a mean score of 0.8212 while MMDAs in Volta region averaged the least efficiency score with an average score of 0.6663. With a mean efficiency score of 0.8173, MMDAs in Upper East region averaged the second highest efficiency scores. MMDAs in Greater Accra, Western, Ashanti, Brong Ahafo, Central, Northern and Eastern regions had a mean efficiency score of 0.7922, 0.7904, 0.7721, 0.7575, 0.7508, 0.6900 and 0.6828 in that order. Also metropolitan assemblies combined their inputs better than municipal and district assemblies.

5.4.2 Fiscal Decentralisation and Other Determining Factors of Technical Efficiency

The results from the estimation of equations 4.14 and 4.16 are shown in table 5.11 (page 77).

For reasons explained earlier, fiscal autonomy was entered in models 1 and 2 whereas vertical imbalance was entered in models 3 and 4. Our results were most of the times consistent with the results obtained from the Tobit regression model. Fiscal autonomy had its expected sign but was statistically insignificant at all levels of significance in both models. Conversely, vertical imbalance had a negative and statistically significant impact on efficiency of MMDAs. Our results also showed a strong and significant positive influence of effective district administration on the efficiency of MMDAs. This implies that districts that scored high marks in FOAT assessment were more efficient. The results remain unchanged when we use either measures of fiscal decentralisation. This explains why MMDAs in Upper West and Upper East regions had high average efficiency scores as these two regions performed very well in 2013 FOAT assessment. In fact they were the first two best performing regions in the 2013 FOAT assessment.

Incidence of poverty also had a significant inverse relationship with efficiency. In other words, districts which have high incidence of poverty exhibit high inefficiencies. There was a significant and negative influence of population on the efficiency of MMDAs. This implies that, MMDAs with high population are unable to realize the advantages associated with economies of scale. This is again expected given that most local governments in Ghana are district assemblies. This result further provides evidence for the high average efficiency scores for the two upper regions as these two regions are less populated. Perceived competency of MMDAs by their residents was statistically significant and also had a positive influence on efficiency of local governments in Ghana. This result proves that, citizens' perceptions about the activities of local government operations in Ghana are crucial in

determining their efficiency levels. Average years of schooling (*edys*) and per capita block grant (*grant*) had their expected signs but were statistically insignificant.

5.5 Summary

In this chapter we have presented the empirical results of our study. We measured efficiency using two main approaches, the DEA and SFA approaches. We also investigated the impact of fiscal decentralisation and other control variables on the efficiency of MMDAs in Ghana. We used a two stage approach to explain efficiency scores obtained from our DEA model but we adopted the one stage approach in explaining efficiency in the SFA case. There was high variation in efficiency scores in the DEA model relative to the SFA. Averagely efficiency scores obtained by the SFA approach were also higher than the scores obtained using the DEA. The correlation coefficient between the efficiency scores obtained by the DEA and the SFA was fairly strong and positive (see appendix 2K).

In explaining what determines efficiency of MMDAs in Ghana, both the two-stage Tobit model and the one stage SFA model produced consistent and similar results. Fiscal autonomy, 'perceived' Competency of MMDAs and effective district administration (FOAT) had positive effect on the efficiency of MMDAs in Ghana. On the other hand vertical imbalance, per capita grant, incidence of poverty and population were the factors that were found to be drag technical efficiency of MMDAs. However, average years of schooling was positive but its effect was found to be insignificant effect on efficiency.

Table 5.11: Results of SFA estimation

Independent Variable	Model 1 Estimates	Model 2 Estimates	Model 3 Estimates	Model 4 Estimates
<u><i>Production frontier</i></u>				
<i>Constant</i>	3.8885*** (0.2292)	3.8277*** (0.2667)	4.1544*** (0.3556)	3.8885*** (0.2265)
<i>logCap</i>	-0.0041 (0.0109)	0.0076 (0.0104)	-0.007 (0.0127)	0.0093 (0.0097)
<i>logLab</i>	0.0319*** (0.0122)	0.0305*** (0.0115)	0.0311*** (0.0104)	0.0328*** (0.0111)
<i>logMat</i>	0.0236** (0.0101)	0.0098 (0.0129)	0.0149 (0.0134)	0.0005 (0.0117)
<i>logLan</i>	-0.0712*** (0.0145)	-0.0439*** (0.0133)	-0.0718*** (0.0118)	-0.0393*** (0.0133)
<i>mun_d</i>	0.1056*** (0.0300)	0.0851 (0.0307)	0.0998*** (0.0305)	0.0678** (0.0309)
<i>met_d</i>	0.0617 (0.0773)	0.0745 (0.0777)	0.0608 (0.0707)	0.0513 (0.0728)
<u><i>Inefficiency Model</i></u>				
<i>logfd_1</i>	-0.0156 (0.0437)	-0.0146 (0.0295)		
<i>logfd_2</i>			0.0620*** (0.0213)	0.4693** (0.1830)
<i>logfoat</i>		-0.224 (0.1873)		-0.5774** (0.2294)
<i>loggrant</i>		0.0693 (0.0502)		0.0379 (0.0504)
<i>logCom</i>		-0.1410** (0.0590)		-0.1529*** (0.0532)
<i>logpoin</i>		0.1014** (0.0419)		0.0773** (0.0378)
<i>logedyrs</i>		-0.1716 (0.1864)		-0.1480 (0.1881)
<i>logpop</i>		0.1505*** (0.0522)		0.1197** (0.0509)
<u><i>Variance Parameters</i></u>				
<i>SigmaSq</i>	0.0997*** (0.0236)	0.0527*** (0.0104)	0.0542*** (0.0120)	0.0489*** (0.0089)
<i>gamma</i>	0.9175*** (0.0551)	0.9518*** (0.0445)	0.9719*** (0.0617)	0.9675*** (0.0325)
<i>loglikelihood</i>	53.1632	66.2958	55.4677	70.2998

NB: ‘*’, ‘**’ and ‘***’ denotes significance at 10%, 5% and 1% level respectively. Standard errors are in parentheses.

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSIONS AND POLICY RECOMMENDATIONS

6.1 Introduction

This chapter concludes the study and it present the summary of the findings, draw conclusions from the study and also offer some policy recommendations. Conclusions are drawn based on the findings of the study and policy recommendations are grounded on the conclusions. Later in the chapter, limitations of the study are provided which will be a foundation from which further researches could be conducted.

6.2 Summary of Findings

This thesis investigated the impact fiscal decentralisation has on efficiency of MMDAs in Ghana. To achieve this aim we first estimated efficiency through two main approaches, the DEA and SFA. We assessed the efficiency of MMDAs in four key sectors; education, health, water and waste management. The main output used is the District Composite Output Indicator (DCOI) which was calculated using MMDAs outcomes in education, health, water and waste management. We measured MMDAs outcomes; in education as net enrolment rate, in health as delivery by skilled staff, in water as access to improved water sources and in waste management as percentage of household waste collected. Our main input variables were MMDAs actual expenditures on compensation of employees as labour inputs, expenditures on asset as capital inputs, expenditures on goods and services as material inputs and total coverage area as land inputs. Efficiency scores obtained using the DEA approach were explained in a second-stage Tobit regression whereas we adopted the one stage SFA

approach by Battese and Coelli (1995) in explaining the variations in efficiency scores. We used a set of fiscal decentralisation and other control variables to explain the variations in efficiency scores among MMDAs. We used two proxies as measures of fiscal decentralisation; fiscal autonomy and vertical imbalance. We did this to check for the robustness of our empirical results. Other control variables used to explain efficiency scores obtained are FOAT, per capita grant, 'perceived' competency of MMDAs, incidence of poverty, average years of schooling and population.

Our results offer an intriguing introspection into the operations of the local governments in Ghana, especially as regards to assignment of revenues and expenditures. Using the DEA efficiency estimates, local governments in Ghana were relatively inefficient as they could, on the average, reduce their current inputs by approximately 55% and still be capable of providing their current output levels. In the regional distribution of efficiency scores, MMDAs in the Greater Accra region averaged the highest efficiency scores followed by Central, Ashanti, Eastern, Upper West, Western, Volta, Brong Ahafo, Upper East and Northern region in that order. It was also found that Municipal Assemblies were more efficient than Metropolitan and District Assemblies. There was a high variation of efficiency scores obtained through the DEA with a range of 0.0525 and 1 and a standard deviation of 0.2994.

According to the SFA model, MMDAs in Ghana could still produce their current level of services with approximately 26% less inputs. In the regional distribution of efficiency scores, Upper West region came first again with an average efficiency score of 0.8212 followed by Upper East, Greater Accra, Western, Ashanti, Central, Brong Ahafo, Eastern, Northern and Volta regions respectively. Our results indicated that Metropolitan Assemblies were more efficient than Municipal and District Assemblies. Relative to the DEA efficiency scores, the

SFA efficiency scores showed less variability ranging from 0.3973 to 0.9794 with a standard deviation of 0.1371. The correlation between the two efficiency scores was also positive and significant (see table 3K in the appendix).

Fiscal autonomy was shown to improve efficient delivery of local public services by MMDAs in Ghana. That is, as MMDAs increase their percentage share of IGF in total revenue efficient use of resources is encouraged for the delivery of local public services. This provides evidence in support of traditional fiscal federalism theory which postulates that local governments will match the cost of providing a local service to its benefit when given total control over their own sources of revenue (Bird, 2001; McLure, 2007). Also, a larger share of own source revenue cause public sector accountability of local politicians and managers which results in efficient use of resources. This result was also in line with other empirical studies like Benito et al. (2010) and Boetti et al. (2010) for developed countries and more recently, Monkam (2015) for Sub-Saharan Africa. However, vertical imbalance was found to have a negative relationship with efficiency. This implies that, as MMDAs heavily rely on the centre for their developmental needs, inefficient use of these resources is heightened. This result can be related to the famous ‘flypaper’ effects which states that a per capita increase in grant results in more spending (inefficient) of local governments than equivalent increase in per capita income.

FOAT performance measures which we used to proxy for effective district administration was found to be an efficiency augmenting factor. This was expected as effective management and accounting for district resources will lead to efficient matching of expenditures to benefits. The impact of this factor was very strong in the SFA model and explains why MMDAs in the two Upper regions of Ghana were found to show more efficient behaviour in the SFA model. Other factors like high per capita grant, incidence of poverty and large

populations were found to be efficiency reducing factors. As regards to high per capita grant, our result confirms the findings of De Borger & Kerstens (1996). However, our findings contradicted the conclusions of Loikkanen & Susilouto (2005) and Afonso and Fernandes (2008) in respect of the impact of large population size on efficiency of local governments. It might be the case that MMDAs in Ghana are not taking full advantage of the benefits associated with the provision of services to a larger population. Poverty incidence denoting the impact of income was found to reduce efficiency and was in consonance with the findings of Loikkanen & Susilouto (2005).

Citizens' perceptions about the operations of local government which we used the 'perceived' competency of MMDAs to measure this perception was found to be have statistically positive impact on local governments' efficiency. Meanwhile, average years of schooling was found to be positive but was statistically insignificant.

6.3 Conclusions

A number of conclusions can be drawn from this research work. First, the efficiency scores for MMDAs in Ghana were relatively low using both set of approaches (i.e. DEA and SFA) as compared to other developing economies like Brazil. Notwithstanding, local governments in Ghana are performing relatively better than their counterparts in other African Countries like South Africa and Morocco. While some MMDAs are doing relatively well, some were doing poorly and therefore MMDAs in Ghana should strive and learn among themselves to be more efficient. The study has proven that, factors such as high fiscal autonomy, 'perceived' competency of MMDAs and effective district administration have a positive and significant consequence on efficiency. On the other hand, high grant per capita, large size of population and vertical imbalance were the factors that were found to have a negative effect on efficiency of MMDAs in Ghana.

In view of these findings we conclude that a high percentage share of IGF in total revenue improves the efficiency of MMDAs in Ghana and that over reliance of MMDAs on the central government for their expenditures induce inefficiencies. That is, there is a positive impact of fiscal decentralisation on the efficiency of MMDAs in Ghana. Also we conclude a high incidence of poverty and large population results in inefficiency in service delivery by MMDAs.

6.4 Policy Recommendations

Based on the findings and conclusions made from this study, we offer the government of Ghana some key policy recommendations it must consider. Both central and local governments should adopt radical changes in policies that will increase the potentials of MMDAs to generate enough revenue internally so that MMDAs will rely less on the centre for funds for their developmental needs. We therefore offer some policy advices to the government of Ghana as follows:

- ✓ First, the central government must empower the assemblies to generate enough internal generated funds (IGF) for their developmental needs. For example, the central government can make changes to the formula that is used to distribute the District Assemblies Common Fund (DACF) or institute a new scheme that rewards assemblies that generate enough IGF vis-à-vis their potentials. Instead of allocating more funds to assemblies that generate more IGF, the funds should rather be reallocated to assemblies that lack basic infrastructure in generating revenue but are nonetheless doing well in terms of IGF so as to increase their potentials and also increase their revenue scope. For example, the building of market stalls, lorry parks among others can increase the economic activities in the district which will in turn increase their revenue generation. That is the DACF formula should incorporate a

system whereby the capacity of the assembly to generate enough revenue is placed side by side with their potentials so as to know the true performance of assemblies in IGF generation. Also, with the coming into implementation of government's flagship policy of 'one constituency-US\$1million, the DACF formula can be altered to incorporate these reforms.

- ✓ Moreover, the assemblies must be seen by the citizens to be accountable for the utilisation of the IGF. One of the reasons for the high default rate in the payments of taxes to the assemblies is the difficulty of citizens to link taxes paid to service delivery (Intergovernmental Fiscal Decentralisation framework, GoG, 2008). Most assemblies use their IGF for consumption expenditure and investing little or none at all in capital expenditures (MMDAs Budgets, 2013). By so doing it become difficult for the citizenry to visibly see what their taxes are been used for and becomes a challenge in the collection of revenue by the assemblies. This problem can be attributed in part to the strict the conditions¹⁵ attached to the utilisation of DACF, DDF and other donor grants. The assemblies can involve the citizenry by educating them on the use of revenue collected and also having visible infrastructure to show for the revenue collected. This will raise the confidence of the populace in the assemblies and the MMDAs will not encounter lot of problems in revenue collection. Our study also found that citizens' perceptions about local government activities are key and thus local authorities should try as much as possible to involve their residents in their activities.
- ✓ Authorities (i.e. MLGRD and LGS) should find a way of integrating service delivery by MMDAs into the future FOAT assessment process so as capture the actual performance of MMDAs. Currently, the FOAT focuses on the political, legal, fiscal

¹⁵ Most grants that the assemblies received are used for none other than capital expenditure.

and administrative performance of MMDAs. What the FOAT is currently missing is the link between MMDAs permissible duties and obligations and its effects on service delivery. That is, the FOAT do not determine whether while performing their duties and obligations, MMDAs have improved the welfare of their residents through improved service delivery. Thus, it is relevant to include service delivery outcomes in the calculation of the FOAT index so as to capture the true performance of the Assemblies.

6.5 Limitations and Further Research

The main limitation of the study has to do with the quality of the data set employed. It has been challenged, on the basis of accuracy, the quality of data collected in developing countries. This trouble is compounded by the intricacies involved in gathering data in Ghana. According to Kholdy (1995), “data compiled in most developing countries is inaccurate and may therefore bias the empirical results”. Another challenge has been the inputs and outputs variables used for this study. Our inputs and outputs indicators were not ideal due to the problem quantifying and pricing of public sector goods more so at the local level and also the unavailability of data. The inputs and outputs variables used were makeshift substitutes for MMDAs services delivery.

Moreover, the application of cross-sectional data made it difficult to capture the growth pattern of each MMDA as time effect was not accounted for. Since the growth patterns in cross-sectional data are based on many MMDAs, they do not depict the observed growth pattern of any particular MMDA (McMurray 1996). Therefore, running regression with such data using classical estimation techniques could produce misleading result (McMurray 1996). Also, benefits from most government projects are long term and thus not accounting for the time trend is problematic. Therefore future studies should endeavour to solve this problem.

Moreover, future research should look at disaggregating the delivery of services into its component parts so as to have comprehensive conclusions of the empirical results. That is, future studies should pick a single service delivered by MMDAs and measure their efficiency in that service. In this way, strong conclusions can be drawn.



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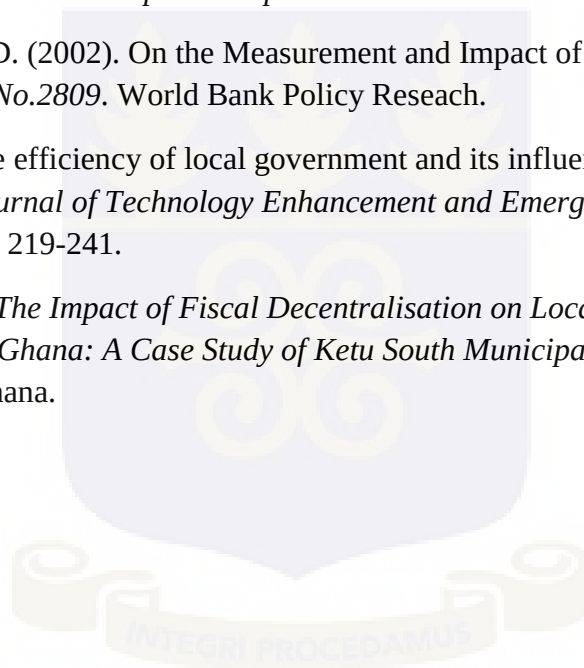
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APPENDICES

APPENDIX 1

Table 1A: Scope of Service Delivery by MMDAs in Ghana

SERVICE	RESPONSIBILITY			SERVICE	RESPONSIBILITY		
	Central	RCCs	MMDA		Central	RCCs	MMDAs
<u>Education</u>				<u>Economic</u>			
Pre-School			XXX	Trade & Industry	XX	XX	XX
Primary			XXX	Local economic devt	XX	XX	XX
Secondary			XXX	Tourism	XX	XX	XX
Vocational/Technical	XXX			Agriculture	XX	XX	XX
Tertiary/Higher Education	XXX			<u>Utilities</u>			
<u>Health</u>				Water Supply			XXX
Primary health care			XXX	Electricity	XXX		
Hospitals	XXX			<u>General Services</u>			
Health protection			XXX	Police	XX		XX
<u>Social Welfare</u>				Fire			XXX
Family Welfare			XXX	Civil status register			XXX
Welfare Home			XXX	Criminal justice	XXX		
Social Security	XX		XX	Statistical office			XX
<u>Physical Planning</u>				Electoral register	XXX		
Housing		XX	XX	<u>Culture, Leisure & Sports</u>			
Town planning		XX	XX	Sports & leisure			XXX
Regional planning		XX	XX	Museums & libraries	XXX		X
<u>Environment & Sanitation</u>				Parks and open spaces			XXX
Water & Sanitation			XXX	Theatre & Concerts			X
Refuse collection & disposal			XXX				
Cemeteries & crematoria			XXX				
Slaughterhouse			XXX				
Environmental protection	XX	XX	XX				
Consumer protection	XXX						
<u>Road & Transport</u>							
Transport		XX	XX				
Roads	XX	XX	XX				
Airports	XXX						
Ports	XXX						

NB: 'XXX' means complete responsibility, 'XX' means shared responsibility and 'X' means discretionary responsibility.

Source: Commonwealth Local Government Forum (CLGF, 2014), the Local Government System in Ghana.

Table 1B: Variable Measurement and Data Sources

Variable	Measurement	Data Sources
<u>Inputs</u>		
Capital	Actual MMDAs' expenditure on assets	The various MMDAs composite budgets. These budgets were downloaded from the MoFEP website.
Labor	Actual MMDAs' expenditure on compensation for employees	
Material	Actual MMDAs' expenditure on goods and services	
Land	Total jurisdictional coverage area of the district	The District Analytical report (2014) produced by GSS.
<u>Outputs</u>		
Education	MMDAs' output in education is measured as net enrolment rate which is defined as the percentage share of children who are enrolled into basic school in the total children of the official school going age population.	Ghana Education Services (GES) EMIS portal
Health	MMDAs' output in health is measured as delivery by skilled staff which is defined as Percentage of expected delivery by skilled attendant.	UNICEF-Ghana website. This is the same data they used for the 2013 version of the DLT.
Water	MMDAs outputs in water supply services is measured as access to improved water sources	District Analytical Report (2014)
Waste	MMDAs' output in waste management is measure as amount of waste collected and is defined as percentage of districts' household population who has their solid waste collected.	
<u>FD and other control</u>		
Fiscal Autonomy (fd_1)	The percentage share of IGF in total MMDAs' revenue	All variables used for fiscal autonomy and vertical imbalance were obtained from the MMDAs composite budgets
Vertical imbalance (fd_2)	The percentage share of central government's transfers in total MMDAs' expenditure	

Table 1B continued

Variable	Measurement	Data sources
Grant per capita	DACF and DDF per population. $grant = \frac{DACF + DDF}{population}$	DACF and DDF were gotten from MMDAs composite budget will population figures were derived from the district analytical report (2014).
FOAT	Performance measures from the 2013 FOAT assessment	FOAT PMs were taken from the Local Government Services (LGS) website.
Average Years of Schooling	Total number of years of education	GLSS 6 (2012/13)
'Perceived' Competency of MMDAs	Percent of people who say local governments are competent	
Incidence of poverty	Percentage of household population living below the poverty line.	District Mapping report (2015)
Population	Total number of inhabitants in the district	Districts' Analytical Reports.

Table 1C: Pearson's Correlation matrix of inputs and output variables

	capital	labour	material	land	DCOI
Capital	1	0.2862	0.4554	-0.0498	0.2047
Labour	0.2862	1	0.5789	-0.1266	0.2042
Material	0.4554	0.5789	1	-0.1936	0.3152
Land	-0.0498	-0.1266	-0.1936	1	-0.4168
DCOI	0.2047	0.2042	0.3152	-0.4168	1

Table 1D: Pearson's Correlation matrix of FD and other control Variables

	fd_1	fd_2	grant	edys	foat	poin	pop	com
fd_1	1	-1	-0.2849	0.0175	0.0461	-0.4117	0.2889	-0.0965
fd_2	-1	1	0.2849	-0.0175	-0.0461	0.4117	-0.2889	0.0965
grant	-0.2849	0.2849	1	-0.3314	0.046	0.3202	-0.2303	-0.0398
edys	0.4700	-0.4700	-0.3005	1	-0.0810	-0.4553	0.3091	0.0188
Foat	0.0461	-0.0461	0.046	-0.0827	1	0.0061	0.0366	0.1590
Poin	-0.4117	0.4117	0.3202	-0.4314	0.0061	1	-0.2601	0.0913
Pop	0.2889	-0.2889	-0.2303	0.0559	0.0366	-0.2601	1	-0.0023
com	-0.0965	0.0965	-0.0398	0.0188	0.1590	0.0913	-0.0023	1

Table 1E: LR Test for Appropriate Model (Cobb Douglass vs. Translog)

Hypotheses (Cobb Douglass vs. Translog)	Chisq	P-value	Decision
Model 1	6.9144	0.5459	reject translog
Model 2	0.4784	1.0000	reject translog
Model 3	0.2795	1.0000	reject translog
Model 4	7.9066	0.5436	reject translog

Table 1F: LR Test for the Appropriate Model (Cobb-Douglass Specification)

Hypotheses	Chisq	P-value	Decision
Model 1 Vs. Model 4	24.682	0.00016	reject Model 1
Model 2 Vs. Model 4	5.6998	2.20E-16	reject Model 2
Model 3 Vs. Model 4	20.073	0.00121	reject Model 3



APPENDIX 2**Table 2A: The Results of the DEA Efficiency scores, Central and Western regions.**

Western	Score	Central	Score
Jomoro	0.1359	Komenda Edina Eguafo Abirem	0.4203
Ellembele	0.4801	Cape Coast	1.0000
Nzema East	0.2330	Abura Asebu Kwamankese	1.0000
Ahanta West	0.2945	Mfantsiman	0.4755
Sekondi-Takoradi Metro	0.1944	Ajumako-Enyan-Essiam	0.3245
Shama	0.5921	Gomoa West	0.6881
Wassa East	1.0000	Effutu	0.6846
Tarkwa	1.0000	Gomoa East	0.3813
Prestea	0.2362	Awutu Senya West	1.0000
Amenfi East	0.2396	Agona East	0.3174
Amenfi West	0.2276	Agona West	0.3873
Aowin	0.0853	Asikuma Odoben Brakwa	0.2421
Sefwi Akontombra	0.2839	Assin South	0.1659
Sefwi Wiaso	1.0000	Assin North	0.2474
Bibiani Anhwiaso Bekwai	0.3626	Twifo Ati Morkwa	0.5429
Juaboso	1.0000	Upper Denkyira East	0.6976
Bia West	0.3600	Upper Denkyira West	0.3415
Mpohor	0.5159	Twifo Heman Lower Denkyira	0.3546
Amenfi Central	0.3080	Ekumfi	1.0000
Suaman	0.5592	Awutu Senya East	1.0000
Bodi	0.5088		
Bia East	0.4135		

Table 2B: The Results of DEA Efficiency scores Upper West and East regions.

Upper West	Score	Upper East	Score
Wa West	0.1820	Builsa North	0.2259
Wa	0.7324	Kasena Nankana West	0.2501
Wa East	0.1331	Kasena Nankana East	0.1723
Sissala East	0.1091	Bolgatanga	0.3418
Nadowli-Kaleo	0.3340	Talensi	0.2323
Jirapa	0.2869	Bongo	0.4335
Sissala West	0.5228	Bawku West	0.2501
Lambussie Karni	0.4378	Garu Tempane	0.1881
Lawra	0.3069	Bawku	0.5615
Daffiama Bussie	0.9754	Builsa South	0.2494
Nandom	1.0000	Nabdam	0.7388
		Binduri	0.4179
		Pusiga	0.7104

Table 2C: The Results of the DEA Efficiency scores, Eastern and Northern regions

Eastern	Score	Northern	Score
Birim South	0.3026	Bole	0.1856
Birim Central	0.2477	Sawla-Tuna-Kalba	0.1265
West Akim	0.3553	West Gonja	0.1626
Suhum	0.5603	Central Gonja	0.2403
Nsawam Adoagyiri	1.0000	East Gonja	0.0746
Akwapim North	0.4129	Kpandai	0.2741
New Juaben	0.4919	Nanumba South	1.0000
Yilo Krobo	0.2592	Nanumba North	0.0990
Lower Manya	0.5017	Zabzugu	0.7037
Asuogyaman	0.3149	Yendi	0.2144
Upper Manya	0.2270	Tamale	0.3775
Fanteakwa	0.1734	Tolon	0.0772
East Akim	0.2233	Savelugu Nanton	0.1983
Kwaebibirem	1.0000	Karaga	0.0971
Akyemansa	0.2706	Gushiegu	0.0794
Birim North	0.2944	Saboba	0.8174
Atiwa	0.1679	Chereponi	0.1655
Kwahu West	1.0000	Bunkpurugu Yunyuu	0.1746
Kwahu South	0.4514	East Mamprusi	0.2080
Kwahu East	0.2805	West Mamprusi	0.1749
Kwahu Afram Plains North	0.0949	North Gonja	1.0000
Upper West Akyem	1.0000	Kumbungu	0.2265
Akwapim South	1.0000	Sagnerigu	1.0000
Ayensuano	0.3948	Mion	0.0836
Dekyembour	0.4457	Tatale	0.1922
Kwahu Afram Plains South	0.4769	Mamprugu Moagduri	0.2747

Table 2D: Results of the DEA Efficiency scores by Region, Brong Ahafo and Northern

Volta	Score	Brong Ahafo	Score
South Tongu	0.2588	Asunafo South	0.0833
Keta	0.2718	Asunafo North	0.1561
Ketu South	0.2515	Asutifi North	0.1038
Ketu North	0.4727	Dormaa	0.4232
Akatsi South	0.3605	Dormaa East	0.2909
Central Tongu	0.2364	Tano South	0.4641
Agotime Ziope	0.4044	Tano North	0.8797
Ho	0.2360	Sunyani	1.0000
South Dayi	0.4317	Sunyani West	0.1283
Kpando	1.0000	Berekum	0.1740
Hohoe	0.1591	Jaman South	0.3915
Biakoye	0.2223	Jaman North	0.7825
Jasikan	0.3235	Tain	0.5760
Kadjebi	0.3753	Wenchi	0.4647
Krachi East	0.0874	Techiman	0.3586
Krachi West	0.2127	Nkoranza South	0.1947
Nkwanta South	0.1019	Nkoranza North	0.1436
Nkwanta North	0.2639	Atebubu Amantin	0.0783
North Tongu	0.8347	Sene West	0.0525
Akatsi North	0.9786	Pru	0.0673
Adaklu	0.6589	Kintampo South	0.1329
Ho West	1.0000	Kintampo North	0.0907
Afadzato South	0.7017	Asutifi South	1.0000
North Dayi	0.4043	Dormaa West	1.0000
Krachi Nchumuru	1.0000	Techiman North	0.5060
		Banda	0.4772
		Sene East	0.4553

Table 2E: The Results of DEA Efficiency scores, Ashanti and Greater Accra regions.

Ashanti	Score	Greater Accra	Score
Atwima Mponua	0.1815	Ga South	0.2620
Amansie West	0.8654	Ga West	0.3048
Amansie Central	0.2838	Ga East	0.7548
Adansi South	0.1436	AMA	0.2399
Obuasi	0.5588	Adenta	0.6638
Adansi North	0.2440	Ledzokuku/Krowor	0.7924
Bekwai	0.2876	Ashaiman	0.8547
Bosome Freho	0.2953	Tema	1.0000
Asante Akim South	0.2137	Shai Osudoku	0.2054
Asante Akim Central	0.5364	Ada East	0.7475
Ejisu Juaben	0.4701	Ga Central	0.5542
Bosomtwi	1.0000	La Dade Kotopon	1.0000
Atwima Kwanwoma	0.5614	La Nkwantanang Madina	1.0000
KMA	0.1290	Kpone Katamanso	0.5249
Atwima Nwabiagya	1.0000	Ningo Prampram	0.6985
Ahafo Ano South	0.1917	Ada West	0.5118
Ahafo Ano North	0.6214		
Offinso	0.6185		
Afigya Kwabre	0.5562		
Kwabre East	1.0000		
Sekyere South	0.3558		
Mampong	0.3132		
Sekyere East	1.0000		
Sekyere Kumamu	0.1393		
Sekyere Central	0.1316		
Ejura Sekyidumasi	0.4333		
Offinso North	0.3306		
Asokore Mampong	0.7238		
Asante Akim North	1.0000		
Sekyere Afram Plains	0.3566		

APPENDIX 3**Table 3A: The Results of the SFA Efficiency scores, Western region.**

District	Model 1 Scores	Model 2 Scores	Model 3 Scores	Model 4 Scores
Jomoro	0.7178	0.6422	0.6338	0.6295
Ellembele	0.9513	0.9552	0.9544	0.9556
Nzema East	0.8564	0.7882	0.7752	0.7784
Ahanta West	0.7851	0.7268	0.7000	0.7178
Sekondi-Takoradi Metro	0.6917	0.6339	0.6221	0.6420
Shama	0.8398	0.7934	0.7548	0.7879
Wassa East	0.8370	0.7877	0.7278	0.7682
Tarkwa	0.9537	0.9647	0.9646	0.9753
Prestea	0.8634	0.7767	0.7810	0.7646
Amenfi East	0.8836	0.8274	0.8065	0.8187
Amenfi West	0.9241	0.8994	0.8888	0.8860
Aowin	0.7258	0.6429	0.6373	0.6239
Akontombra	0.5977	0.5475	0.5185	0.5386
Wiaso	0.9376	0.9469	0.8939	0.9527
Bab	0.9317	0.9215	0.9017	0.9169
Juaboso	0.9633	0.9746	0.9775	0.9781
Bia West	0.9262	0.8829	0.8884	0.8692
Mpohor	0.8680	0.8138	0.7822	0.8037
Amenfi Central	0.8835	0.8156	0.7902	0.7962
Suaman	0.8364	0.7841	0.7496	0.7715
Bodi	0.7035	0.6609	0.6099	0.6509
Bia East	0.8415	0.7712	0.7601	0.7627

Table 3B: The Results of SFA Efficiency Scores, Upper East region

District	Model1 Scores	Model 2 Scores	Model 3 Scores	Model 4 Scores
Builsa North	0.8437	0.7682	0.7603	0.7558
Kasena Nankana West	0.9182	0.8812	0.8701	0.8685
Kasena Nankana East	0.7912	0.7232	0.7126	0.7210
Bolgatanga	0.9139	0.9001	0.8691	0.9091
Talensi	0.8058	0.7282	0.7154	0.7124
Bongo	0.9273	0.9026	0.8895	0.8921
Bawku West	0.9396	0.9263	0.9289	0.9237
Garu Tempane	0.9227	0.8800	0.8947	0.8792
Bawku	0.8604	0.8389	0.7855	0.8506
Builsa South	0.8358	0.7622	0.7453	0.7509
Nabdam	0.8956	0.8516	0.8320	0.8505
Binduri	0.6968	0.6421	0.6190	0.6367
Pusiga	0.9079	0.8799	0.8440	0.8740

Table 3C: The Results of the SFA Efficiency scores, Central region

District	Model 1 Scores	Model 2 Scores	Model 3 Scores	Model 4 Scores
Komenda Edina Eguafo Abirem	0.7195	0.6643	0.6346	0.6573
Cape Coast	0.8891	0.8833	0.8120	0.8923
Abura Asebu Kwamankese	0.9135	0.8314	0.8124	0.7799
Mfantiman	0.7346	0.6816	0.6520	0.6762
Ajumako-Enyan-Essiam	0.7320	0.6702	0.6472	0.6581
Gomoa West	0.7675	0.6789	0.6614	0.6490
Effutu	0.8512	0.8343	0.7774	0.8405
Gomoa East	0.7191	0.6462	0.6284	0.6263
Awutu Senya West	0.8985	0.8615	0.8269	0.8603
Agona East	0.8486	0.7860	0.7633	0.7741
Agona West	0.8992	0.8756	0.8381	0.8754
Asikuma Odoben Brakwa	0.8077	0.7451	0.7195	0.7321
Assin South	0.7141	0.6417	0.6323	0.6290
Assin North	0.7893	0.7192	0.7081	0.7171
Twifo Ati Morkwa	0.9372	0.9364	0.9068	0.9312
Upper Denkyira East	0.9139	0.8976	0.8582	0.9018
Upper Denkyira West	0.8759	0.8257	0.7966	0.8115
Twifo Heman Lower Denkyira	0.7380	0.6795	0.6461	0.6648
Ekumfi	0.6204	0.5614	0.5387	0.5534
Awutu Senya East	0.9034	0.9037	0.8407	0.9201

Table 3D: The Results of SFA Efficiency Scores, Greater Accra region

District	Model 1 Scores	Model 2 Scores	Model 3 Scores	Model 4 Scores
Ga South	0.5916	0.5508	0.5248	0.5531
Ga West	0.8863	0.8572	0.8251	0.8656
Ga East	0.7591	0.7480	0.6793	0.7568
AMA	0.7700	0.7264	0.7019	0.7420
Adenta	0.8871	0.8744	0.8138	0.8822
Ledzokuku/Krowor	0.6936	0.6879	0.6189	0.6961
Ashaiman	0.7979	0.7774	0.7220	0.7850
Tema	0.8979	0.8912	0.8444	0.9166
Shai Osudoku	0.9258	0.8963	0.8902	0.8925
Ada East	0.7896	0.7253	0.6915	0.7059
Ga Central	0.6311	0.6153	0.5586	0.6217
La Dade Kotopon	0.8797	0.8937	0.8123	0.9112
La Nkwantanang Madina	0.9283	0.9415	0.9084	0.9551
Kpone Katamanso	0.8581	0.8044	0.7736	0.8043
Ningo Prampram	0.9389	0.9281	0.9154	0.9297
Ada West	0.7280	0.6713	0.6404	0.6578

Table 3E: The Results of SFA Efficiency Scores, Volta Region

District	Model 1 Scores	Model 2 Scores	Model 3 Scores	Model 4 Score
South Tongu	0.8295	0.7606	0.7448	0.7487
Keta	0.8390	0.7807	0.7625	0.7813
Ketu South	0.6891	0.6291	0.6105	0.6182
Ketu North	0.8041	0.7381	0.7154	0.7294
Akatsi South	0.6869	0.6318	0.6051	0.6225
Central Tongu	0.8148	0.7343	0.7179	0.7130
Agotime Ziope	0.7859	0.7352	0.7040	0.7303
Ho	0.8327	0.7706	0.7448	0.7639
South Dayi	0.6982	0.6505	0.6162	0.6383
Kpando	0.9022	0.8744	0.8269	0.8657
Hohoe	0.6305	0.5739	0.5574	0.5711
Biakoye	0.8502	0.7767	0.7596	0.7577
Jasikan	0.6880	0.6253	0.6048	0.6106
Kadjebi	0.8786	0.8131	0.7927	0.7948
Krachi East	0.5508	0.4799	0.4824	0.4706
Krachi West	0.8009	0.7218	0.7109	0.7059
Nkwanta South	0.7935	0.6922	0.7059	0.6736
Nkwanta North	0.6785	0.5939	0.5995	0.5807
North Tongu	0.9080	0.8525	0.8390	0.8407
Akatsi North	0.6397	0.5826	0.5567	0.5727
Adaklu	0.5342	0.4813	0.4597	0.4726
Ho West	0.7090	0.6191	0.6146	0.5983
Afadzato South	0.5060	0.4526	0.4360	0.4436
North Dayi	0.7937	0.7309	0.7017	0.7166
Krachi Nchumuru	0.7760	0.6698	0.6616	0.6357

Table 3F: The Results of SFA Efficiency scores, Upper West

District	Model 1 Scores	Model 2 Scores	Model 3 Scores	Model 4 Scores
Wa West	0.8347	0.7332	0.7472	0.7159
Wa	0.9422	0.9501	0.9414	0.9608
Wa East	0.7036	0.6126	0.6270	0.6036
Sissala East	0.9340	0.8873	0.9103	0.8728
Nadowli-Kaleo	0.9404	0.9283	0.9310	0.9292
Jirapa	0.8933	0.8124	0.8207	0.7953
Sissala West	0.9283	0.8696	0.8910	0.8601
Lambussie Karni	0.8598	0.7802	0.7649	0.7621
Lawra	0.8265	0.7503	0.7411	0.7371
Daffiama Bussie	0.9298	0.8836	0.8846	0.8716
Nandom	0.9354	0.9249	0.9047	0.9243

Table 3G: The Results of SFA Efficiency scores, Eastern region

District	Model 1 Scores	Model 2 Scores	Model 3 Scores	Model 4 Scores
Birim South	0.6652	0.6106	0.5729	0.5940
Birim	0.8110	0.7402	0.7262	0.7361
West Akim	0.6349	0.6003	0.5615	0.5993
Suhum	0.7976	0.7697	0.7106	0.7710
Nsawam Adoagyiri	0.8760	0.8820	0.7968	0.8877
Akwapim North	0.6761	0.6406	0.5961	0.6411
New Juaben	0.8296	0.8084	0.7528	0.8175
Yilo Krobo	0.6802	0.6178	0.5980	0.6123
Lower Manya	0.9019	0.8787	0.8395	0.8794
Asuogyaman	0.9331	0.9006	0.8958	0.8851
Upper Manya	0.6511	0.5822	0.5697	0.5686
Fanteakwa	0.6415	0.5716	0.5621	0.5575
East Akim	0.7133	0.6623	0.6359	0.6607
Kwaebibirem	0.6692	0.6584	0.5870	0.6571
Akyemansa	0.6614	0.6079	0.5860	0.5966
Birim North	0.7749	0.7158	0.6891	0.7048
Atiwa	0.8286	0.7473	0.7409	0.7320
Kwahu West	0.9418	0.9377	0.9175	0.9321
Kwahu South	0.9334	0.9189	0.9023	0.9125
Kwahu East	0.6534	0.5977	0.5751	0.5890
Kwahu Afram Plains North	0.5061	0.4390	0.4360	0.4240
Upper West Akyem	0.6694	0.6109	0.5857	0.6050
Akwapim South	0.7735	0.7391	0.6550	0.7182
Ayensuano	0.5390	0.4905	0.4716	0.4855
Dekyembour	0.9357	0.9118	0.9143	0.9090
Kwahu Afram Plains South	0.5545	0.4784	0.4753	0.4649

Table 3H: The Results of SFA Efficiency scores, Ashanti region

District	Model 1 Scores	Model 2 Scores	Model 3 Scores	Model 4 Scores
Atwima Mponua	0.8569	0.7725	0.7629	0.7494
Amansie West	0.9575	0.9559	0.9656	0.9487
Amansie Central	0.7397	0.6753	0.6489	0.6612
Adansi South	0.7577	0.6812	0.6740	0.6694
Obuasi	0.8941	0.8891	0.8328	0.8986
Adansi North	0.8258	0.7617	0.7386	0.7507
Bekwai	0.7799	0.7333	0.7004	0.7316
Bosome Freho	0.7388	0.6705	0.6524	0.6583
Asante Akim South	0.8478	0.7720	0.7680	0.7618
Asante Akim Central	0.8532	0.8111	0.7667	0.8033
Ejisu Juaben	0.9117	0.8822	0.8576	0.8817
Bosomtwi	0.9561	0.9704	0.9666	0.9743
Atwima Kwanwoma	0.9246	0.9296	0.8821	0.9269
KMA	0.6618	0.6032	0.5981	0.6139
Atwima Nwabiagya	0.9635	0.9771	0.9777	0.9794
Ahafo Ano South	0.8113	0.7255	0.7175	0.7031
Ahafo Ano North	0.8149	0.7162	0.7046	0.6822
Offinso	0.9256	0.9243	0.8915	0.9333
Afigya Kwabre	0.9048	0.8766	0.8412	0.8698
Kwabre East	0.9494	0.9641	0.9406	0.9643
Sekyere South	0.8911	0.8532	0.8223	0.8473
Mampong	0.5920	0.5519	0.5222	0.5507
Sekyere East	0.9106	0.8879	0.8351	0.8646
Sekyere Kumamu	0.5438	0.4814	0.4725	0.4688
Sekyere Central	0.5908	0.5248	0.5129	0.5103
Ejura Sekyidumasi	0.9419	0.9352	0.9292	0.9387
Offinso North	0.9133	0.8686	0.8567	0.8557
Asokore Mampong	0.5899	0.5851	0.5187	0.5895
Asante Akim North	0.9581	0.9660	0.9678	0.9697
Sekyere Afram Plains	0.4869	0.4185	0.4197	0.4066

Table 3I: The Results of SFA Efficiency scores, Brong Ahafo region

District	Model 1 Scores	Model 2 Scores	Model 3 Scores	Model 4 Scores
Asunafo South	0.7889	0.6848	0.6978	0.6616
Asunafo North	0.7876	0.7209	0.7058	0.7161
Asutifi North	0.7897	0.7126	0.7184	0.7044
Dormaa	0.8837	0.8131	0.8068	0.8020
Dormaa East	0.8382	0.7790	0.7552	0.7691
Tano South	0.9255	0.9123	0.8864	0.9096
Tano North	0.9083	0.8281	0.8238	0.7912
Sunyani	0.9461	0.9531	0.9410	0.9563
Sunyani West	0.8563	0.7953	0.7867	0.7903
Berekum	0.8475	0.7937	0.7757	0.7971
Jaman South	0.9201	0.9003	0.8730	0.8944
Jaman North	0.8610	0.7668	0.7524	0.7309
Tain	0.9256	0.8521	0.8608	0.8144
Wenchi	0.8762	0.8177	0.7959	0.8057
Techiman	0.9330	0.9244	0.9050	0.9235
Nkoranza South	0.7770	0.7186	0.6963	0.7160
Nkoranza North	0.6601	0.5881	0.5829	0.5755
Atebubu Amantin	0.7895	0.7010	0.7071	0.6881
Sene West	0.7894	0.6903	0.7051	0.6745
Pru	0.8007	0.6999	0.7170	0.6852
Kintampo South	0.6037	0.5338	0.5284	0.5227
Kintampo North	0.8468	0.7561	0.7666	0.7472
Asutifi South	0.9515	0.9587	0.9457	0.9571
Dormaa West	0.8565	0.7840	0.7411	0.7499
Techiman North	0.7283	0.6850	0.6437	0.6788
Banda	0.9142	0.8374	0.8450	0.8135
Sene East	0.4976	0.4156	0.4237	0.3973

Table 3J: The Results of SFA Efficiency scores, Northern region

	Model 1	Model 2	Model 3	Model 4
Northern	Scores	Scores	Scores	Scores
Bole	0.9582	0.9497	0.9717	0.9459
Sawla-Tuna-Kalba	0.7162	0.6132	0.6276	0.5918
West Gonja	0.9465	0.9235	0.9418	0.9096
Central Gonja	0.6282	0.5236	0.5479	0.5062
East Gonja	0.6819	0.5742	0.6025	0.5575
Kpandai	0.7217	0.6346	0.6403	0.6243
Nanumba South	0.7805	0.6760	0.6907	0.6610
Nanumba North	0.7091	0.6182	0.6237	0.5994
Zabzugu	0.7381	0.6349	0.6323	0.6007
Yendi	0.8169	0.7361	0.7288	0.7246
Tamale	0.9431	0.9268	0.9405	0.9390
Tolon	0.6991	0.6173	0.6187	0.6060
Savelugu Nanton	0.8175	0.7377	0.7343	0.7338
Karaga	0.6913	0.6042	0.6113	0.5887
Gushiegu	0.7174	0.6331	0.6390	0.6202
Saboba	0.8756	0.7598	0.7726	0.7199
Chereponi	0.6579	0.5794	0.5821	0.5695
Bunkpurugu Yunyuu	0.7204	0.6378	0.6329	0.6227
East Mamprusi	0.9103	0.8523	0.8556	0.8418
West Mamprusi	0.8316	0.7192	0.7379	0.6949
North Gonja	0.7602	0.6540	0.6682	0.6388
Kumbungu	0.8835	0.8164	0.8075	0.8023
Sagnerigu	0.9072	0.8684	0.8318	0.8520
Mion	0.6578	0.5730	0.5803	0.5584
Tatale	0.7831	0.6988	0.6948	0.6826
Mamprugu Moagduri	0.6515	0.5697	0.5702	0.5614

Table 3K: Correlation matrix of DEA and SFA efficiency scores

	DEA	SFA Model 4
<u>Pearson's Product Moment</u>		
DEA	1	0.3894
SFA model 4	0.3894	1
<u>Spearman rank</u>		
DEA	1	0.4221
SFA model 4	0.4221	1